Preen
AC POWER CORP.

AFV-S Series

High Performance Programmable AC Power Supply

User Manual

AC Power Corp. (Preen)

V 1.01EN

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SAFETY SUMMARY

The following general safety precautions must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or specific WARNINGS given elsewhere in this manual will violate safety standards of design, manufacture, and intended use of the product.
Preen assumes no liability for the customer‘s failure to comply with these requirements.

1) BEFORE APPLYING POWER
   Verify that the product is set to match with the power line input.

2) PROTECTIVE GROUNDING
   Make sure to connect the product to the protective ground to prevent an electric shock before turning on the power.

3) NECESSITY OF PROTECTIVE GROUNDING
   Never cut off the internal or external protective grounding wire, or disconnect the wiring of protective grounding terminal. Doing so will cause a potential shock hazard that may bring injury to a person.

4) DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE
   Do not operate the product in the presence of flammable gases or fumes.

5) DO NOT REMOVE THE COVER OF THE PRODUCT
   Personnel who operate the product must not remove the cover of the product. Component replacement and internal adjustment can be done only by qualified service personnel.

WARNING
LETHAL VOLTAGES. The product can supply 440V peak at its output. DEATH on contact may result if either the output terminals or the output circuits connected to the output are touched when the product output is on.

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1 General Information

1.1 Introduction

Preen's AFV-S series is a programmable AC power supply and precision measurements. This compact power supply comes in four power levels, 600VA, 1250VA, 2500VA and 5000VA, which provides stable output voltage and output frequency with low distortion. The front panel has both touch screen and rotary knob for setting the product output, In-built with 20 Memories and 4 Shortcuts, and one of the 4 Shortcuts is selectable, which provide an easy operation and measurement reading display. Remote control for the product can be accomplished selectively via RS232, RS485, Ethernet(optional) & USB(optional) or Analog(optional).

The following figures show the V/I curve according to the AC output of AFV-S Series, which can be applied to any product model and any output voltage range of the product.

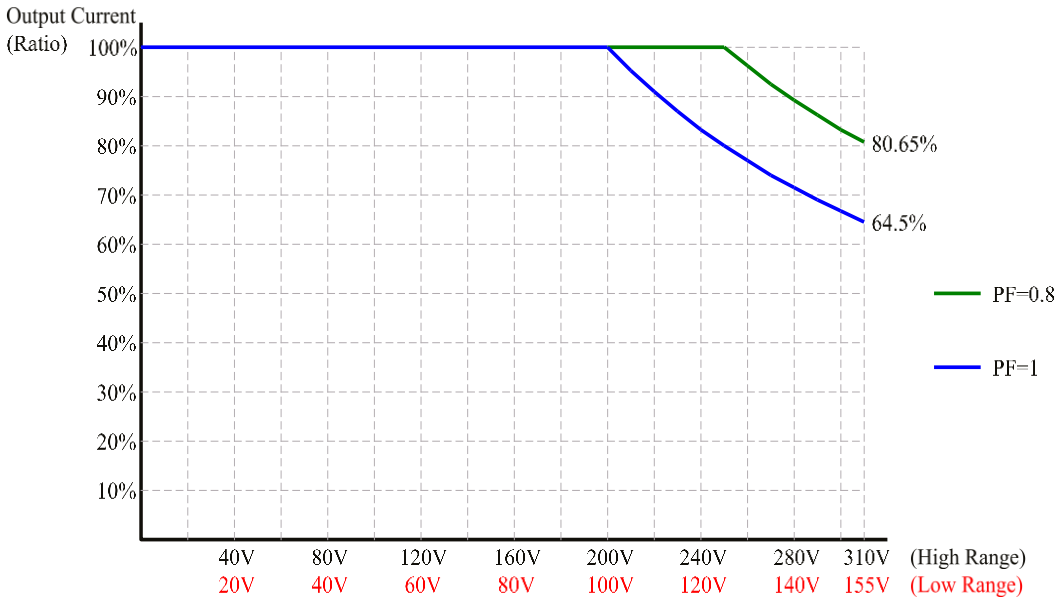


Figure 1.1 V/I curve for the AC output of AFV-S series

NOTICE
If the Power Factor (PF) corresponding to the AC output of AFV-S is less than 0.65, 100% output current can be achieved under 0%-100% output voltage, which can be applied to any AFV-S model and any output voltage range of AFV-S.

1.2 Key Features

A. Configuration

1. Local operation via the touch screen and the rotary knob on the front panel.
2. Remote control via RS232, RS485, Ethernet (optional) & USB (optional), or Analog(optional) .
3. Protection for OVP, LVP, OCP, OPP, OTP, RCP, Fan Fail and AMP Fail.
4. Temperature-controlled fan speed.

B. Input / Output

1. Selective output voltage range with full scale 310V/Auto.
2. Universal input voltage range 98~132V_{AC}/196~264V_{AC}.
3. Wide output voltage from 0 to 310V_{AC} & output frequency from 40 to 500Hz.
4. Measurement readings of V, I, P, VA, VAR, F, I_{pk}, CF and PF.
5. Output of Synchronized signal.

1.3 Specifications

Technical specifications of product are listed below. All specifications have been tested according to Preen's standard test procedures.

Model	AFV-S-600	AFV-S-1250	AFV-S-2500	AFV-S-5000
AC Input				
Phase	Single			
Input Voltage Range	98-132V_{ac}/196-264V_{ac}		196-264V_{ac} (opt.175-235V_{ac})	
Input Frequency	47~63Hz			
Max. Current	10A	20A	20A	40A
AC Output				
Power (VA)	600VA	1250VA	2500VA	5000VA
Power (W)	500W	1000W	2000W	4000W
Phase	1ϕ /2 Wire + G			
Voltage Range	0-155V_{rms} / 0-310V_{rms} , user selectable			
Voltage Accuracy	±(1% of Setting + 0.1% F.S.)			
Voltage Resolution	0.1Vrms			
Frequency	40-500Hz			
Frequency accuracy	±0.2%			
Frequency Resolution	0.1Hz			
Max. Current (RMS)	5A/2.5A	10A/5A	20A/10A	40A/20A
Max. Current (Peak)	20A/10A	40A/20A	80A/40A	160A/80A
Total Harmonic Distortion (THD)	≤0.5%(Resistive Load) ≤0.3% at 110V/220V, 50Hz, 60Hz.			
Line Regulation	±0.1V			
Load Regulation	≤0.07% F.S (Resistive Load)			
Response Time	≤300μs			
Crest Factor	≥3			
Inrush Current	≥4 times of max. output current (R.M.S)			
Measurement				
Voltage Range	0-420V			
Voltage Accuracy	±(0.2% of Reading + 5 Counts)			
Voltage Resolution	0.1V			
Frequency Range	40.0-500.0Hz			
Frequency Accuracy	±0.1Hz			
Frequency Resolution	0.1Hz			
Current Range	Hi: 1-12A/		Hi: 2-24A/	Hi: 0.05-48A

	Lo: 0.005-1.2A		Lo: 0.005-2.4A	
Current Accuracy	±(1% of Reading + 5 Counts), at 40-500Hz,*2			
Current Resolution	Hi: 0.01A / Lo: 0.001A			Hi: 0.01A
Peak Current Range	0-40A		0-80A	0-160A
Peak Current Accuracy	±(1% of Reading + 10 Counts), at PF >0.2			
Peak Current Resolution	0.1A			
Power Range	Hi: 100-1200W/ Lo: 0-120W		Hi: 200-2400W/ Lo: 0-240W	Hi: 0-4800W
Power Accuracy	±(2% of Reading + 10 Counts), at 40-500Hz;			
Power Resolution	Hi: 1W/Lo: 0.1W			Hi: 1W
General				
Efficiency	≥77% at Max. Power	≥80% at Max. Power		
Protection	OVP, LVP, OCP, OPP, OTP, RCP, Fan Fail and AMP Fail			
Remote Interface	Standard: RS232/RS485/PLC Remote In & Out; Option: Analog Control/Ethernet & USB			
Over Current Foldback (OC-FOLD)	When the OC-FOLD mode is enabled, the criteria to activate/deactivate the OC-FOLD mode is the set value of the max. output current. The response time from exceeding the up limit to falling back to the up limit is ≤1.4S.			
Synchronized Signal	ON Mode (5V DC Signal) or EVENT Mode (5V DC Pulse Signal) (BNC type)			
Memories	20 Memories			
Operating Temperature	0-40°C			
Dimensions(H×W×D)	88 x 442 x 495mm		88 x 442 x 650mm	176 × 442 × 665mm
	3.5 x 17.4 x 19.5inch		3.5 x 17.4 x 25.6inch	6.9 x 17.4 x 26.2inch
Weight	16kg	20kg	31.3kg	61.5kg
	35.3lbs	44.1lbs	69lbs	135.6lbs

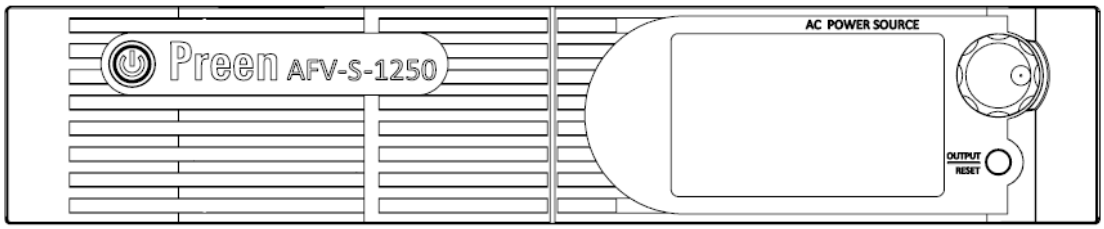
*1. All specifications are subject to change without notice

*2. AFV-S-2500 is ±((1% F.S + 5 Counts)

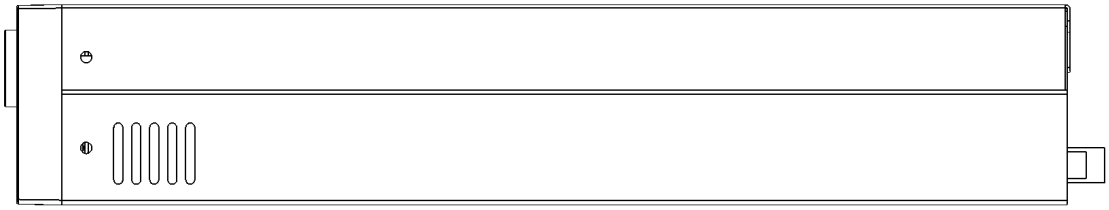
Table 1.1 Technical specifications

1.4 Exterior

Product exterior of the AFV-S series are given as follows,



(a) Front-side view of the AFV-S series.



(b) Right-side view of the AFV-S series.

Figure 1.2 Product exterior of the AFV-S series

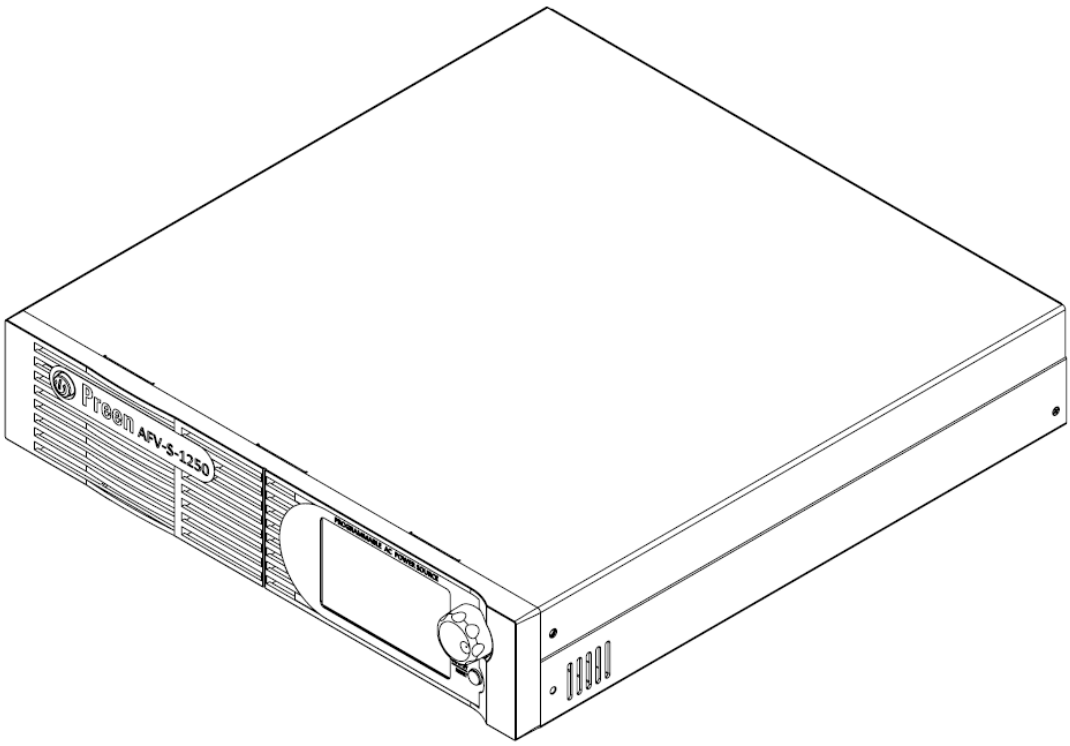


Figure 1.3 Product exterior of the AFV-S series in axis-side view

1.5 Name of Parts

A. Front Panel

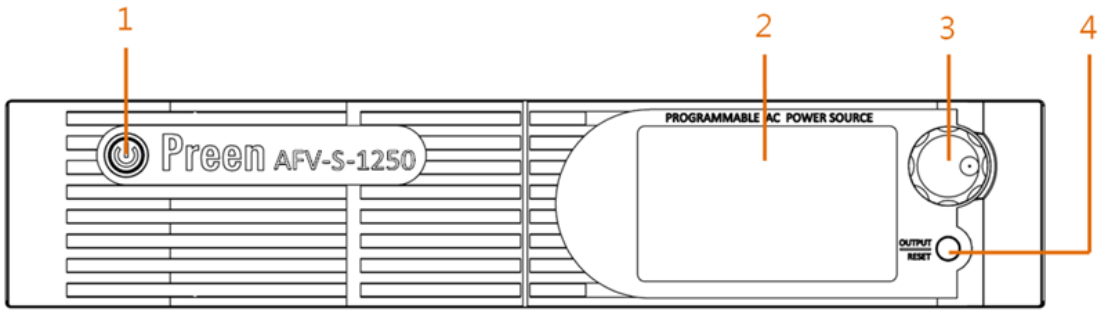


Figure 1.4 Front panel

Item	Name	Description
1	Power Switch	Press this switch to turn on/ turn off the product.
2	Touch Screen	Touch the screen for setting values, menu, and testing settings.
3	Rotary Knob	Turn or press the rotary knob to for setting values, menu, and testing settings.
4	Output & Reset Button	Press this button to enable/disable the product output. ● When the output is stopped, short press ＜2 seconds to restart output. ● When the output is stopped, long press ≧2 seconds to clear the display.

B. Rear Panel

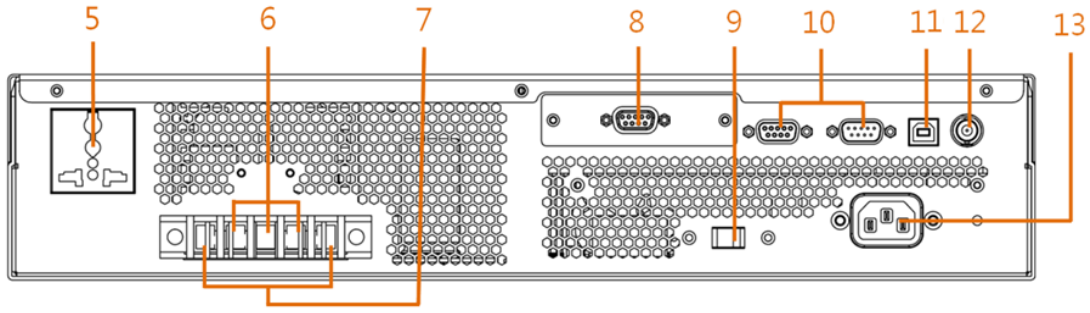


Figure 1.5 Rear panel (for the product model of AFV-S-600)

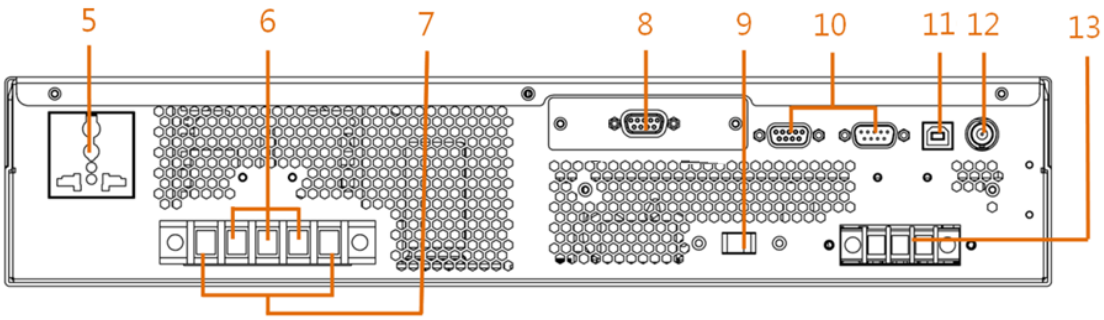


Figure 1.6 Rear panel (for the product models of AFV-S-1250)

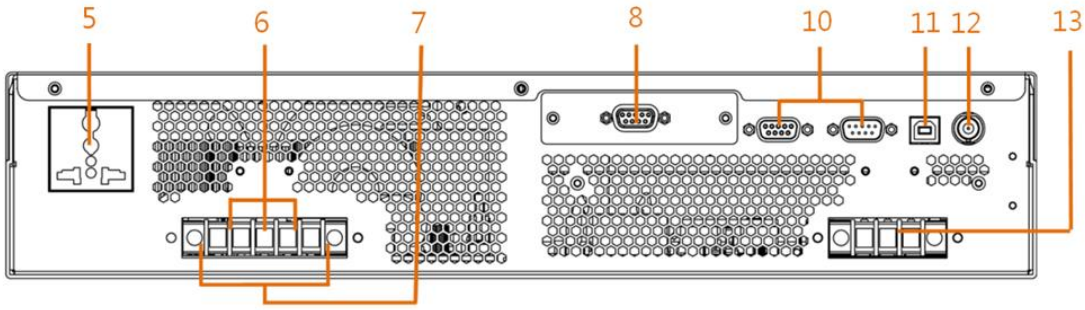


Figure 1.7 Rear panel (for the product models of AFV-S-2500)

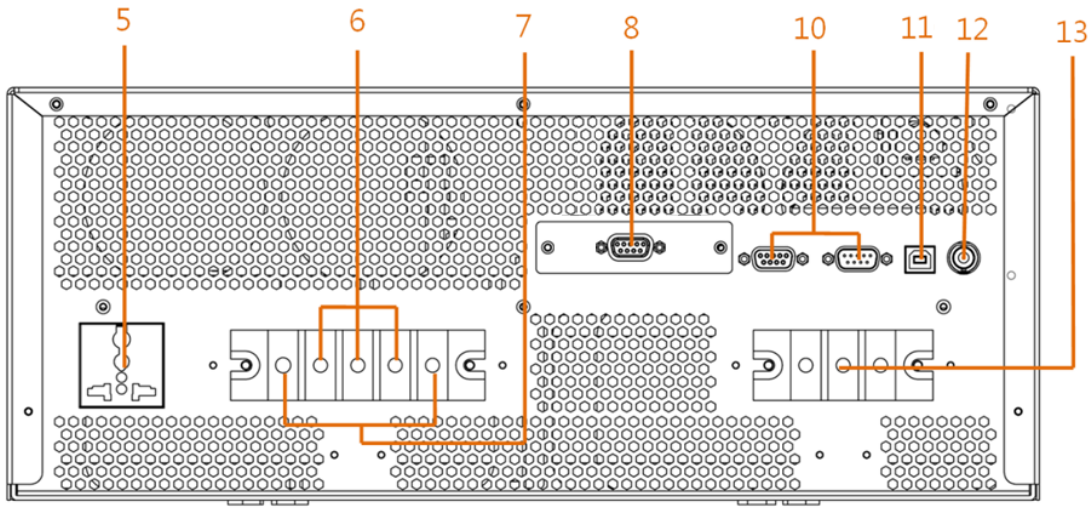


Figure 1.8 Rear panel (for the product model of AFV-S-5000)

Item	Name	Description
5	AC Output Socket	This socket is used to output AC power to the load.
6	Output Terminals	These terminals are used to output AC power to the load.
7	Remote Sense Connector	These connectors sense directly at the terminals of the load to compensate any voltage drop on the connecting cable. **NOTICE:** Make sure to connect the terminal "S_L" of the remote sense connector to the terminal "L" of the load and connect the terminal "S_N" of the remote sense connector to the terminal "N" of the load. Notice that reverse polarity is not allowed.
8	RS232/RS485 Interface	This interface is used for remote control via the RS232/RS485 cable
9	Input Voltage Selector	Verify this selector is switching to the position (either 115V or 230V) matching the input voltage before switching on the product. **NOTICE:** This function is only available on the product models of AFV-S-600 and AFV-S-1250.
10	PLC Remote In & Out	These interfaces are used for remote control via PLC.
11	USB Interface	The interface is used for firmware update via the USB cable.
12	Synchronized Signal I/O	This I/O is used to output synchronized signal via the BNC cable.
13	Input Terminals (AC Inlet)	These terminals are used to connect the product with the power line input. **NOTICE:** These terminals are replaced by the AC IEC inlet for the product model of AFV-S-600.

2 Installation

2.1 Inspection

After unpacking the product, please inspect any damage that may have occurred during the shipment. Save all packing materials in case the product has to be returned one day.

If any damage is found, please file a claim with the carrier immediately. Do not return the product to the factory without obtaining the prior Return Merchandise Authorization (RMA) acceptance from Preen.

2.2 User Preparation

Be sure the device is connected to the power line input that meets the specification. The device must be installed in an air-circulated area, so that the fans built-in are able to ventilate the heat generated by components properly. The ambient temperature should be controlled within 40°C.

2.2.1 Notice for Installation

1. The device must be installed on horizontal grounds and should be located near the load so that the connection is as short as possible.
2. Leave sufficient space around the device for ventilation and maintenance (refer to Figure 2.1). Do not block the cooling fan opening in case of internal temperature getting too high and having bad impact on product lifespan.
3. The device should be located in proper ventilation. The ambient temperature and humidity should not be high. Stay away from liquid, flammable gases, corrosive substances, heat sources, or direct sunlight. Keep the opening free from dust.
4. The operating environment should be free from dust, volatile organic compounds, high salinity, or corrosive substance.
5. Do not operate the device outdoor.
6. Use correct cable selection and proper power distribution to ensure the safety of the device and the users.

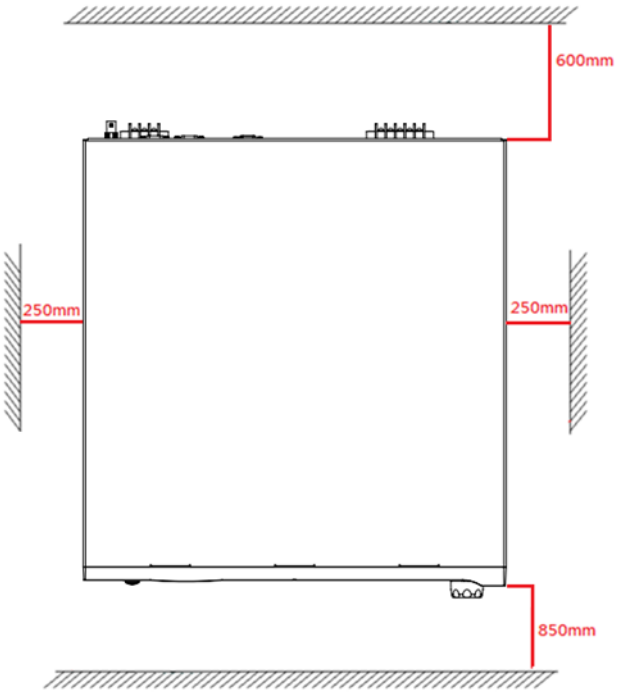


Figure 2.1 The required space for the device.

2.3 Input Connection

The input terminals are located on the rear panel of the product (see Figure 2.2). The input power cord must be rated at least for 85°C. The input power cord must have rated current which is greater than or equal to the maximum input rated current of the product.

See Figure 2.2 and do the following procedures step by step:

1. Remove the safety cover from the rare panel of the product.
2. Screw the power cord to the input terminals of the product as follows,
   2.1 green or yellow wire to the terminal "G" of the input terminals;
   2.2 white or blue wire to the terminal "N" of the input terminals; and
   2.3 black or brown wire to the terminal "L" of the input terminals.
3. Slip the safety cover over the input terminals, and secure the cover with two screws.

WARNING
Protective Grounding. **To protect users, the wire connected to terminal "G" (that is GND) must be connected to the earth ground. Under no circumstances shall this product operated without an adequate protective grounding connection.**

Installation of the power cord to the product must be done by a professional and in accordance with local electrical codes.

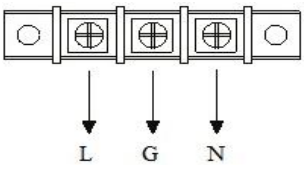


Figure 2.2 Input terminals

2.4 Output Connection

The output terminals are located on the rear panel of the product (see Figure 2.3). The terminals “N” and “L” of the output terminals are connected to the load. To match the safety requirements, the safety cover for the output terminals must be fastened. The wires to the load must be sufficiently large gauges, so they will not overheat while carrying the output current.

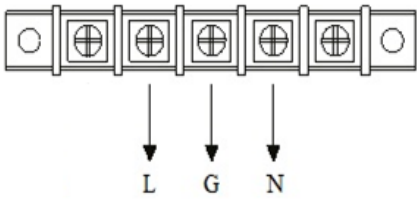


Figure 2.3 Output terminals

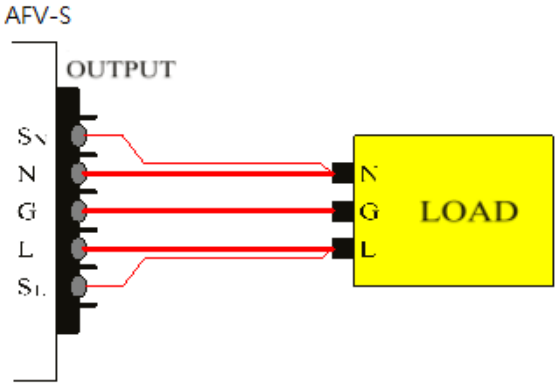


Figure 2.4 Output terminals to the load

2.5 Remote Sense Connection

The product supports remote sense function, which monitors the voltage at the load instead of the output terminal of the product. It ensures the delivery of accurate voltage as programmed at the load by automatically compensating the output voltage drop over the connecting cable.

Remove the iron chip from the terminals "S_N" and "S_L" of the remote sense connector and connect the terminals of the remote sense connector to the corresponding terminal of the load (see Figure 2.4 & 2.5). Because the sensing leads carry only a few milliamperes, the sensing leads are much lighter than the load leads. The sensing leads are part of the feedback path of the product, so they must be kept at a low resistance to maintain the best performance. The sensing leads must be connected to the load carefully so that they will not be open-circuited. If the sensing leads are left unconnected or become open-circuited during operation, the product will disable the output. The sensing leads must be a twisted pair to minimize the interference from external noise. The sensing leads need to be connected to the load as closely as possible.

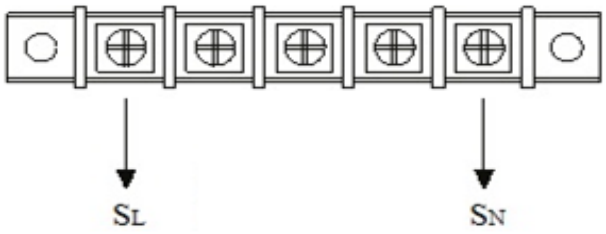


Figure 2.5 Remote sense connector

2.6 Power-on Procedures

WARNING
Before turning on the product, all protective grounding terminals, extension cords, and devices connected to the product must be connected to a protective ground. Any disconnection of the protective ground will cause a potential electric shock hazard that could result in personal injury.

Apply power and press the power switch to turn on the product, then the touch screen located on the front panel will light up and display the POWER-ON page shown as below,

Figure 2.6 POWER-ON page

After displaying the POWER-ON page, the MAIN page is shown on the touch screen as follows, and then users can input programming data or options by either pressing the touch screen or turning the rotary knob.

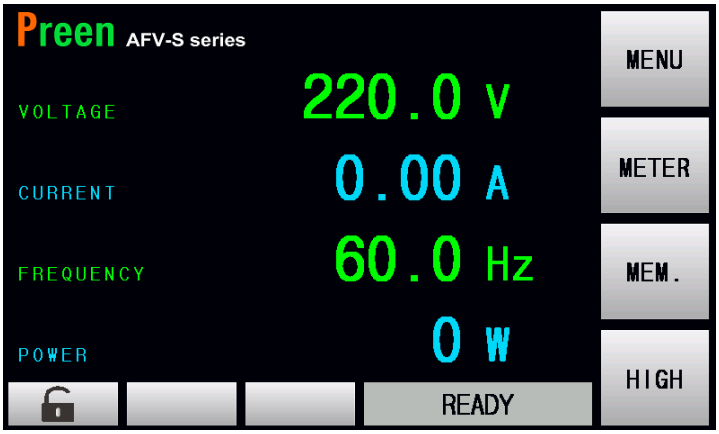


Figure 2.7 MAIN page

2.7 Rack Mounting Handle Installation

The product comes with rack mounting handles. To install the handles to the right-side and the left-side of the product, please refer to the Figure 2.8 to fix the handles to the product with eight screws.

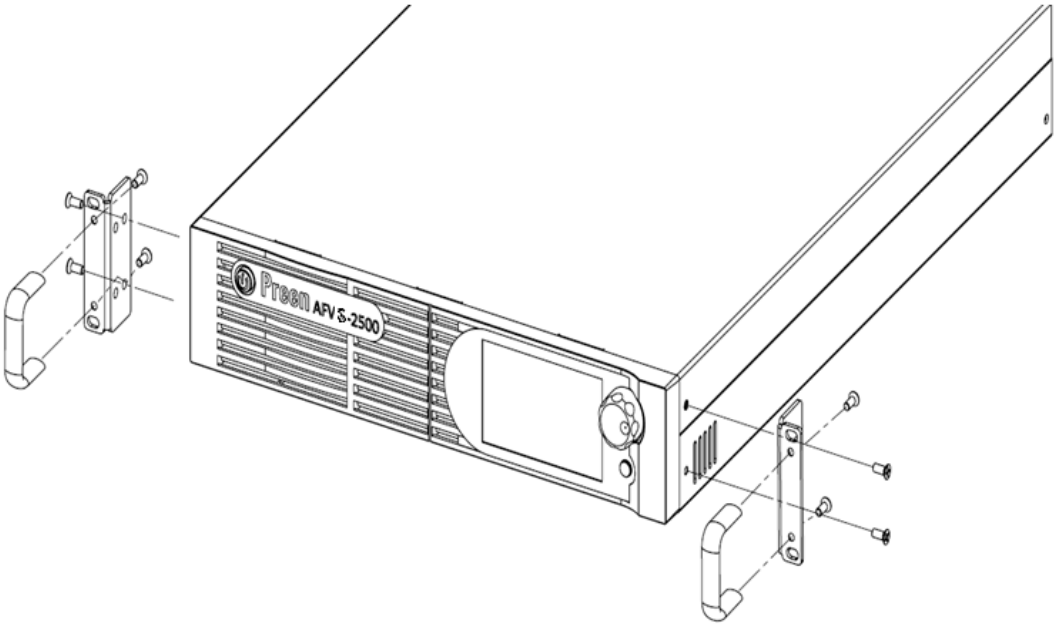


Figure 2.8 Product handle

2.8 Interface Card Installation

To install the interface card or replace the standard interface card with optional interface card, please refer to the Figure 2.9 to install or replace the interface card with two screws.

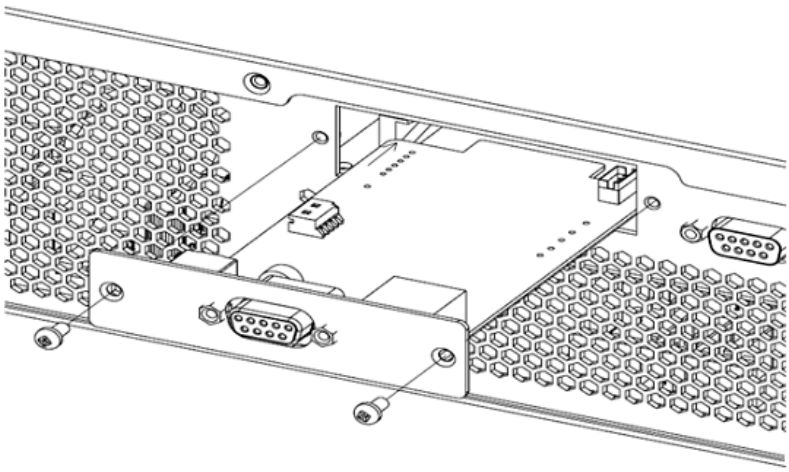


Figure 2.9 Interface Card

2.8.1 RS232/RS485 9-Pin D-Type Connector

To remotely control the product output via the interface RS232 or RS485, please connect a computer with the product via the RS232/RS485 9-pin D-type connector according to the following instructions.

The definition for the pins of the RS232/RS485 9-pin D-type female connector is given as follows:

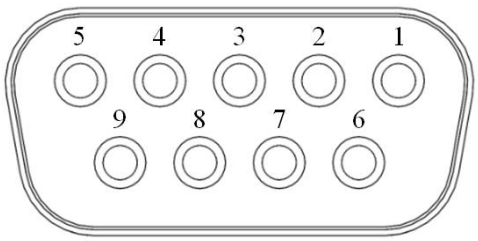


Figure 2.10 RS232/RS485 9-Pin D-Type female connector

Pin NO.	Definition
1	No Connection
2	RS232 TX
3	RS232 RX
4	No Connection
5	GND
6	No Connection
7	RS485 D+
8	RS485 D-
9	No Connection

2.8.2 PLC Remote In & Out Connector

To remotely control the product output via the PLC remote interface, please connect the PLC remote In & Out connector according to the following instructions.

The definition for the pins of the PLC remote input male connector is given as follows,

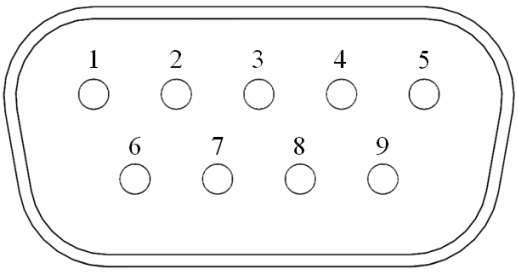


Figure 2.11 PLC remote input D-type male connector

Pin NO.	Definition
1	Ground
2	No Connection
3	Test
4	Reset
5	Memory 4
6	Memory 2
7	Memory 1
8	Ground
9	No Connection

Notice
AFV-S series programmable AC source can use PLC remote to call the output memories, M1, M2, M3(M1+M2), M4, M5(M1+M4), M6(M2+M4), M7(M1+M2+M4), total 7 memories.

The definition for the pins of the PLC remote output female connector is given as follows:

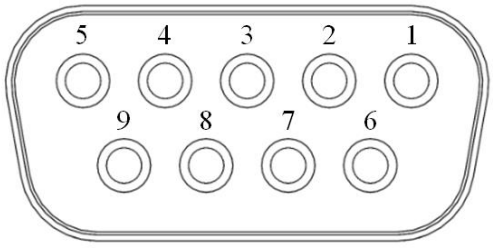


Figure 2.12 PLC remote output D-type female connector

Pin NO.	Definition
1	Pass
2	Pass
3	Fail
4	Fail
5	Processing
6	Processing
7	No Connection
8	No Connection
9	No Connection

Notice
Pass, Fail and Processing are normally open contact signals and are shorted during activation. The maximum permissible current is 1A.

2.8.3 Analog Control Interface Card (Optional)

Preen provides an optional analog control card, AFV-S-003, for remote control (see the figure below). Users can set the AC voltage and frequency and monitor the output voltage and frequency via external DC signal input. Refer to Subsection 3.7.3 for setting analog control on the product.

Figure 2.13 Analog control interface card (AFV-S-003)

Notice
The analog control card shares the same pins with RS-232/RS-485 card. Users can only use one card at a time.

2.8.3.1 Analog Control Card Specification

Analog Signal Input	
Input mode select	0 - 5Vdc or 0 - 10Vdc or 4 - 20mA select
Accuracy	± 0.2% (full scale)
Resolution	1/4200 max
Input impedance	5M Ohm min ± 5% @ Voltage input mode 250 Ohm ± 5% @ Current input mode
Max. Voltage / Current Limit	15Vdc max ± 5% @ Voltage input mode 25mA max ± 5% @ Current input mode
Analog Signal Output	
Output range	0 - 5Vdc or 0 - 10Vdc or 4 - 20mA select
Accuracy	± 0.2% (full scale)
Resolution	1/4200 max
Digital Signal Input	
High voltage level	2.5Vdc - 5.5Vdc max.
Low voltage level	< 1Vdc (Enable)
Max. Voltage Limit.	6Vdc max. ± 10%
Digital Signal Output	
Max. output current	5mA / channel max.
Output voltage	0Vdc (Low level) 5Vdc (High level) ± 5% (Enable)
Over voltage protection	6Vdc max. ± 10%
General	
Operating Temperature	0℃ - 55℃
Humidity	0 - 90% RH
Connector Type	15 pole D-Type connector (Female)

2.8.3.2 Analog Control Card Pin Assignments

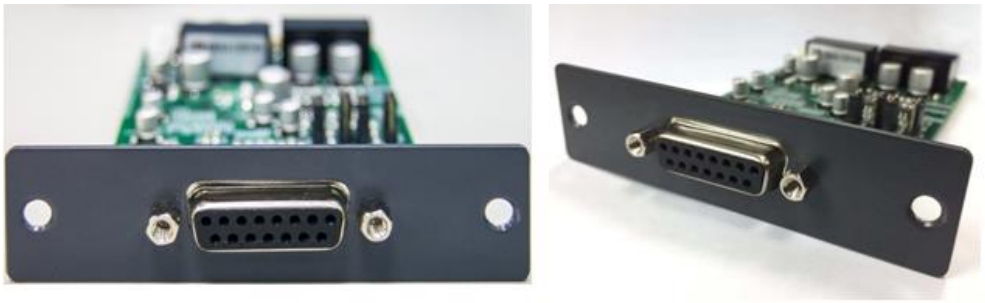


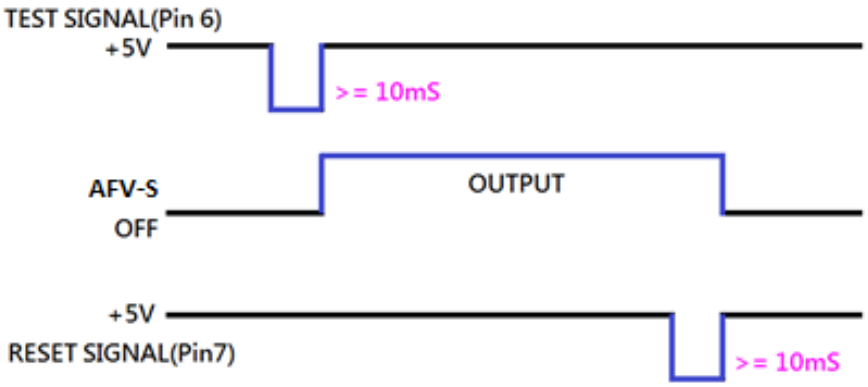
Figure 2.14 Analog control 15-pin D-type female connector

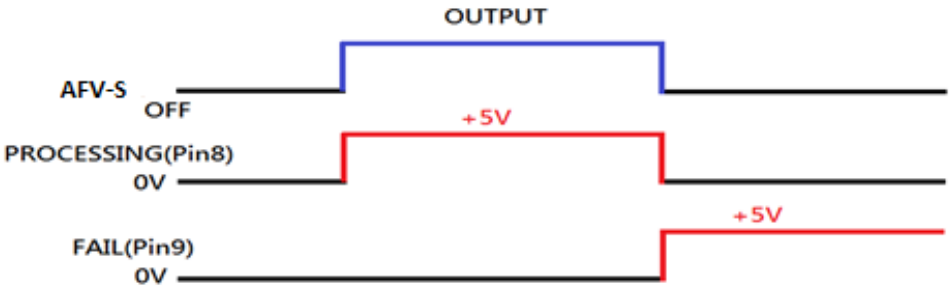
Definitions of analog control signal pin:

Analog control	Analog signal source	AFV-S voltage & frequency	Pin
Setting	Voltage (0-5Vdc or 0-10Vdc)	Output voltage (0-310V)	Pin 1 / Pin5 (GND)
Monitoring			Pin 11 / Pin15 (GND)
Setting	Current (4mAdc - 20mAdc)	Output voltage (0-310V)	Pin 2 / Pin5 (GND)
Monitoring			Pin 12 / Pin15 (GND)
Setting	Voltage (0-5Vdc or 0-10Vdc)	Output frequency (40-500Hz)	Pin 3 / Pin5 (GND)
Monitoring			Pin 13 / Pin15 (GND)
Setting	Current (4mAdc - 20mAdc)	Output frequency (40-500Hz)	Pin 4 / Pin5 (GND)
Monitoring			Pin 14 / Pin15 (GND)

Definitions of digital control signal pin:

Digital control	Digital control source	Pin
Test	5Vdc: normal high 0Vdc: active low (≥10mS)	Pin 6 / Pin10 (GND)
Reset	5Vdc: normal high 0Vdc: active low (≥10mS)	Pin 7 / Pin10 (GND)
Processing	0Vdc: normal low 5Vdc: active high	Pin 8 / Pin10 (GND)
Fail	0Vdc: normal low 5Vdc: active high	Pin 9 / Pin10 (GND)


TEST SIGNAL(Pin 6)
+5V
>= 10mS
AFV-S
OFF
OUTPUT
+5V
RESET SIGNAL(Pin7)
>= 10mS


OUTPUT
AFV-S
OFF
+5V
PROCESSING(Pin8)
0V
+5V
FAIL(Pin9)
0V

3 Local Operation

3.1 General

The product can support local operation or remote operation. The remote operation enabled via complete communication interfaces, such as RS232, RS485, Ethernet (optional) & USB (optional) or Analog(optional) will be described in Chapter 3. In this section, the local operation enabled via the touch screen and the rotary knob on the front panel will be described. The product is configured for local operation when it is turned on.

3.2 Operation via the Touch Screen and the Rotary Knob

The product provides the user-friendly programming interface using the touch screen and rotary knob on the front panel. Each display of the touch screen on the product represents an operational page.

Before describing each operational page, the followings show how to use touch screen and rotary knob to input programming data or options. When the power-on procedures are finished (refer to Subsection 2.6), the touch screen will display the MAIN page subsequently.

A. Touch Screen

Press the item shown on the touch screen directly, to choose the desired item (see Figure 3.1). Use the virtual numeric and decimal keys to set value, and then press the icon 

on the touch screen to confirm. After setting value, users can revise value by pressing the icon 

, or press the icon  to return to the previous page.

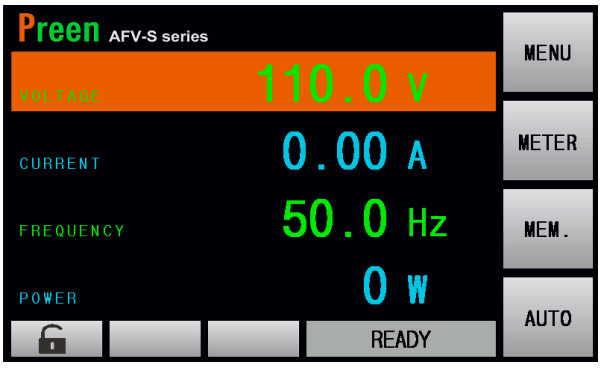


Figure 3.1 Press the value the touch screen

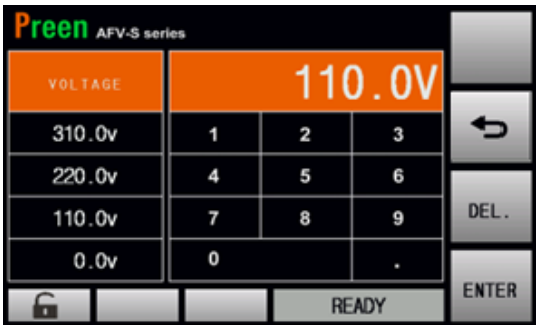


Figure 3.2 Virtual numeric and decimal keys

B. Rotary Knob

Turn the rotary knob on the front panel to move the cursor shown on the touch screen, and press the rotary knob to choose the desired item. After choosing the desired item, continue to turn the rotary knob to set value, and then press the rotary knob to confirm.

Figure 3.3 Move the cursor on the touch screen by turning the rotary knob

3.3 MAIN Page

When users turn on the product, the touch screen shows the MAIN page after the power-on procedures. The MAIN page shows the output settings and the measurement readings of the product output. Users can set output value by using the touch screen or the rotary knob (refer to Subsection 3.2), and then press the output & reset button on the front panel to enable the output of the product. Please see the following figures:

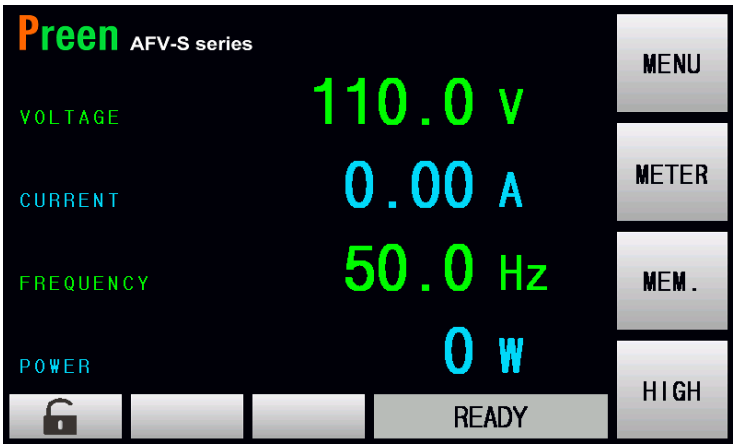


Figure 3.4 MAIN page when the product output is off

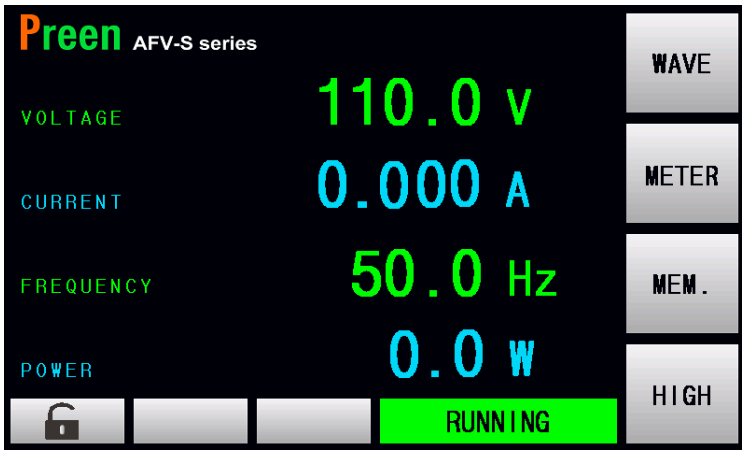


Figure 3.5 MAIN page when the product output is on

The description for the items and the icons on the MAIN page are given as follows:

1) 

: Press to set the output voltage.

2) 

: Press to set the maximum output current. When the output current exceeds the set value of maximum output current, the product will shut down the output. This set value of maximum output current can also

apply to the OC-FOLD mode, refer to Subsection 3.5.1.1.

3) 

: Press to set the output frequency.

4) 

: Press to set the maximum output power.

5) 

: Press to enter the MENU page.

6) 

: Press to enter the METER page.

7) 

: Press to enter the MEMORY page.

8) 

/ 

: Press to set the output voltage range, with two options of HIGH and AUTO.

9) 

/ 

: Shown the status of the output or the error code.

10) 
: Press to lock/unlock the operation of the touch screen, and only allow pages to switch between the MAIN page and the METER page when the operation of the touch screen is locked.

11) 

: Press to enter the WAVE page.

NOTICE
When the product output is off, the upper-right side of the MAIN page will be the icon  **; when the product output is on, the upper-right side of the MAIN page will be the icon**  **.**

3.3.1 Output Voltage Range

The product supplies full output voltage range with two options of HIGH and AUTO. Users can press the icon 

to set output voltage range at the MAIN page. HIGH indicates that the maximum output voltage will be 310V and provides the output current of HIGH range. AUTO indicates that the maximum output voltage switches automatically between 155V and 310V as required and provides the maximum output current by the voltage range.

- AUTO: The maximum output voltage switches automatically between 155V (low level) and 310V (high level) according to the set voltage
- HIGH: The maximum output voltage to be 310V (high level). The maximum output current will be half of the low level in AUTO range.

Figure 3.6 Set the output voltage range from HIGH to AUTO

3.4 MENU Page

When the MAIN page is shown on the touch screen, users can press the icon 

to enter the MENU page. Please see the following figures,

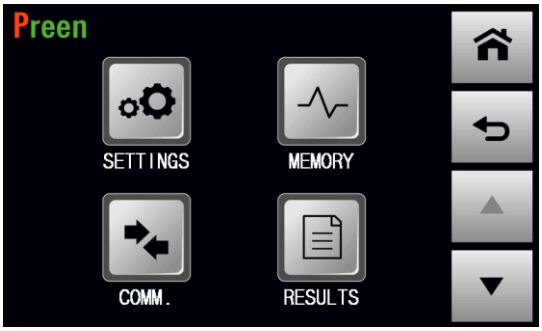


Figure 3.7 MENU page 1

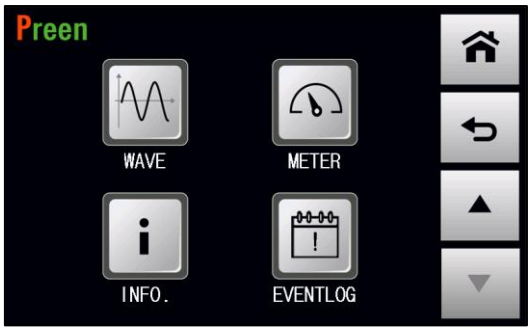


Figure 3.8 MENU page 2

The description for the icons at the MENU page is given as follows:

1)  : Press to enter the SETTINGS page.

2)  : Press to enter the MEMORY page.

3)  : Press to enter the COMMUNICATION page.

4)  : Press to enter the RESULTS page.

5)  : Press to enter the WAVE page.

6)  : Press to enter the METER page.

7)  : Press to enter the INFORMATION page.

8)  : Press to return to the MAIN page.

9)  : Press to return to the previous page.

10)  : Press to move to the previous page of the MENU page.

11)  : Press to move to the next page of the MENU page.

3.5 SETTINGS Page

When the MENU page is shown on the touch screen, users can press the icon  to enter the SETTINGS page, and the SETTINGS page includes two subpages: the TESTING subpage and the SYSTEM subpage.

3.5.1 TESTING Subpage

After pressing the icon  to enter the SETTINGS page, the TESTING subpage will be shown on the touch screen Please see the following figures:

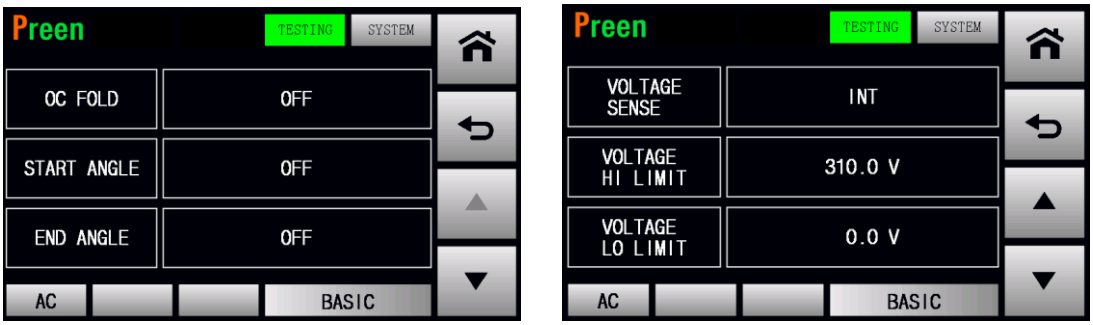


Figure 3.9 TESTING subpages 1 & 2

Figure 3.10 TESTING subpage 3 & 4

The description for the items and the icons at the TESTING subpage (ADVANCED mode) are given as follows:

1)  : Press to enable/disable the over current foldback, with two options of OFF and ON.

2)  : Press to set the start angle, with options from 0° to 359°.

3)  : Press to set the end angle, with options from 0° to

359°.

4) 

: Press to set the voltmeter point, with two options of INT and EXT.

5) 

: Press to set the maximum output voltage, with options from 0V to 310V.

6) 

: Press to set the minimum output voltage, with options from 0V to 310V.

7) 

: Press to enable/disable the synchronized signal, with three options of EVENT, OFF and ON.

8) 

: Press to set the maximum output frequency, with options from 40Hz to 500Hz.

9) 

: Press to set the minimum output frequency, with options from 40Hz to 500Hz.

10) 

: Press to set the power-on status, with three options of OFF, ON and LAST.

11)  : Press to move to the previous page of the TESTING subpage.

12)  : Press to move to the next page of the TESTING subpage.

3.5.1.1 Over Current Foldback (OC-FOLD)

At the TESTING subpage 1, users are allowed to enable the OC-FOLD mode. Thus when the output current exceeds the set value of maximum output current, the product can automatically control the output voltage to maintain the output current at the up limit; when the output current falls back to the up limit, the output voltage will then return to t**he set value of output voltage(refer to Subsection 3.3). The response time starting from the output current exceeding the up limit till falling back to the up limit is ≤1.4S. In practical applications, it can effectively improve the starting capacity for the rectifier loads and the electric motor lo**ad.

When OC FOLD mode is disabled, AFV-S series will shut down the output if the output current were to exceed the set value of maximum output current.

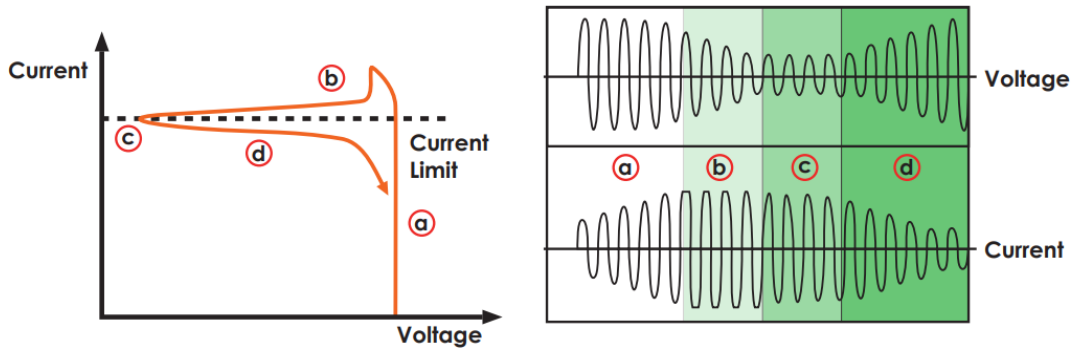


Figure 3.11 Principle of OC-FOLD Operation

The procedures of enabling the OC-FOLD mode are given as below:

1. Press the item 

twice to switch the icon status from OFF to ON.

2. Press the icon 

to confirm and enable the OC-FOLD mode.

Figure 3.12 Enable the o OC-FOLD mode

3.5.1.2 Output Phase Angle

At the TESTING subpage1, users are allowed to set the output phase angel with options from 0° to 359° by using the touch screen and the rotary knob (refer to Subsection 3.2). In other words, the product can control the output phase angle (that is, the start angle and the end angle) of the output waveform.

Firstly, the following shows the procedures of setting the start angle from 0° to 90° by using the virtual numeric keys are given as below:

1. Press the item 

to use the virtual numeric keys to set the value of 90.

2. Press the icon 

to confirm.

Figure 3.13 Set the start angle from 0° to 90°

Secondly, the following shows the procedures of setting the end angle from 0° to 270° by using the virtual numeric keys are given as below:

1. Press the item 

to use the virtual numeric keys to set the value of 270.

2. Press the icon 

to confirm.

Figure 3.14 Set the end angle from 0° to 270°

3.5.1.3 Voltage Sense

There are two options for users to set the voltmeter point: INT and EXT, and the default option is INT. INT indicates that the voltmeter point is located at the terminals "N" and "L" of the output terminals of the product; EXT indicates that the voltmeter point is located at the terminals "S_N" and "S_L" of the output terminals.

The procedures of setting the voltmeter point from INT to EXT are given as below:

1. Press the item 

twice to switch the icon status from INT to EXT.

2. Press the icon 

to confirm.

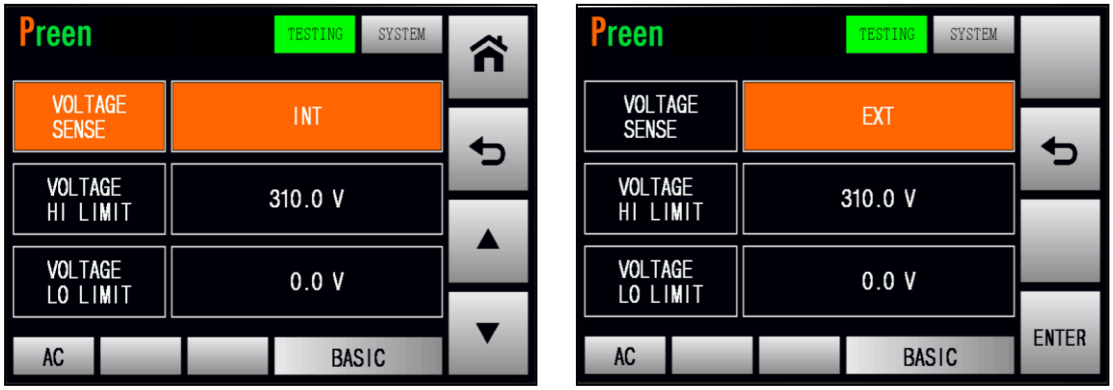


Figure 3.15 Set the voltmeter point from INT to EXT

NOTICE

When the voltmeter point is set to be EXT, but the terminals "S_L" and "S_N" are not connected to the load, the Low Voltage Protection (LVP) will be triggered after the output is on.

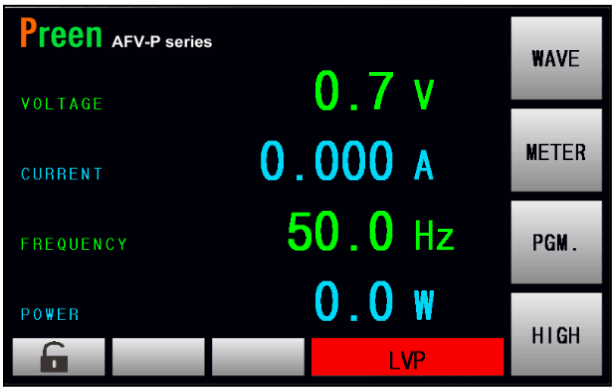


Figure 3.16 The MAIN page when LVP is triggered

3.5.1.4 Output Voltage Range

At the TESTING subpage 2, users are allowed to set the output voltage range with options from 0V to 310V by using the touch screen and the rotary knob (refer to Subsection 3.2). When users set value of the output voltage exceeding the preset range (that is, the preset value of the maximum to minimum output voltage), the product can automatically adjust the set value to meet the preset range.

3.5.1.5 Output Frequency Range

At the TESTING subpage 3, users are allowed to set the output frequency 40Hz-500Hz, by using the touch screen and the rotary knob (refer to Subsection 3.2). When users set value of the output frequency exceeding the preset range (that is, the preset value of maximum to minimum output frequency), the product can automatically adjust the set value to meet the preset range.

3.5.1.6 Synchronized Signal

At the TESTING subpage 3, users are allowed to enable the synchronized signal. There are three options of the synchronized signal: EVENT, OFF, and ON, and the default option is EVENT. EVENT indicates that the product outputs a 5V DC pulse signal when the product output changes; OFF indicates that the synchronized signal is disabled; ON indicates that the product continuously outputs a 5V DC signal when the product output is on, and stop the 5V DC signal when the product output is off.

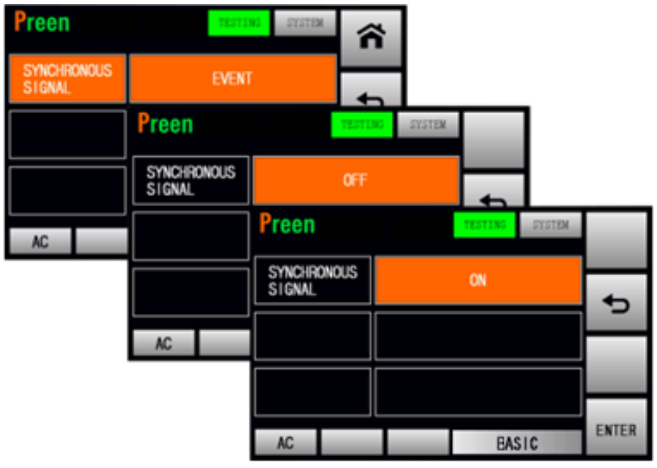


Figure 3.17 Three options of the synchronized signal

3.5.1.7 Power-on Status

At the TESTING subpage 4, users are allowed to set the power-on status with three options of OFF, ON and LAST. OFF indicates that the output is off after turning on the product; ON indicates that the output is on after turning on the product; LAST indicates that if the output remains on while turning off the product previously, the output is on after turning on the product currently, otherwise, the output is off after turning on the product currently.

The procedures of setting the power-on status are given as below:

1. Press the item 

repeatedly to switch the icon status from OFF to either ON or LAST.

2. Press the icon 

to confirm.

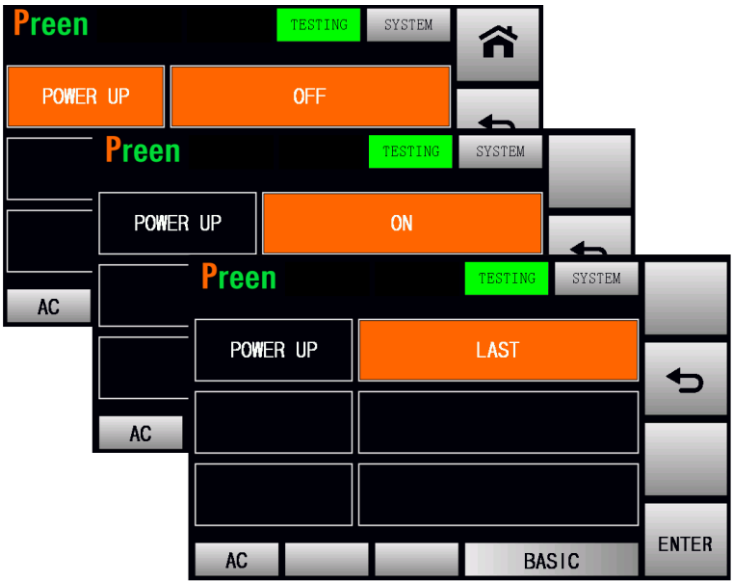


Figure 3.18 Three options of the power-on status

3.5.2 SYSTEM Subpage

After pressing the icon  to enter the SETTINGS page, the TESTING subpage will be shown on the touch screen, and users can press the icon 

on the upper-right side of the touch screen to enter the SYSTEM subpage. Please see the following figures,

Figure 3.19 SYSTEM subpages 1 & 2

Figure 3.20 SYSTEM subpage 3 & 4

The description for the items and the icons at the SYSTEM subpage are given as follows,

1) 

: Press to set the operational language, with three options of ENGLISH, 繁體中文 and 简体中文.

2) 

: Press to set the alarm volume, with options from 0 to 9.

3) 

: Press to set the backlight level of the touch screen, with options from 0 to 9.

4) 

: Press to set the touch sound ON/OFF.

5) 

: Press to unlock/lock the MEMORIES feature, with two options of OFF and ON.

6) 

: Press to set the time the product will lock the touch screen automatically. This function only available after user set LOCK PASSWORD.

7) 

: Press to set the password of touch screen lock.

8) 

: Press to set AUTO or FIXED to change the adjustment scale the rotary knob controls by knob turning speed.

9) 

: Press to set 0.1V or 1.0V to change the adjustment scale the rotary knob controls when turning the rotary knob.

10) 

: Press to reset the product to the default settings.

11) 

: Press to enter the CALIBRATION page (refer to Chapter 4).

12)  : Press to move to the previous page of the SYSTEM subpage.

13)  : Press to move to the next page of the SYSTEM subpage.

3.5.2.1 Operational Language

At the SYSTEM subpage 1, users are allowed to set the operational language with three options of ENGLISH, 繁體中文 and 简体中文, and the default operational language is ENGLISH. 繁體中文 indicates Traditional Chinese; 简体中文 indicates Simplified Chinese..

The procedures of setting the operational language are given as below:

1. Press the item 

repeatedly to switch the icon status to the desired language.
2. Press the icon 

to confirm.

Figure 3.21 Options of the operational language

3.5.2.2 Alarm Volume

At the SYSTEM subpage 1, users are allowed to set the alarm volume with options from 0 to 9 by using the touch screen and the rotary knob (refer to Subsection 3.2), and the default alarm volume is 5. The bigger the number is, the higher the alarm volume is. The procedures of setting the alarm volume from 5 to 9 by using the touch screen are given as below:

1. Press the item 

to use the virtual numeric keys to set the value of 9.

2. Press the icon 

to confirm.

Figure 3.22 Set the alarm volume from 5 to 9

3.5.2.3 Backlight Level

At the SYSTEM subpage 1, users are allowed to set the backlight level of the touch screen with options from 0 to 9 by using the touch screen and the rotary knob (refer to Subsection 3.2), and the default backlight level is 9. The bigger the number is, the brighter the touch screen is.

The procedures of setting the backlight level from 9 to 5 by using the touch screen are given as below:

1. Press the item 

to use the virtual numeric keys to set the value of 5.

2. Press the icon 

to confirm.

Figure 3.23 Set the backlight level from 9 to 5

3.5.2.4 Other Settings

A. Turn ON or OFF the TOUCH SOUND Feature

At the SYSTEM subpage 2， users are allowed to turn on or turn off the touch sound. Feature of the product with two options of OFF and ON, and the default option is OFF.

The procedures of turning on the touch sound are given as below:

1. Continuously press the icon 

twice to switch from OFF to ON.

2. Press the icon 

to confirm and turn on the touch sound.

Figure 3.24 Turn on the TOUCH SOUND feature.

B. Unlock/Lock the MEMORIES LOCK Feature

At the SYSTEM subpage 2, users are allowed to unlock/lock the MEMORIES LOCK feature of the product with two options of OFF and ON, and the default option is OFF. The procedures of locking the MEMORIES LOCK feature are given as below:

1. Press the icon 

twice to switch the icon status from OFF to ON.

2. Press the icon 

to confirm and lock the MEMORIES LOCK feature.

Figure 3.25 Lock the MEMORIES LOCK feature.

C. Auto Lock Time

At the SYSTEM subpage 2, users are allowed to set the Auto Lock Time. This function is activated only after setting the LOCK PASSWORD in paragraph D. Then, users can set the time to automatically lock the touch screen.

1. Press the item 

to enter the setting page.

2. Set the seconds and press icon 

to confirm.

Figure 3.26 Auto Lock Time setting page

D. Lock Password

At the SYSTEM subpage 3, users are allowed to set password to lock the touch panel, and the default setting is OFF. After user set the password in the setting page, the unit will require password each time when unlock the touch screen.

1. Press the item 

to enter the setting page.

2. Set the password and press icon 

to confirm.

Figure 3.27 Lock Password setting page

*How to turn off the LOCK PASSWORD function:

1. Go to SYSTEM subpage 3 and press the item 

to enter the setting page.

2. Set the password to “0” and press icon 

to confirm.

Figure 3.28 How to turn off the LOCK PASSWORD function

E. Encoder mode

At the SYSTEM subpage 3, users are allowed to set the adjustment scale the rotary knob controls by the knob turning speed. When set AUTO, if the user turns the knob at a faster speed, the scale will change automatically from the resolution unit to a bigger scale. When set FIXED, the adjustment scale won’t be changed no matter how the knob turning speed is. The default option is AUTO.

1. Press the item 

twice to switch the icon status from AUTO to FIXED.

2. Press the icon 

to confirm.

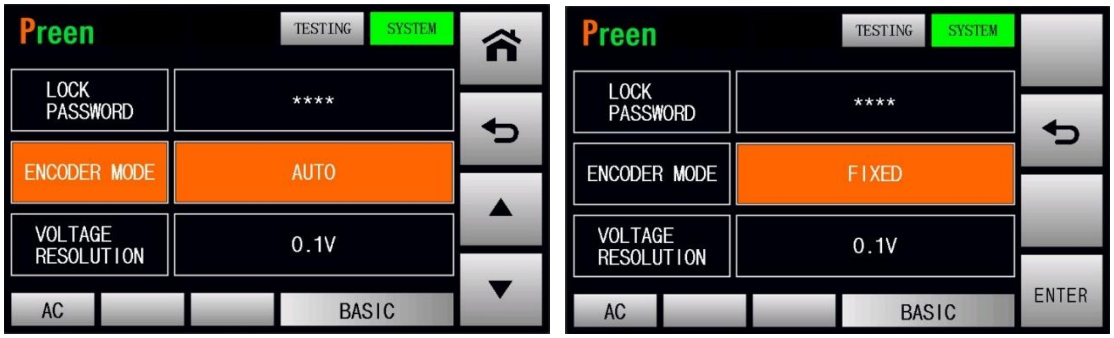


Figure 3.29 Reset the product to the default settings

F. Reset to the Default Settings

At the SYSTEM subpage 2, users are allowed to reset the product to the default settings. The procedures of resetting the product to the default setting are given as below:

1. Press the item 

twice to switch the icon status to YES.

2. Press the icon 

to confirm and reset the product.

Figure 3.30 Reset the product to the default settings

3.6 MEMORY PAGE

The product supports MEMORY feature to memorize multiple output settings. Up to 20 Memory Sets can be stored, and the name of each Memory Set is editable to call for test sequence. There are 4 shortcuts of Memory Sets for quick switching at output page, including the first three Memory Sets and one selectable from the 20 sets.

If the MENU page is shown on the touch screen, user can press the icon 

to enter the MEMORY page. Please see the following figure:

Figure 3.3125 MEMORY page

The description for the items and the icons at the MEMORY subpage are given as follows:

1) 01.MEMORY AC 110.0V 60.0Hz : Press to set the name, voltage and frequency of the Memory Set, and the settings will show on the item.

2) MEMORY AC : Show the name of Memory Set with the default name "MEMORY AC". The name can be edited within 10 characters.

3) 110.0V : Show the output voltage of the Memory Set.

4) 60.0Hz : Show the output frequency of the Memory Set.

5)  : Press to switch pages. 5 Memory Sets in one page, there are 20 sets in total.

3.6.1.1 Setting Page of MEMORY Feature

To enter the setting page of MEMORY feature, press the item of each Memory Set, for example 01.MEMORY AC 110.0V 60.0Hz. Please see the following figure:

Figure 3.32 Setting page of MEMORY feature

The description for the items and the icons at the MEMORY setting subpage are given as follows:

1) 01.MEMORY AC：Press to set the name of Memory Set within 10 characters (including capital or lowercase English, numbers, and symbols). Please see the following figure:

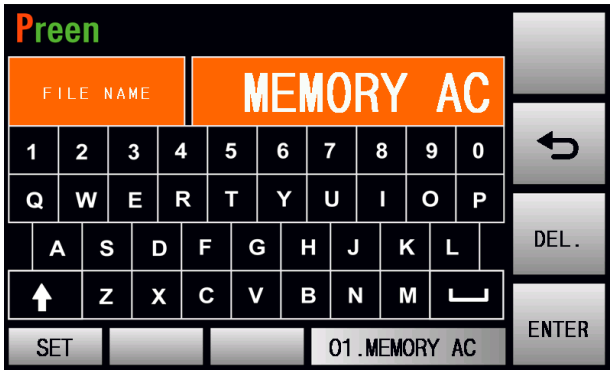


Figure 3.33 Name setting of Memory Set

2) SET：Press to enter the subpage for advanced setting of Memory Set. Please see the following figures:

Figure 3.34 Advanced setting of Memory Set

The description for the items and the icons at the subpage for advanced setting of Memory Set are given as follows,

A. 

: Press to set the voltage range as AUTO or HIGH.

AUTO: The maximum output voltage switches automatically between 155V (low level) and 310V (high level) according to the set voltage

HIGH: The maximum output voltage to be 310V (high level). The maximum output current will be half of the low level in AUTO range.

B. 

: Press to set the maximum output current. Set “0” to disable the function and this icon status will be OFF.

C. 

: Press to set the maximum output power. Set “0” to disable the function and this icon status will be OFF.

D. 

: Press to restore to the default setting.

3) 

: Press to set the voltage of Memory Set. Some of the commonly used voltages are listed by default values for quick access. Please see the following figure:

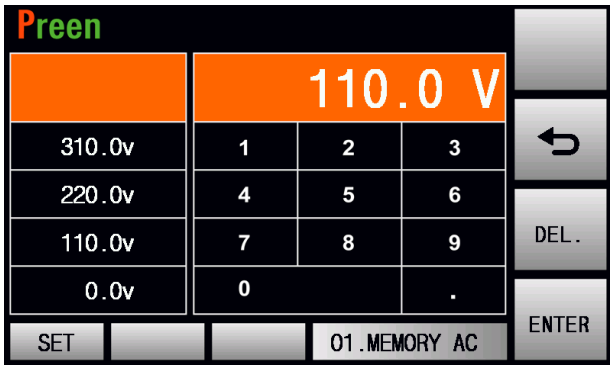


Figure 3.35 Voltage setting of Memory set

4) Freq. 60.0 Hz：Press to set the frequency of Memory Set. Some of the commonly used voltages are listed by default for quick access. Please see the following figure:

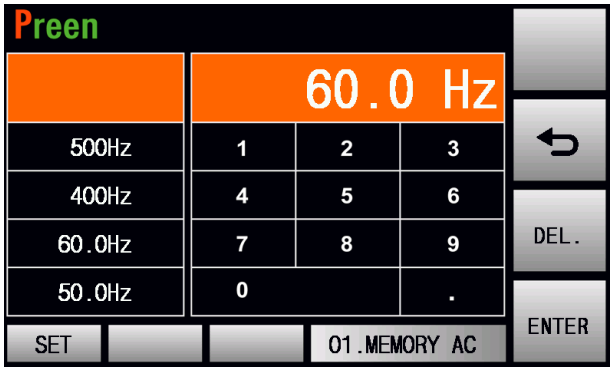


Figure 3.36 Frequency setting of Memory set

3.6.2 Output Page of MEMORY Feature

Once the setting is completed, press the output & reset button to start output testing. There are 4 shortcuts of Memory Sets for quick switching at the output page: three are fixed in the first three Memory Sets; one is assigned by users from the 20 sets. Please follow the figures below:

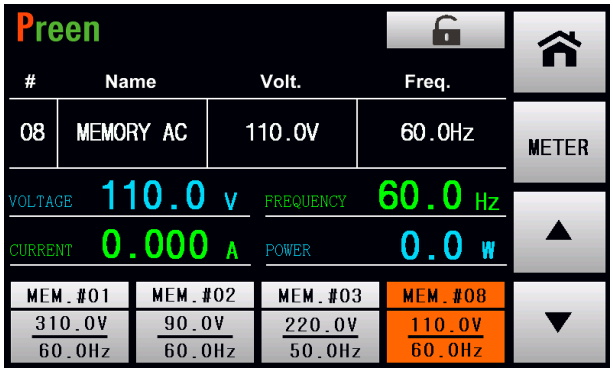
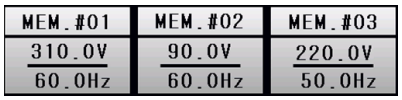
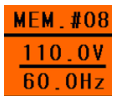


Figure 3.37 Output page of MEMORY feature

The description for the items and the icons at the output page of MEMORY feature are given as follows,

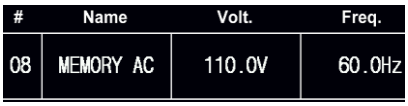
1) 

：These are the fixed shortcuts to the first three Memory Sets. Users can set the most commonly used voltages and frequencies in these three sets for quick switching.

2) 

：The forth shortcut is user-assigned; any of the 20 Memory Sets can be selected, such as MEM. #08 demonstrated in Figure 3.. The orange background indicates that the set is currently outputting. Press  to switch to the next Memory Set, such as MEM. #09; press  to the previous Memory Set, such as MEM. #07.

NOTICE
For safety reason, when users press  or  to preview the Memory Set while outputting, the output remains in the original Memory Set; once the desired set is confirmed, user has to press the selected Memory set to enable the output switching.

3) 

：Shows the settings of the MEMORY set in operation.

4) 

：Shows the output display of the MEMORY set in operation.

5)   ：Press to lock/unlock the operation of the touch screen. When the operation of the touch screen is locked, only switching pages between the MAIN page and the METER page is allowed.

6) 

：Press to enter the METER page for complete readings display.

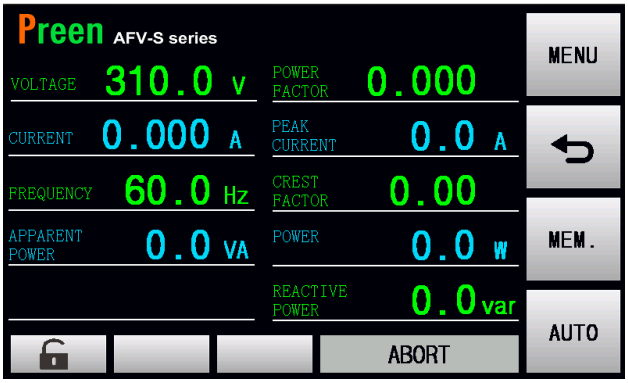


Figure 3.38 METER page

3.7 COMMUNICATION Page

If the MENU page is shown on the touch screen, users can press the icon  to enter the COMMUNICATION page, and the COMMUNICATION page includes different subpages: the GENERAL subpage and the ETHERNET (Opt.) subpage or ANALOG(Opt.) subpage.

3.7.1 GENERAL Subpage

After pressing the icon  to enter the COMMUNICATION page, the GENERAL subpage will be shown on the touch screen in advance, and users can press the icon 

on the upper-right side of the touch screen to enter the GENERAL subpage. Please see the following figures,

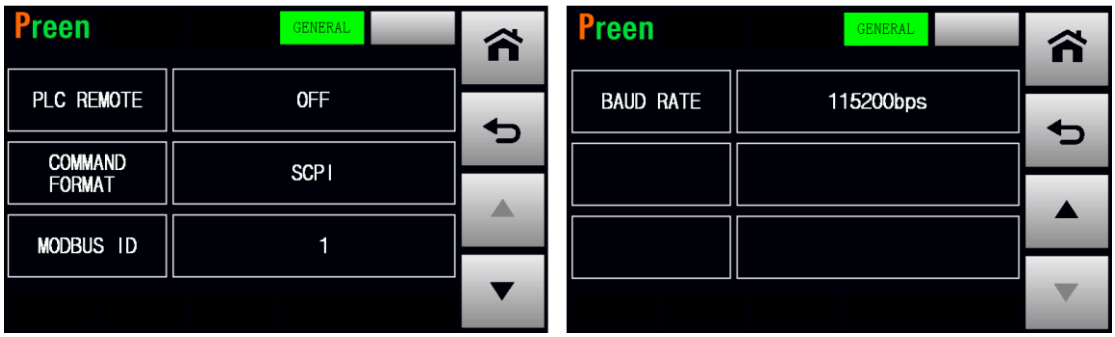


Figure 3.39 GENERAL subpages 1 & 2

The description for the items and the icons at the GENERAL subpage are given as follows,

1) 

: Press to ON/OFF the PLC remote feature.

2) 

: Press to set the command format, with two options of MODBUS and SCPI.

3) 

: Press to set the Modbus ID, with options from 1 to 255.

4) 

: Press to set the Baud rate, with five options of 9600bps, 19200bps, 38400bps, 57600bps and 115200bps.

5)  : Press to move to the previous page of the GENERAL subpage.

6)  : Press to move to the next page of the GENERAL subpage.

3.7.2 ETHERNET Subpage (Opt.)

After pressing the icon  to enter the COMMUNICATION page, the ETHERNET subpage will be shown on the touch screen in advance. Please see the following figures,

Figure 3.40 ETHERNET subpages 1 & 2

The description for the items and the icons at the ETHERNET subpage are given as follows,

1)  : Press to set the IP mode with two options of AUTO mode and MANUAL mode.

2)  : Press to set the IP address under the MANUAL mode.

3)  : Press to set the subnet mask under the MANUAL mode.

4)  : Press to set the default gateway under the MANUAL mode.

5)  : Press to set the MAC address under the MANUAL mode.

6)  : Press to set the Ethernet port under the MANUAL mode.

7)  : Press to move to the previous page of the ETHERNET subpage.

8)  : Press to move to the next page of the ETHERNET subpage.

3.7.3 ANALOG Subpage (Optional)

After replacing the standard interface card with optional analog control card (refer to Subsection 2.8), the ANALOG subpage will show on the screen in advance. Please see the following figures,

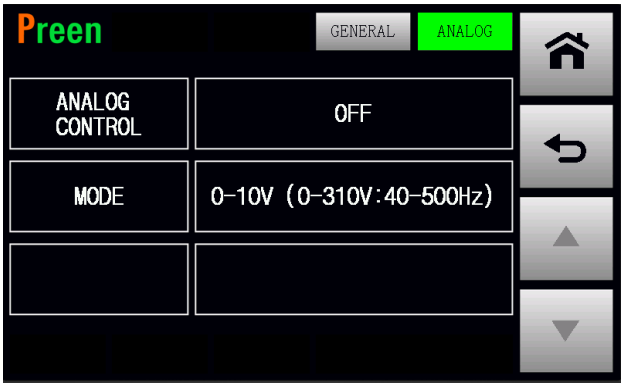
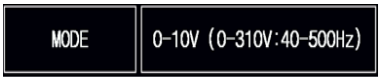


Figure 3.41 ANALOG subpage

The descriptions for the item and icons at the ANALOG subpage are given as follows,

1) 

: Press to enable/disable the analog control feature.

2) 

: Press to switch the signal source ranging from 0-10V, 0-5V or 4-20mA. Please see the following figures:

Figure 3.42 Analog signal control source 0-5V, 0-10V or 4-20mA

3) Once the external signal source is selected, the voltage setting on the MAIN page will be 0.0V when there is no external signal input from the analog control card, and an icon will show on the bottom left of the MAIN page indicating the remote control is active. Please see the following figure,

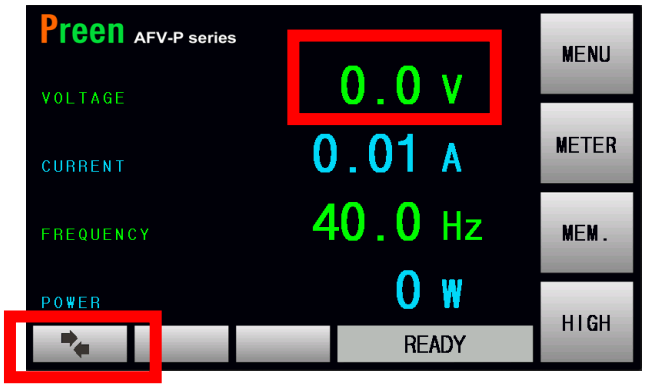


Figure 3.43 MAIN page when analog control is enabled

3.8 RESULTS Page

If the MENU page is shown on the touch screen, users can press the icon  to enter the RESULTS page. Please see the following figures,

Figure 3.44 RESULTS page

The description for the icons at the RESULTS page are given as follows,

1) 

: Press to see the settings of the designated Memory Set.

2) 

: Show the label number of the current Memory Set.

3) 

: Show whether the desired the Memory Set passed the output test or not.

3.9 WAVE Page

If the MENU page is shown on the touch screen, users can press the icon  to enter the WAVE page. Please see the following figures,

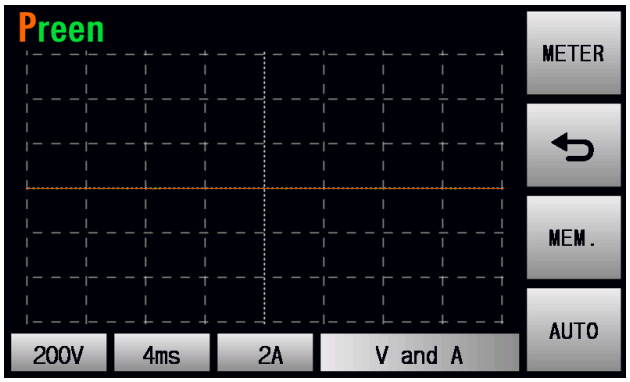


Figure 3.45 WAVE page when the output is off

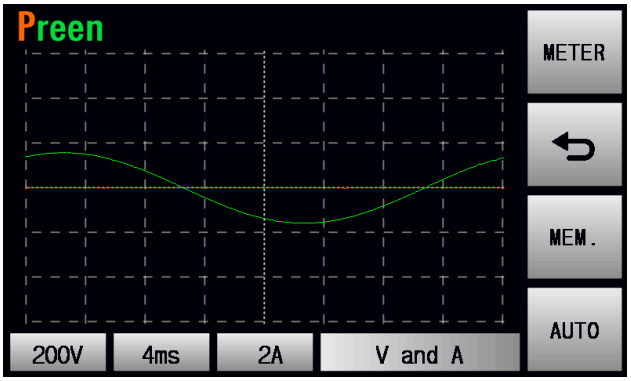


Figure 3.46 WAVE page when the output is on

Additionally, when the product output is on, users can also press the icon  located the upper-right side of the MAIN page to enter the WAVE page.

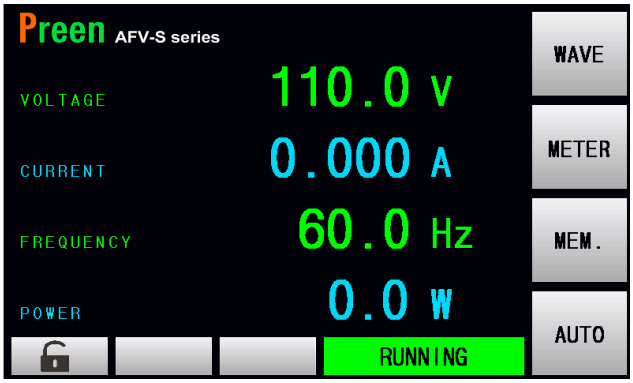


Figure 3.47 MAIN page when the output is on

The description for the icons at the WAVE page are given as follows,

1) 

: Press to set the displaying scale of the output voltage, with two options of 40V and 200V per division.

2) 

: Press to set the display scale of the time, with six options of 1ms, 2ms, 4ms, 10ms, 100μs, 200μs and 400μs per division.

3) 

: Press to set the display scale of the output current, with two options of 2A and 20A per division for the product models of AFV-S-600 and AFV-S-1250; 4A and 40A per division for the product model of AFV-S-2500; 8A and 80A per division for the product model of AFV-S-5000.

4) 

: Press to set the waveform display at the WAVE page, with options of displaying the output voltage only, displaying the output current only and displaying both voltage and current. The waveform of the output voltage is shown in green; the waveform of the output current is shown in orange.

3.10 METER Page

If the MENU page is shown on the touch screen, users can press the icon  to enter the METER page. Please see the following figures,

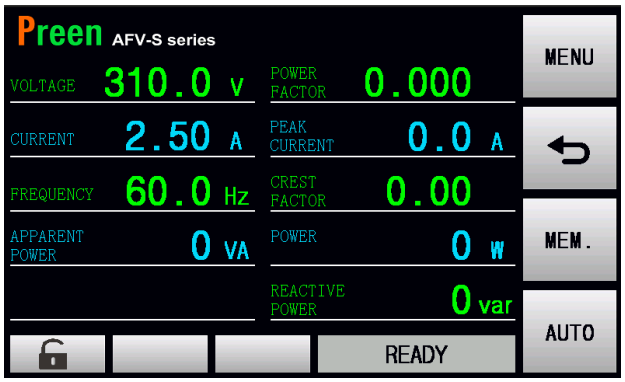


Figure 3.48 METER page when the output is on

Additionally, when the MAIN page is shown on the touch screen, users can also press the icon 

at the MAIN page to enter the METER page.

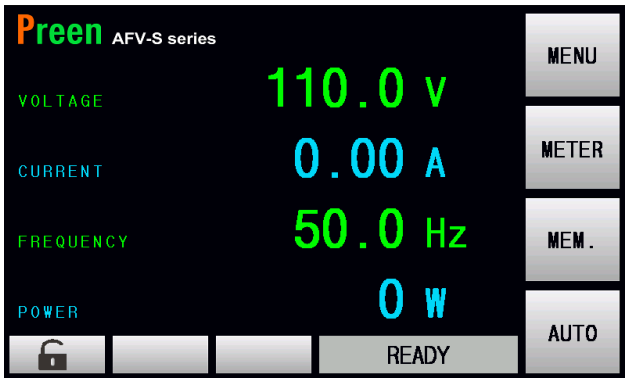


Figure 3.49 MAIN page

The description for the items and the icons at the METER page are given as follows,

1) 

: Show the measurement reading of the output voltage.

2) 

: Show the measurement reading of the output current.

3) 

: Show the measurement reading of the output frequency.

4) 

: Show the measurement reading of the apparent power.

5) 

: Show the measurement reading of the power factor.

6) 

: Show the measurement reading of the peak current.

7) 

: Show the measurement reading of the crest factor.

8) 

: Show the measurement reading of the output power.

9) 

: Show the measurement reading of the reactive power.

10) 

: Show the elapsed time of the product output.

11) 

: Show the label number of the current Memory Set.

3.11 INFORMATION Page

If the MENU page is shown on the touch screen, users can press the icon  to enter the INFORMATION page. Please see the following figures:

Figure 3.50 INFORMATION page

The description for the items at the INFORMATION page are given as follows:

1) 

: Show the manufacturer information.

2) 

: Show the product model.

3) 

: Show the serial number of the product.

4) 

: Show the firmware version of the product.

5) 

: Show the firmware version of the communication card.

6) 

: Show the HMI firmware version of the product.

7) 
: Press to move to the previous page of the INFORMATION page.

8) 
: Press to move to the next page of the INFORMATION page.

3.12 Protection

The product provides complete protection for OVP, LVP, OCP, OPP, OTP, RCP, Fan Fail and AMP Fail. When the protection is triggered, the product will immediately stop the product output, and show the error code corresponding to the protection condition on the touch screen.

Please notice that if any protection is triggered, users shall eliminate the cause of the protection condition according to the Table 3.1 before resuming the product output. After eliminating the cause of the protection condition, users can press the output & reset button on the front panel to unlock the protection, to resume the product output.

Error code, possible causes and solution corresponding to the protection condition are listed as below:

Error Code	Protection Condition	Possible Cause	Possible Solution
OVP	Over Voltage Protection	1. Load oscillation. 2. Problem of the voltage feedbacking from the load to the inverter circuitries. 3. Fault of the inverter control circuitries.	1. Remove the load to inspect the output voltage. 2. Seek the technical assistance.
LVP	Low Voltage Protection	1. Load oscillation. 2. Incorrect wiring of the terminals S_L and S_N when setting voltmeter point to EXT. 3. Fault of the inverter control circuitries.	1. Remove the load to inspect the output voltage. 2. Inspect the wiring of the terminals S_L and S_N. 3. Seek the technical assistance.
OCP	Over Current Protection	When the output current exceeds the maximum rated current.	1. Decrease the output voltage to fit the maximum rated current 2. Remove the load to inspect the output current
OPP	Over Power Protection	When the output power exceed the maximum rated power.	1. Decrease the output voltage to fit the maximum rated power. 2. Remove the load to inspect the output power.
OTP	Over Temperature Protection	1. Poor ventilation. 2. High environmental temperature.	1. Provide adequate space for product ventilation

			2. Use the vacuum cleaner to clean the air inlet 3. Install the product on the place with environmental temperature not exceeding 40°C.
RCP	Reverse Current Protection	Problems of the current feedbacking from the load to the inverter circuitries.	Remove the load to inspect the output voltage.
Fan Fail	Fan Failure	Fault of the fan.	Seek the technical assistance.
AMP Fail	Inverter Failure	1. Load oscillation 2. Problems of the voltage feedbacking to the inverter circuitries 3. Fault of the inverter circuitries.	1. Remove the load to inspect the output voltage. 2. Seek the technical assistance.

Table 3.1 Troubleshooting Table

4 Calibration

The product provides a simple way to calibrate the product output and measurement accuracy without opening cover. Users can perform the calibration according to the procedures given as follows step by step. A voltage meter, a current meter and suitable load are needed while performing the calibration procedures. Connections for the instruments mentioned above please refer to the figure below.

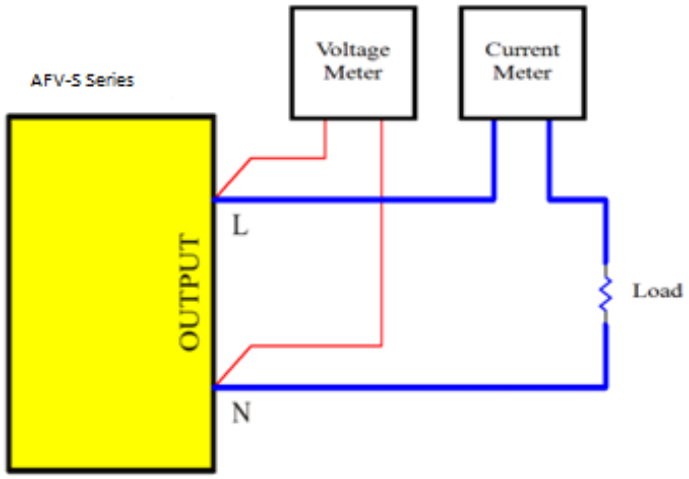


Figure 4.1 Instrument connection for calibration

At the SYSTEM subpage 3 of the SETTINGS page, users can press the item 

, and then use the virtual numeric keys to set the value of 8888, so as to enter the CALIBRATION page. Please see the following figures,

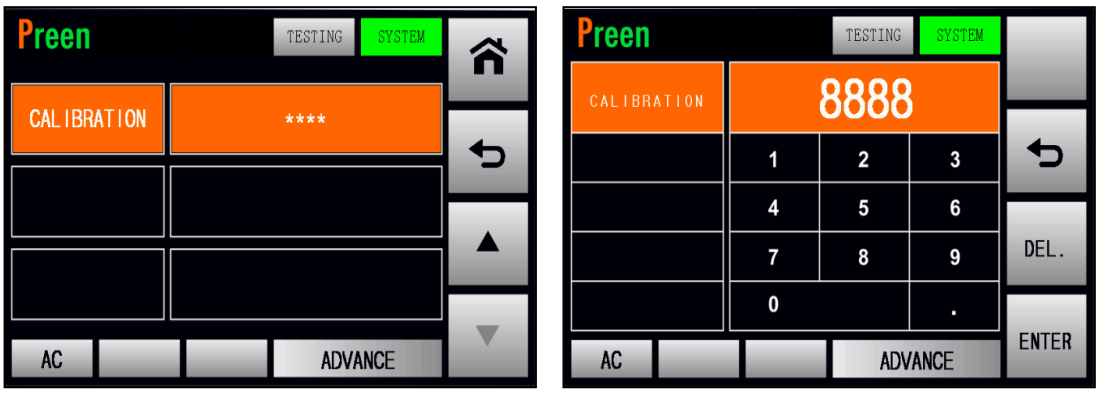


Figure 4.2 Enter the CALIBRATION page from the SYSTEM subpage 3

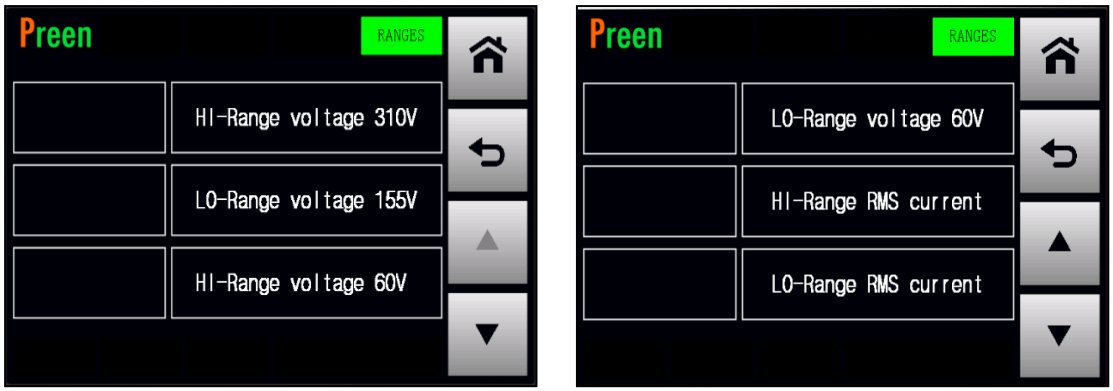


Figure 4.3 CALIBRATION pages 1 & 2

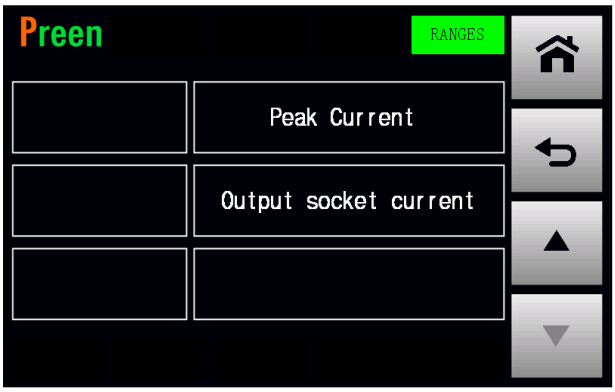


Figure 4.4 CALIBRATION page 3

The description for the items at the CALIBRATION page are given as follows,

1) HI-Range voltage 310V : Press to enter the page which calibrates the HI-Range voltage 310V.
2) LO-Range voltage 155V : Press to enter the page which calibrates the LO-Range voltage 155V.
3) HI-Range voltage 60V : Press to enter the page which calibrates the HI-Range voltage 60V.
4) LO-Range voltage 60V : Press to enter the page which calibrates the LO-Range voltage 60V.
5) HI-Range RMS current : Press to enter the page which calibrates the HI-Range RMS current.

6) 

: Press to enter the page which calibrates the LO-Range RMS current.

7) 

: Press to enter the page which calibrates the peak current.

8) 

: Press to enter the page which calibrate the output socket current (specialize for the product model of AFV-S-5000).

9) 
: Press to move to the previous page of the CALIBRATION page.

10) 
: Press to move to the next page of the CALIBRATION page.

4.1 HI-Range Voltage 310V

On the CALIBRATION page 1, users are allowed to enter the page which calibrates the HI-Range voltage 310V. The procedures of calibrating the HI-Range voltage 310V are given as below:

1. Press the item HI-Range voltage 310V repeatedly to enter the page which calibrates the HI-Range voltage 310V (refer to Figure 4.5).
2. Connect the product with the voltage meter (refer to Figure 4.1).
3. Press the output & reset button on the front panel to enable the calibration of the HI-Range voltage 310V (refer to Figure 4.6), and then the product will start to output the voltage which is closed to 310V.
4. Use the rotary knob to adjust the product output until the measurement reading of the output voltage shown on the touch screen is closed to the measurement reading shown on the voltage meter.
5. Press the rotary knob to confirm and finish the calibration.

NOTICE
Before calibrating the HI-Range voltage 310V, the load shall be temporally removed from the product to avoid a potential electric shock.

Figure 4.5 Enter the page which calibrates the HI-Range voltage 310V

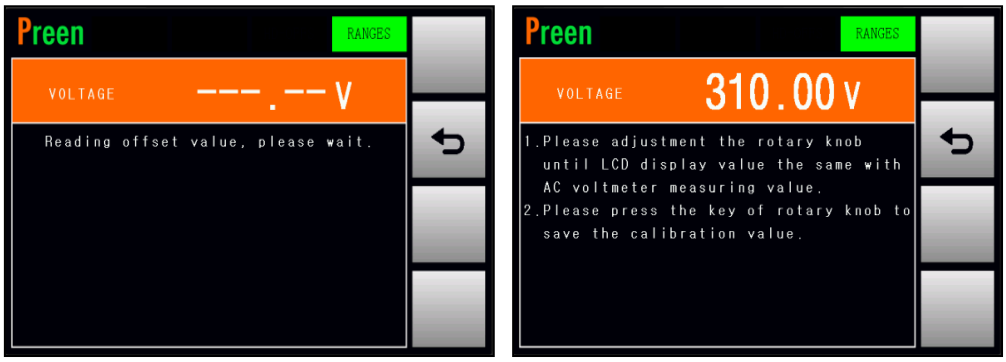


Figure 4.6 Enable the calibration of the HI-Range voltage 310V

4.2 LO-Range Voltage 155V

At the CALIBRATION page 1, users are allowed to enter the page which calibrates the LO-Range voltage 155V. The procedures of calibrating the LO-Range voltage 155V are given as below:

1. Press the item LO-Range voltage 155V repeatedly to enter the page which calibrates the LO-Range voltage 155V (refer to Figure 4.7).
2. Connect the product with the voltage meter (refer to Figure 4.1).
3. Press the output & reset button on the front panel to enable the calibration of the LO-Range voltage 155V (refer to Figure 4.8), and then the product will start to output the voltage which is closed to 155V.
4. Use the rotary knob to adjust the product output until the measurement reading of the output voltage shown on the touch screen is closed to the measurement reading shown on the voltage meter.
5. Press the rotary knob to confirm and finish the calibration.

NOTICE
Before calibrating the LO-Range voltage 155V, the load shall be temporally removed from the product to avoid a potential electric shock.

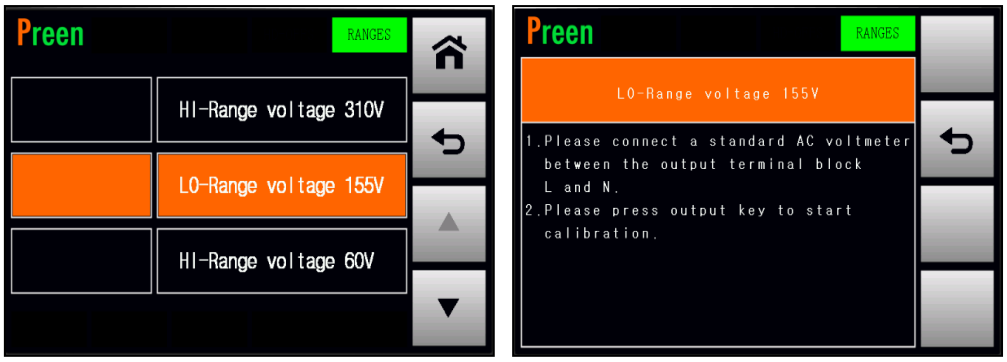


Figure 4.7 Enter the page which calibrates the LO-Range voltage 155V

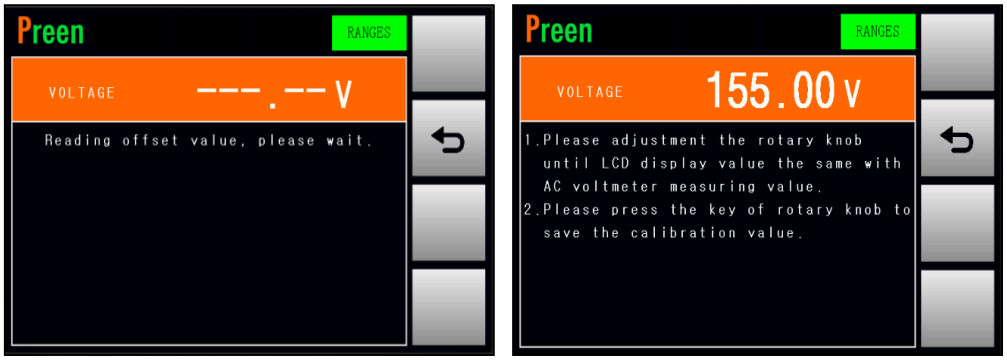


Figure 4.8 Enable the calibration of the LO-Range voltage 155V

4.3 HI-Range Voltage 60V

At the CALIBRATION page 1, users are allowed to enter the page which calibrates the HI-Range voltage 60V. The procedures of calibrating the HI-Range voltage 60V are given as below:

1. Press the item 

repeatedly to enter the page which calibrates the HI-Range voltage 60V (refer to Figure 4.9).
2. Connect the product with the voltage meter (refer to Figure 4.1)
3. Press the output & reset button on the front panel to enable the calibration of the HI-Range voltage 60V (refer to Figure 4.10), and then the product will start to output the voltage which is closed to 60V.
4. Use the rotary knob to adjust the product output until the measurement reading of the output voltage shown on the touch screen is closed to the measurement reading shown on the voltage meter.
5. Press the rotary knob to confirm and finish the calibration.

NOTICE
Before calibrating the HI-Range voltage 60V, the load shall be temporally removed from the product to avoid a potential electric shock.

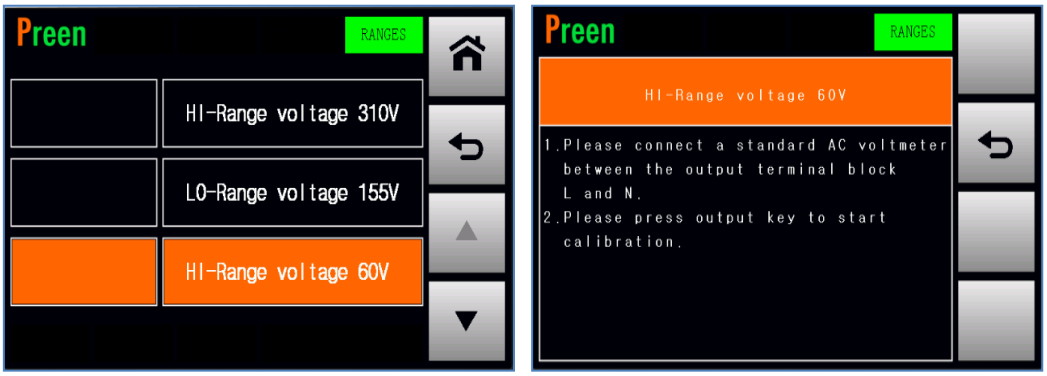


Figure 4.9 Enter the page which calibrates the HI-Range voltage 60V

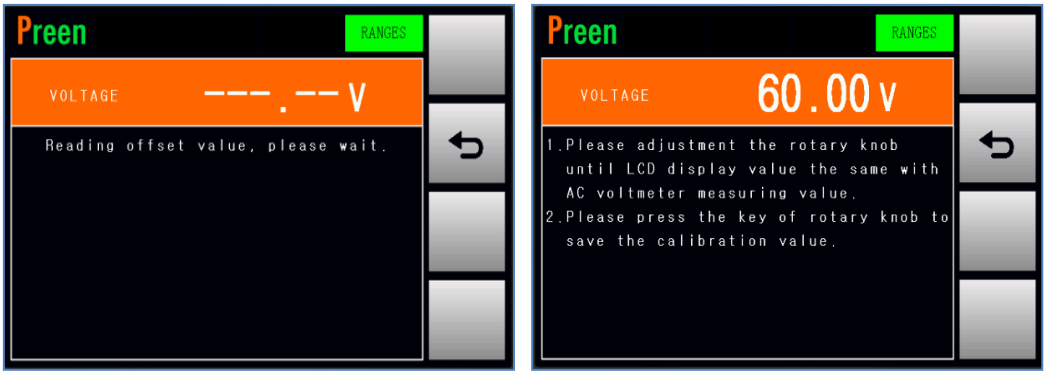


Figure 4.10 Enable the calibration of the HI-Range voltage 60V

4.4 LO-Range Voltage 60V

At the CALIBRATION page 2, users are allowed to enter the page which calibrates the LO-Range voltage 60V. The procedures of calibrating the LO-Range voltage 60V are given as below:

1. Press the item LO-Range voltage 60V repeatedly to enter the page which calibrates the LO-Range voltage 60V (refer to Figure 4.11).
2. Connect the product with the voltage meter (refer to Figure 4.1)
3. Press the output & reset button on the front panel to enable the calibration of the LO-Range voltage 60V (refer to Figure 4.12), and then the product will start to output the voltage which is closed to 60V.
4. Use the rotary knob to adjust the product output until the measurement reading of the output voltage shown on the touch screen is closed to the measurement reading shown on the voltage meter.
5. Press the rotary knob to confirm and finish the calibration.

NOTICE
Before calibrating the LO-Range voltage 60V, the load shall be temporally removed from the product to avoid a potential electric shock.

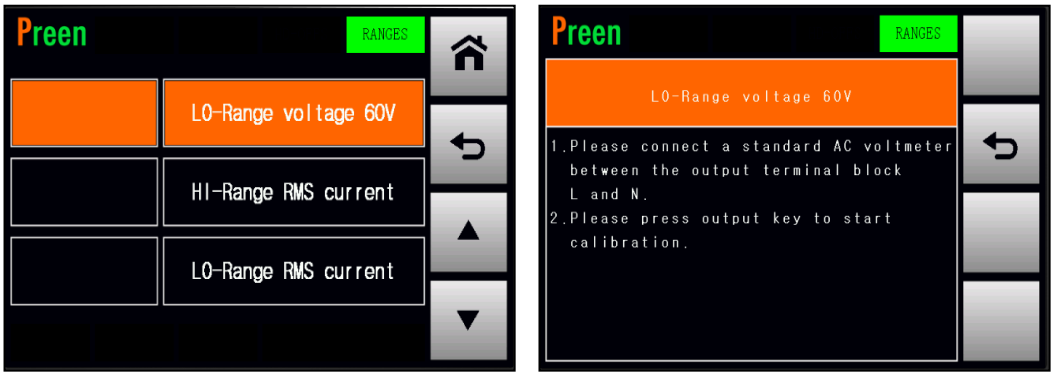


Figure 4.11 Enter the page which calibrates the LO-Range voltage 60V

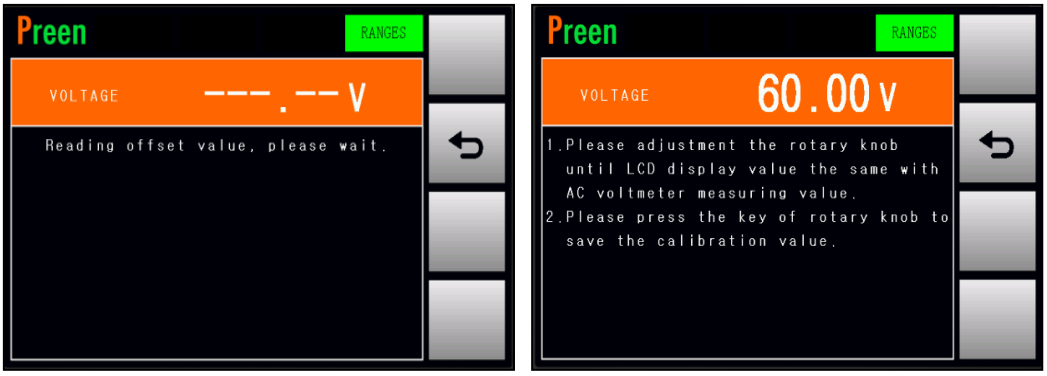


Figure 4.12 Enable the calibration of the LO-Range voltage 60V

4.5 HI-Range RMS Current

At the CALIBRATION page 2, users are allowed to enter the page which calibrates the HI-Range RMS current. The procedures of calibrating the HI-Range RMS current are given as below:

1. Press the item HI-Range RMS current repeatedly to enter the page which calibrates the HI-Range RMS current (refer to Figure 4.13).
2. Connect the product with the current meter and suitable load (refer to Figure 4.1).
3. Press the output & reset button on the front panel to enable the calibration of the HI-Range RMS current (refer to Figure 4.14), and then the product will start to output the voltage which is closed to 100V.
4. Use the rotary knob to adjust the product output until the measurement reading of the output current shown on the touch screen is closed to the measurement reading shown on the current meter.
5. Press the rotary knob to confirm and finish the calibration.

NOTICE		
The definition of the suitable load for calibrating the HI-Range RMS current are given as follows, and the suitable load shall be resistive load.		
Model	**Resistive Value**	**Rated Power**
AFV-S-600	20Ω	500W
AFV-S-1250	10Ω	1000W
AFV-S-2500	5Ω	2000W
AFV-S-5000	2.5Ω	4000W

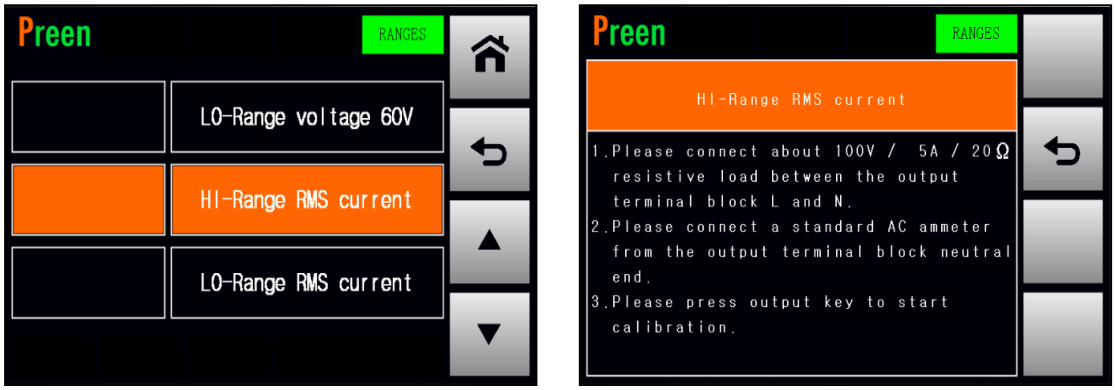


Figure 4.13 Enter the page which calibrates the HI-Range RMS current

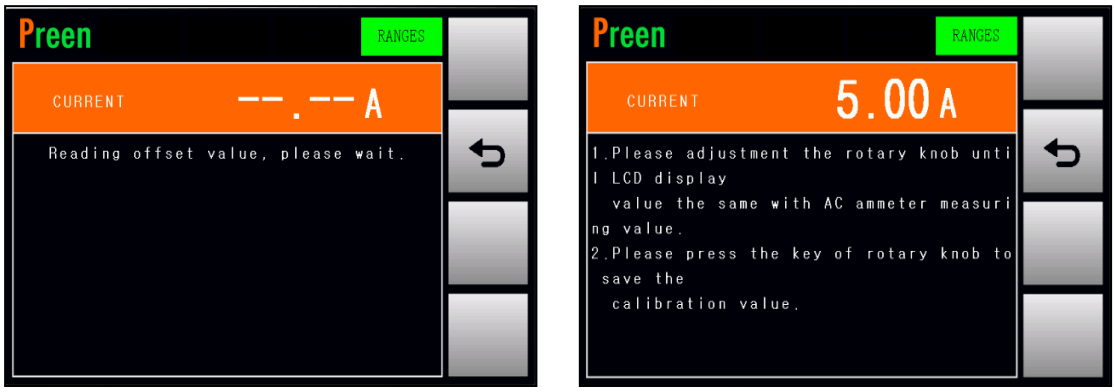


Figure 4.14 Enable the calibration of the HI-Range RMS current

4.6 LO-Range RMS Current

At the CALIBRATION page 2, users are allowed to enter the page which calibrates the LO-Range RMS current. The procedures of calibrating the LO-Range RMS current are given as below:

1. Press the item 

repeatedly to enter the page which calibrates the LO-Range RMS current (refer to Figure 4.15).
2. Connect the product with the current meter and suitable load (refer to Figure 4.1).
3. Press the output & reset button on the front panel to enable the calibration of the LO-Range RMS current (refer to Figure 4.16), and then the product will start to output the voltage which is closed to 100V.
4. Use the rotary knob to adjust the product output until the measurement reading of the output current shown on the touch screen is closed to the measurement reading shown on the current meter.
5. Press the rotary knob to confirm and finish the calibration.

NOTICE		
The definition of the suitable load for calibrating the LO-Range RMS current are given as follows, and the suitable load shall be resistive load.		
Model	**Resistive Value**	**Rated Power**
AFV-S-600	200Ω	50W
AFV-S-1250	100Ω	100W
AFV-S-2500	50Ω	200W
AFV-S-5000	25Ω	400W

Figure 4.15 Enter the page which calibrates the LO-Range RMS current

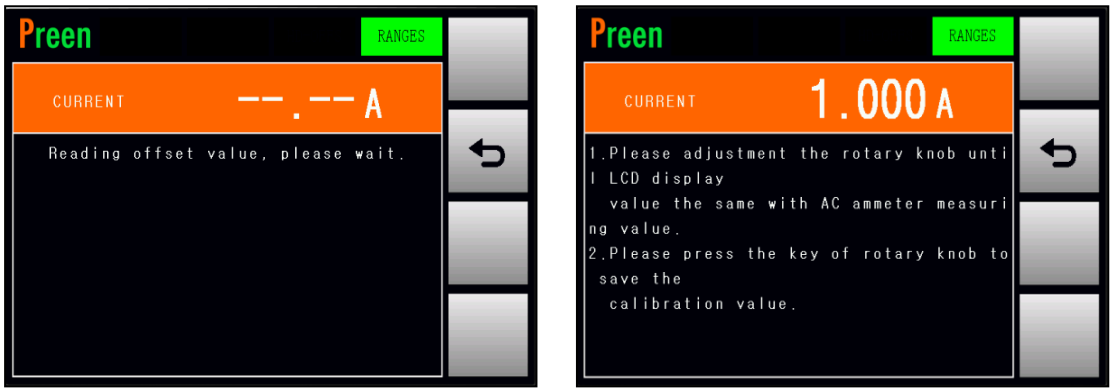


Figure 4.16 Enable the calibration of the LO-Range RMS current

4.7 Peak Current

At the CALIBRATION page 3, users are allowed to enter the page which calibrates the peak current. The procedures of calibrating the peak current are given as below:

1. Press the item 

repeatedly to enter the page which calibrates the peak current (refer to Figure 4.17).
2. Connect the product with the current meter and suitable load (refer to Figure 4.1).
3. Press the output & reset button on the front panel to enable the calibration of the peak current (refer to Figure 4.18), and then the product will start to output the voltage which is closed to 100V.
4. Use the rotary knob to adjust the product output until the measurement reading of the peak current shown on the touch screen is closed to the measurement reading shown on the current meter.
5. Press the rotary knob to confirm and finish the calibration.

NOTICE		
The definition of the suitable load for calibrating the peak current are given as follows, and the suitable load shall be resistive load.		
Model	**Resistive Value**	**Rated Power**
AFV-S-600	20Ω	500W
AFV-S-1250	10Ω	1000W
AFV-S-2500	5Ω	2000W
AFV-S-5000	2.5Ω	4000W

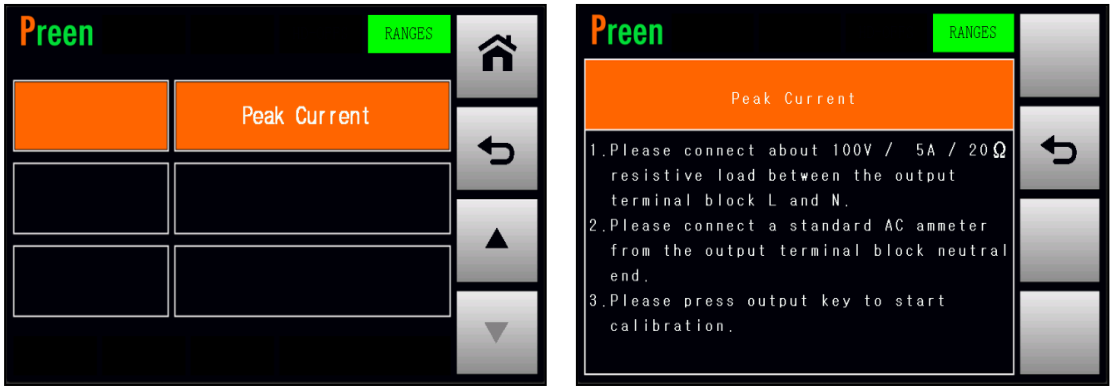


Figure 4.17 Enter the page which calibrates the peak current

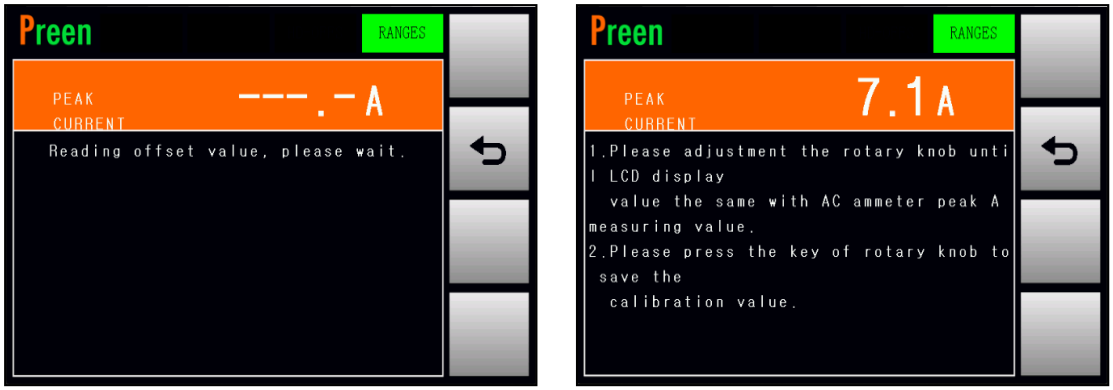


Figure 4.18 Enable the calibration of the peak current

4.8 Output Socket Current (Only for AFV-S-5000)

At the CALIBRATION page 3, users are allowed to enter the page which calibrates the output socket current. Since the maximum output current corresponding to the product model of AFV-S-5000 is 40A, which exceeds the maximum rated current of the AC output socket (that is, 20A), the calibration of the output socket current is necessary to protect the AC output socket from over current damage.

A voltage meter, a current meter and a 5Ω load are needed while performing the calibration procedures, and also, the rated power of the load must be over 2000W. Connections for the instruments mentioned above please refer to the figure below.

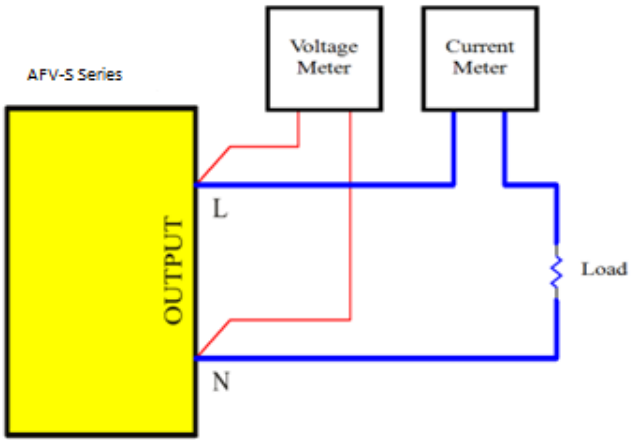


Figure 4.19 Instrument connection for calibration

The procedures of calibrating the output socket current are given as below:

1. Press the item Output socket current repeatedly to enter the page which calibrates the output socket current (refer to Figure 4.).
2. Connect the product with the current meter and the load with 5Ω and the rated power exceeding 2000W (refer to Figure 4.19).
3. Press the output & reset button on the front panel to enable the calibration of the output socket current (refer to Figure 4.), and then the product will start to output the voltage which is closed to 100V.
4. Use the rotary knob to adjust the product output until the measurement reading of the output current shown on the touch screen is closed to the measurement reading shown on the current meter.
5. Press the rotary knob to confirm and finish the calibration.

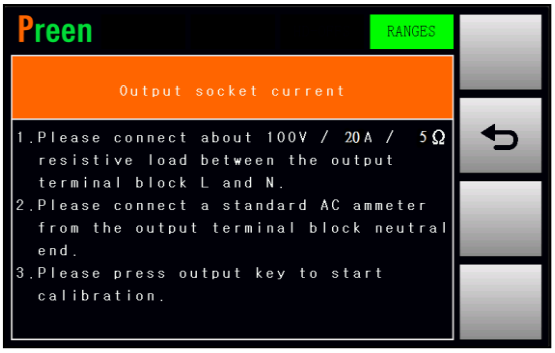


Figure 4.20 Enter the page which calibrates the output socket current

Figure 4.21 Enable the calibration of the output socket current

5 Theory of Operation

The product mainly consists of 8 function blocks, and each of the function blocks has its own specific function. The function blocks of the product are given as below,

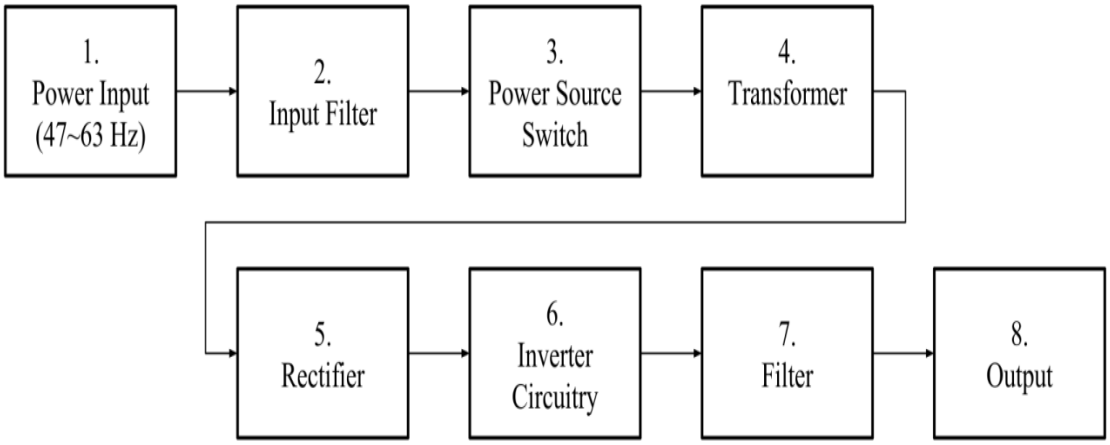


Figure 5.1 Function block of the product

6 Maintenance

In order to maintain the best performance of AFV-S series, it is recommended to conduct product maintenance regularly.

6.1 Notice for maintenance

1. Pay attention to the safety summary and read the manual carefully.
2. Ensure the power line input is cut off and the device has been shut down for 20 minutes before maintenance.
3. Clean the device regularly, especially the air inlet, to ensure good ventilation.
4. Do not block the cooling fan openings.

Notice
To function properly the product, ensure the air inlet/outlet is free from stuff and dust, otherwise it could cause communication failure and overtemperature protection.