K-FACTOR
THE VOLTAGE YOU NEED

ABP SERIES PROGRAMMABLE AC

POWER SUPPLY/FREQUENCY CONVERTER

OPERATING MANUAL

man-conv-abp frequency converter rev01.7.2 20260417 eng

K-FACTOR SRL - ITALY

Thank you for choosing our products. Please read this manual completely before operating.

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K-FACTOR SRL unipersonale - Via Giotto 9 – 42014 Castellarano (RE) - Italy - VAT# IT 02422010369
R.E.A. of Reggio Emilia: n. 286968 – Company registration number of RE: 02422010369
Tel +39-0536261380 – e-mail: info@kfactor.it - http://www.kfactor.it/en

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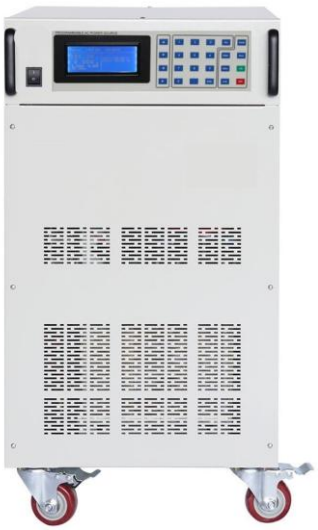
Warranty Statement

K-FACTOR SRL guarantees that the new products are warranted to be free from defects in workmanship and material for a period of one (1) year from date of shipment. In case of warranty or repair, free repair and replacement of any failed component during warranty. K-FACTOR SRL reserves the right to use its discretion on replacing the faulty parts or replacing the assembly or the whole unit. K-FACTOR SRL will void your warranty under the following states:

· Operation of the product under non-normal conditions
· Any non-authorized modifications, tampering or physical damage
· Elimination of any connections in the earth grounding system
· Use of non-authorized parts in the repair of our products. Replacement parts must be recommended by K-FACTOR SRL as an acceptable part.

This warranty does not cover accessories not Associated of K-FACTOR SRL



Chapter 1 Safety Notification / Instructions

To ensure personal health and safety, the electrical installation must fulfil all local regulations and Legislation.

1.1 Safety Signs

The regulations Safety Signs below should be noticed before use!!!

Hi-voltage Warning

Danger Hi-voltage

Grounding

Grounding

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1.2 Safety Statement

1.2.1 Please do not open the cover of the ABP unit to avoid getting electric shock but only when you need to. Have only qualified people remove covers for maintenance or troubleshooting or please contact us if any repair.
1.2.2 Be sure to Power off the ABP unit first before re-located it.
1.2.3 When connecting the unit to the load, make sure that the output power is off.
1.2.4 Internal parts where the voltage exceeds 50 V are covered and / or marked with:

1.2.5 Keep away from fans.

1.3 Maintenance

1.3.1 DON'T
Most internal parts of the ABP unit absolutely do not need maintenance by user. If there is any fault, please contact us for technical support.
1.3.2 DO
The input power cord/Input cables and the exhausted fans and the electrolytic capacitors inside the unit must be carefully visually inspected at least once every 6 months to ensure the safety of users and the normal operation of the ABP unit.
Please be aware that the Capacitors can remain charged to a dangerous voltage up to 10 minutes after the mains input has been disconnected. So please do wait for 10 minutes to touch the capacitors when you need.
If the ABP unit is used in a harsh environment, please open the cover of the unit to remove dust every three months or more frequently to ensure the normal operation of the unit.

Chapter 2 Installation

2.1 Unpacking and inspection

Open the package of the ABP unit and check the provided accessories. The accessories include a manual and a input power cord only for the 1kVA models. If the ordered unit require RS232 interface, it will come along a RS232 cable as accessory.

2.2 Installation precautions

2.2.1 Input power supply selection
The ABP series AC power supply uses single-phase 230Vac ±10% or 120Vac ±10% and three-phase 400Vac ±10% or 440Vac ±10% or three-phase 220Vac ±10% as input power supply. To find which input power supply is required for your unit, please check the technical parameter table in Chapter 3. Please make sure you choose the right input power supply before turning on the unit.
2.2.2 Please ensure that the ABP unit is grounded, no matter if it has single-phase or three-phase output.
2.2.3 Each unit is equipped with a fuse before leaving the factory. If you need to replace the fuse, please replace it with the same specifications. Before replacing the fuse, you must turn off the ABP unit to avoid getting a shock.
2.2.4 Application environment/condition

Main Data

- Ambient operating temperature: -10°C ~ +40°C. Reduce power if ambient temperature exceeds 50°C.
- Storage temperature: -20°C ~ +50°C.
- Relative humidity: 10% ~ 90%
- Altitude: Below 2000 meters above sea level.
- Installation sites must be free of gas, steam, chemical deposition, dust, dirt, and other explosive and mechanically damaging media.
- Installation safety distance: The distance between the ABP unit and the wall must be maintained at 30~50 cm.

Operating Environmental Conditions

- Ambient Temperature: Standard operating range is between +-10°C and +40°C. At temperatures close to the maximum limit (40°C), it is essential to monitor heat dissipation to avoid performance degradation.

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- Relative Humidity (RH): It is best not to exceed 50% at 40°C. At lower temperatures, higher humidity levels are permitted (e.g., 90% at 20°C), provided condensation is absolutely avoided inside or outside the machine.
- Altitude: Nominal operation up to 2,000 m above sea level. Above this altitude, the lower air density reduces cooling capacity and dielectric strength, requiring specific technical evaluation.

Installation and Ventilation Requirements

- Wall Clearance: Maintain a minimum clearance of 30-50 cm on all open sides. This clearance is critical to:
  o Ensure a constant airflow for heat exchange.
  o Ensure accessibility for maintenance and operator safety.

• IP54 Protection Rating Versions: The enclosure is protected against harmful dust deposits and splashes of water from any direction. However, to maintain this protection, the ventilation openings (where present) are equipped with adequate filters that do not excessively impede air circulation in 40°C environments.

Safety and Material Notes

• Hot Surfaces: In 40°C environments, the external surfaces of the machine can easily exceed 50°C during intense work; warn the operator of the thermal risk according to current regulations.
• Storage: When the machine is turned off, it can tolerate wider ranges (from -25°C to +55°C), but must be gradually brought back to operating temperature before turning it on to avoid thermal shock.

2.2.4 Maintenance

a. Filter Maintenance

To ensure operation at 40°C in dusty environments, air filter maintenance is not only recommended, but essential to prevent internal components from overheating.

- **Maintenance Frequency**

In dusty industrial environments, standard maintenance intervals must be shortened:

• Visual inspection: Weekly to check for surface deposits.
• Routine cleaning: Every 300 hours of operation or monthly.
• Complete replacement: Every 6-12 months, or more frequently if the environment is saturated with fine particulates.

- **Filter Cleaning Procedures (G3/G4 Filter Cloths)**

Filters typically installed on IP54 ventilation units (class G3 or G4 synthetic fiber cloths) can be regenerated to a limited extent:
• Dry method: Remove the cloth and shake it or blow it with compressed air (max. 2 bar) in the opposite direction to the normal airflow.
• Washing: Filter cloths can be washed with running water (max. 40°C) and neutral detergent.
o Important: Filters must be completely dry before reassembly to prevent residual moisture from instantly attracting new dust, creating an airtight "crust."
• Regeneration limit: Do not exceed 10 washes; after this threshold, the fiber structure deteriorates, compromising the filtering capacity and degree of protection.

- **Waste Classification (EER Code)**

The filter itself is classified as special waste, but its hazardousness depends on the "contaminant":
• Inert dust (e.g., wood, plastic, common metals): These can be classified as non-hazardous special waste (often under EER code 15 02 03).
• Hazardous dust (e.g., paints, oils, chemical products). If the machinery operates in the presence of toxic or flammable substances, the filter becomes hazardous special waste (often EER 15 02 02*).

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- Handling and Storage Procedures

• Mandatory PPE: During removal and packaging, the operator must wear a mask (minimum FFP2 or FFP3 for fine dust), gloves, and protective glasses to prevent inhaling accumulated particulate matter.
• Sealing: The removed filter must be immediately placed in a sturdy, sealed plastic bag to prevent dust from dispersing into the workplace during internal transport.
• Temporary storage: Filters must be stored in special containers, labeled according to current regulations (e.g., "Contaminated Filters") in a dedicated area of the production site.
User Responsibilities
• It is the employer/facility manager's responsibility to analyze the type of dust treated and assign the correct CER code for disposal through authorized companies.
• Absolute prohibition: Do not dispose of filters in municipal waste or unsorted municipal waste containers.

b. Checking the Seals (IP54 versions)

The IP54 rating depends entirely on the integrity of the elastic parts.
• Elasticity check: Every 6 months, check that the seals on doors, panels, and cable glands are not dry or cracked due to constant heat (40°C).
• Treatment: We recommend applying a thin layer of technical Vaseline or silicone spray to the seals to keep them soft and prevent tenacious adhesion that could tear them the next time they are opened.

c. Tightening the Electrical Connections

The ambient heat (40°C) combined with the heat generated by the passage of electricity can cause micro-thermal expansion.
• Maintenance: Every 6-12 months, retighten the power terminal blocks. Loose connections increase electrical resistance, generating additional heat (Joule effect), which can lead to melting of components or fires, especially in already hot environments.

d. Inspection of Air Exhaust Systems

Ventilation is forced by axial fans.
• Bearing Inspection: At 40°C, the grease in the fan bearings deteriorates more quickly. Check for abnormal noises or vibrations.
• Condensation Management
Even if the ambient temperature is 40°C, turning off the machine overnight in humid environments can cause internal condensation (dew point).
• Mechanical Tightening and Vibration
Vibrations can compromise the degree of protection over time.
• Nut and Bolt Inspection: Check the tightness of the external screws that maintain the pressure of the panels on the gaskets. Uneven pressure is the main cause of water or dust infiltration.

e. Precautions for IP54 Rating

• Seal Integrity: Each time you open the filter unit, check that the perimeter seal is soft and free of cuts. A deteriorated seal will invalidate the protection against splashes of water.
• Thermal Monitoring: If the ambient temperature consistently reaches 40°C, even a partially dirty filter can cause a critical increase in internal temperature.
• Replacement vs. Cleaning: If the dust is oily or conductive, cleaning is ineffective. In these cases, proceed directly to replacing the filter media to avoid bypassing harmful air.

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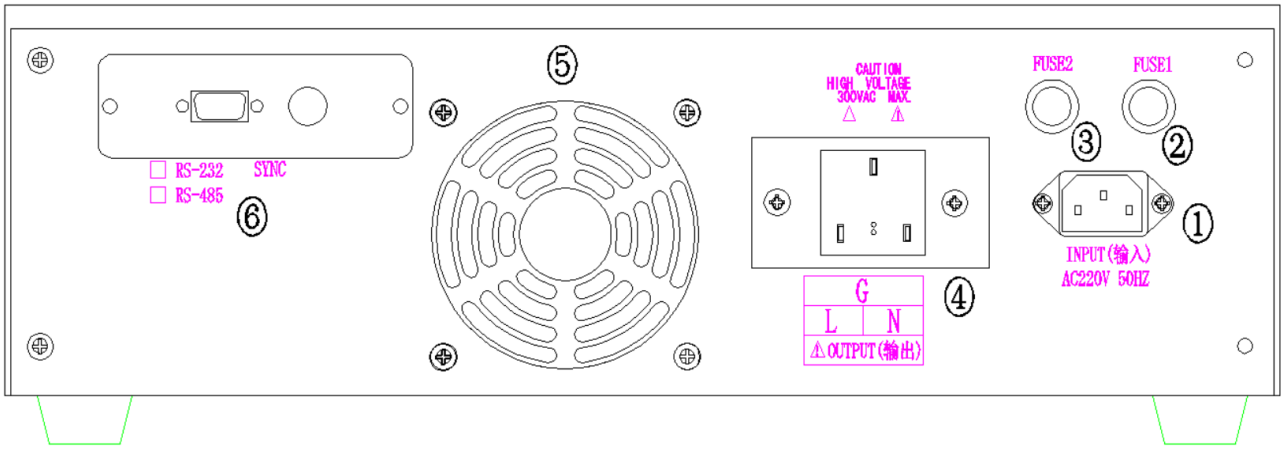
2.3 How to Install

2.3.1 ABP series rear panel for **single-phase 1kVA units**



① Input socket
② Fuse 1
③ Fuse 2
④ Output universal socket
⑤ Vent
⑥ Communication interface/Port – SYNC: synchronous signal for the output

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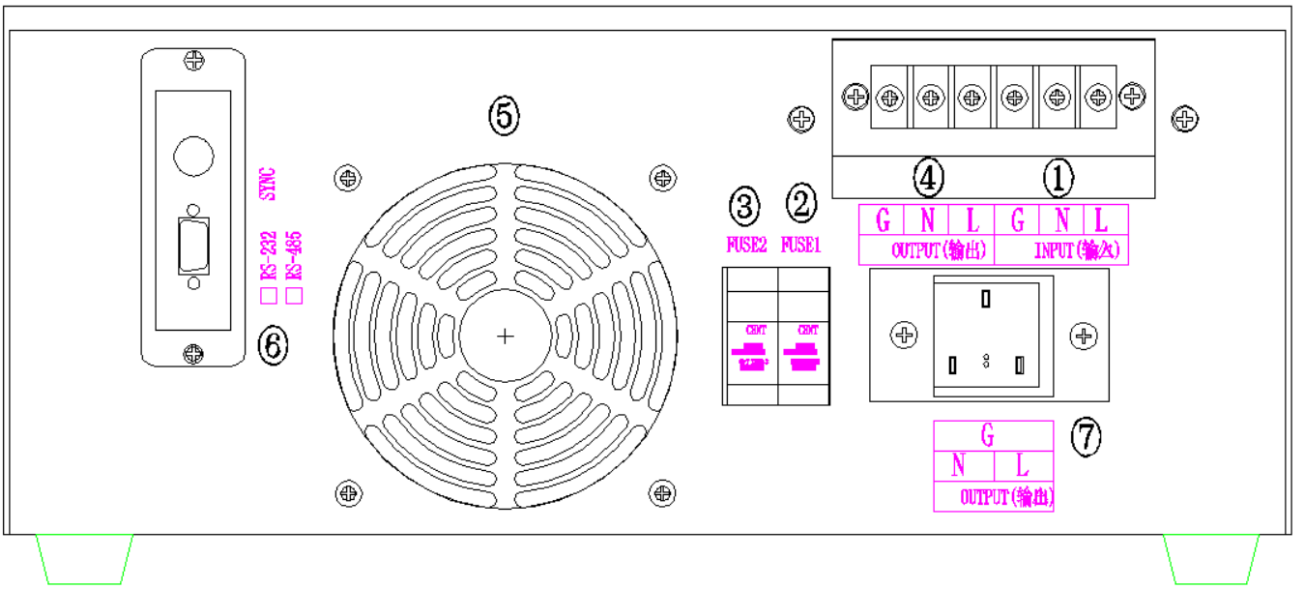
2.3.2 ABP series rear panel for **single-phase1.5kVAto 3kVA units**



① Input Terminal L+N+G
② Fuse 1
③ Fuse 2
④ Output Terminal L+N+G
⑤ Vent
⑥ Communication interface/Port – SYNC: synchronous signal for the output
⑦ Output universal socket

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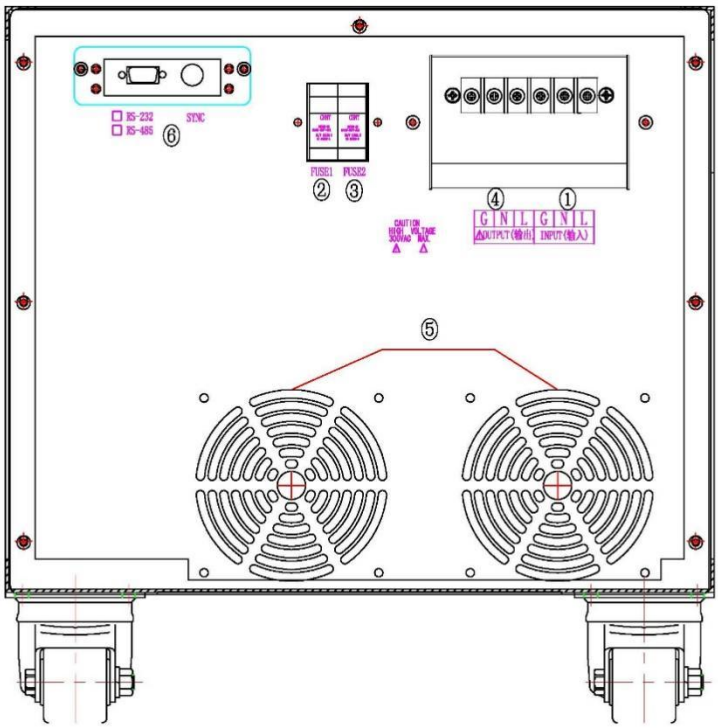
2.3.3 ABP series rear panel for **single-phase 5kVA unit**



① Input Terminal L+N+G
② Fuse 1
③ Fuse 2
④ Output Terminal L+N+G
⑤ Vent
⑥ Communication interface/Port – SYNC: synchronous signal for the output

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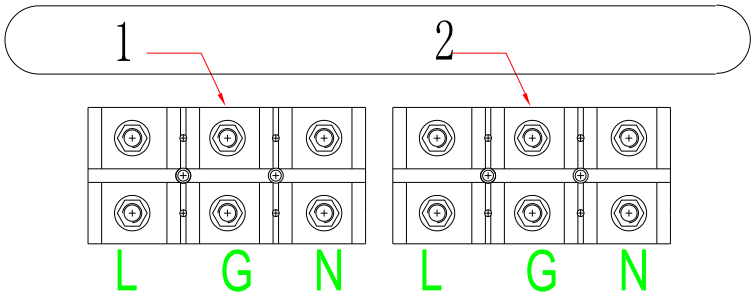
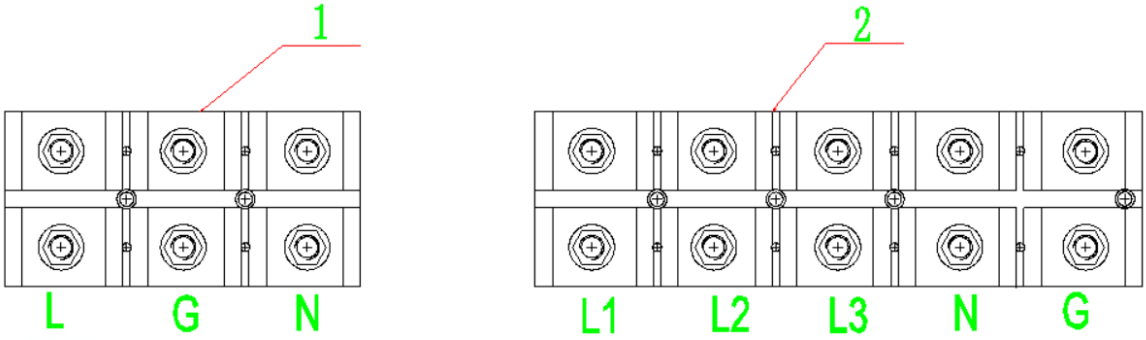
2.3.4 ABP series' input/output connectors for **single-phase 7.5kVA to 20kVA unit**

-Single-phase input and single-phase output (7.5-20kVA)



- Three Phase Input and Single-Phase Output(7.5kVA-20kVA)



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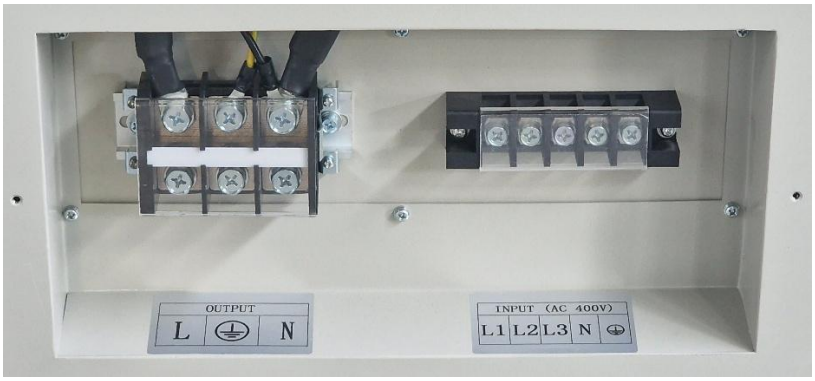

1-Output Terminal
2-Input Terminal

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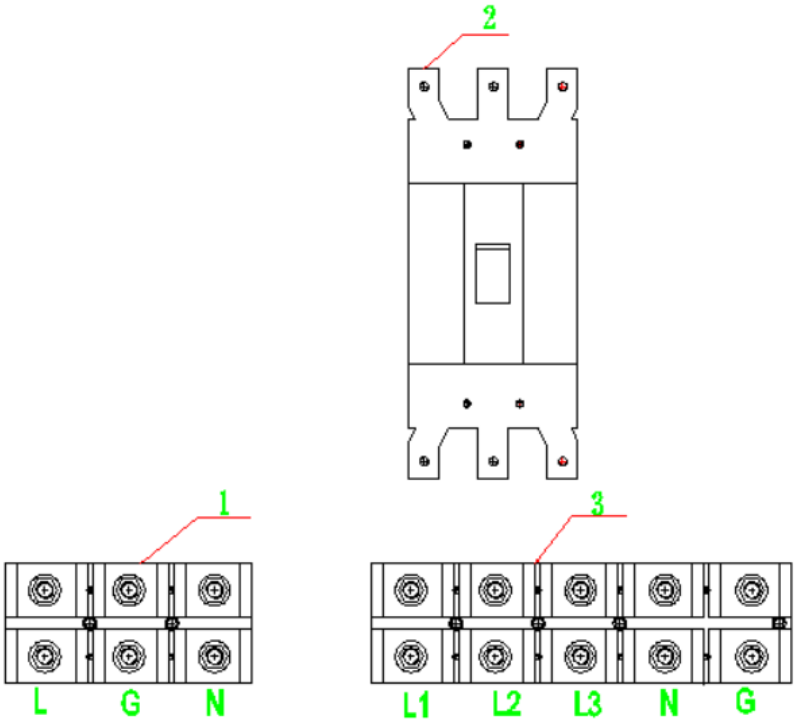
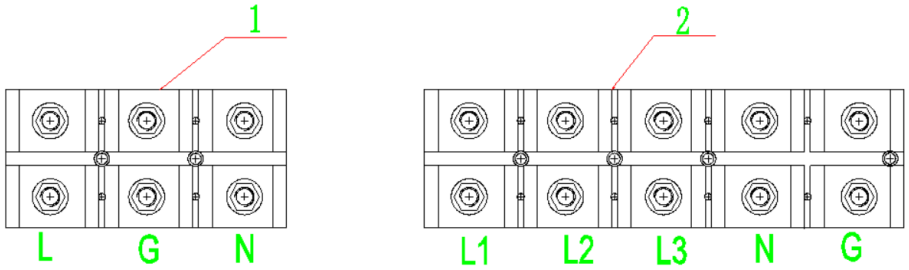
2.3.5 ABP series input/output connectors for **three to single-phase 30kVA to 300kVA unit**



1-Output Terminal
2-Input Non-fuse breaker
3-Input Terminal

2.3.6 ABP series rear panel for **Three Phase 1kVA/3kVA/6kVA unit**



1-Input Terminal
2-Output Terminal

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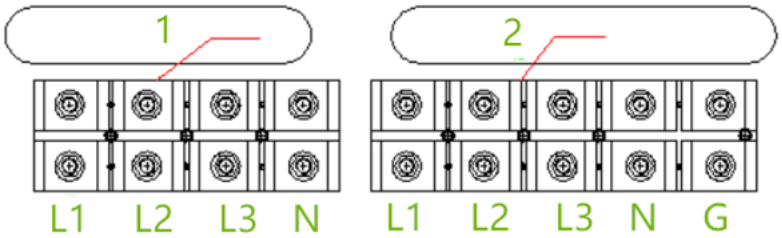
Three phase 1kVA unit

Three phase 3kVA unit

Three phase 6kVA unit

2.3.7 ABP series rear panel for **Three Phase 9kVA-20kVA unit**



1-Output Terminal
2-Input Terminal

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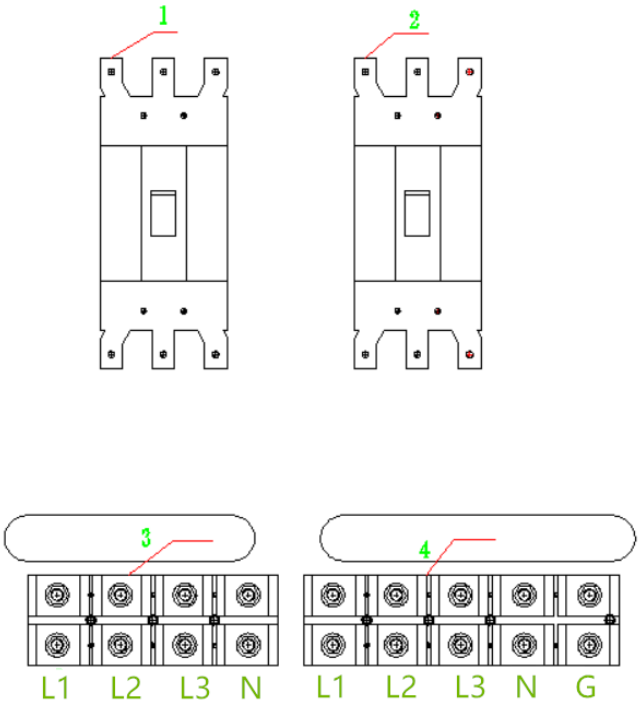
2.3.8 ABP series input/output connector for **Three Phase 30kVA-450kVA unit**



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1-Output Non-fuse Breaker
2-Input Non-fuse Breaker
3-Output Terminal
4-Input Terminal
Open the front door, you will see the connectors as above.

Chapter 3 Technical Parameter

Model	ABP –_____P/N:_____
Manufacture Date	_____/_____/_____(Year/Month/Day)
Output Capacity	□ 1kVA □ 2kVA □ 3kVA □ 5kVA □ 7.5kVA □ 10kVA □ 15kVA □ 20kVA □ 30kVA □ 45kVA □ 50kVA □ 60kVA □ 75kVA □ 100kVA □ 120kVA □ 150kVA □ 200kVA □ 300kVA □ 400kVA □ 450kVA □Other_____
Input Voltage	____Phase ____Wire_____V±10% □Other_____
Input Frequency	□ 47Hz～63Hz □Other _____
Output Voltage	____Phase ____Wire □Other_____ □ 110V □ 115V □120V □ 220V □ 230V □ 240V □ 200V □208V □ 380V □400V □415V □440V □480V □ HI/LO range switchable:(HI）0～300V(L-N),(LO) 0～150V(L-N) □ HI/LO range switchable:(HI）0～520V(L-L),(LO) 0～260V(L-L)
Output Frequency	□ Fixed:50Hz □ Fixed:60Hz □ Fixed:100Hz □ Fixed:200Hz □ Fixed:16.7Hz □ Fixed:400Hz □ Adjustable:45Hz～500Hz □ Adjustable:45Hz～200Hz □Other_____
Output Current(A)	____A at _____V, and _____A at _____V
Load Regulation	□ ±1% □Other_____
Freq Regulation	□ ±0.01% □Other_____
Voltage Regulation	□ ±1% □Other_____
Wave form	Pure Sine Wave
Circuit Type	□ IGBT/PWM □ Linear amplification □Other_____
Distortion THD	□ ≦2%（@ pure resistive loads） □Other_____
Efficiency	□ ≧ 85%（@ full load） □Other_____
Protection	Overload, Overcurrent, Overheat, Short Circuit Protection (cut off the output automatically and make alarm)

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LCD Display Accuracy	Voltage: □ 0.01V □other_____ Current: □ 0.01A □ 0.1A □other_____ Frequency: □ 0.01Hz □other_____ Power: □ 0.1W □1W □0.1KW □ 1KW □Other_____
Memory	Store 32 group data (Voltage/frequency)for easily recall
Enclosure IP	□ IP 20 □ IP32 □IP44 □IP 54 □IP 65 □Other_____
I-LIM Set	0- Max amps
Interface	□ RS232C □ RS485 □GPIB □Not Available □Other_____
Input Cable Connector	□ Terminal block □ Power cord □Other_____
Output Cable Connector	□ Terminal block □ Universal Socket □Other_____
Overload	□ ≤110% -15min, ≤125%-10 min, ≤150%-1min, ≤200%-5s
Working Condition	Environment: -10℃～45℃ Humidity:10%～90%
Altitude	≦1800 meters
Dimension/Weight	_____W*_____H*_____D(mm), _____Kg(Net)

Chapter 4 Front Panel Introduction

4.1 For Units with 1 phase 1kVA-30kVA and units with 3 phase 1kVA-20kVA

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4.2 For Units with 1 phase 45kVA-300kVA and units with 3 phase 30kVA-450kVA

Chapter 5 How To Operate

5.1 Attention

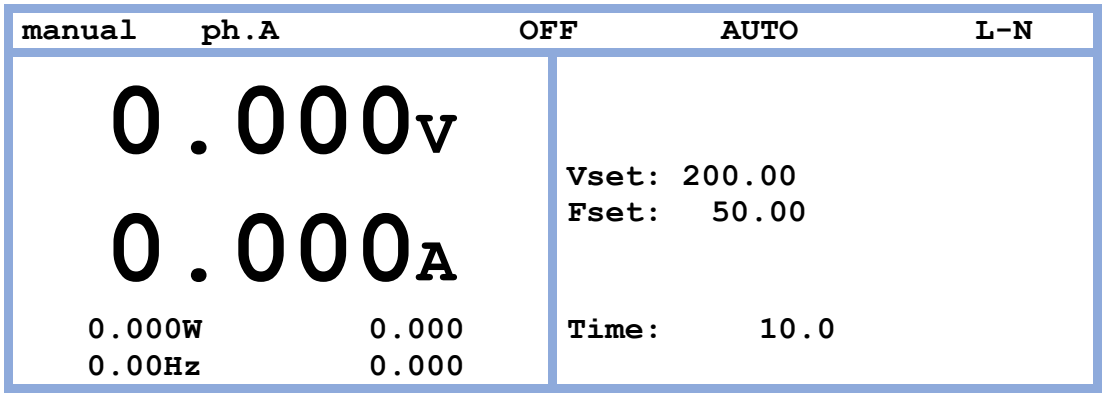
Before turning on the unit, please check whether the wiring to the input and output terminals is correct and whether the input voltage is within acceptable range.

5.2 Start Up

Press the button of “POWER” to turn on the unit (For units < 45kVA) or close the input breaker to turn on the unit (For units ≥ 45kVA). The LCD display screen will light up and show its model number, what mode it is in, because the unit can memorize the last setting value and store it in the unit.

5.3 Fn Button

The unit has two operation modes, manual mode and programmable mode. In the standby state, press Fn to switch between manual mode and programmable mode, as shown in the figure below.



Note: the "ph.A" and “L-N” or “L-L” notations are not present in the single-phase models and the line-to-line voltage data is not visible

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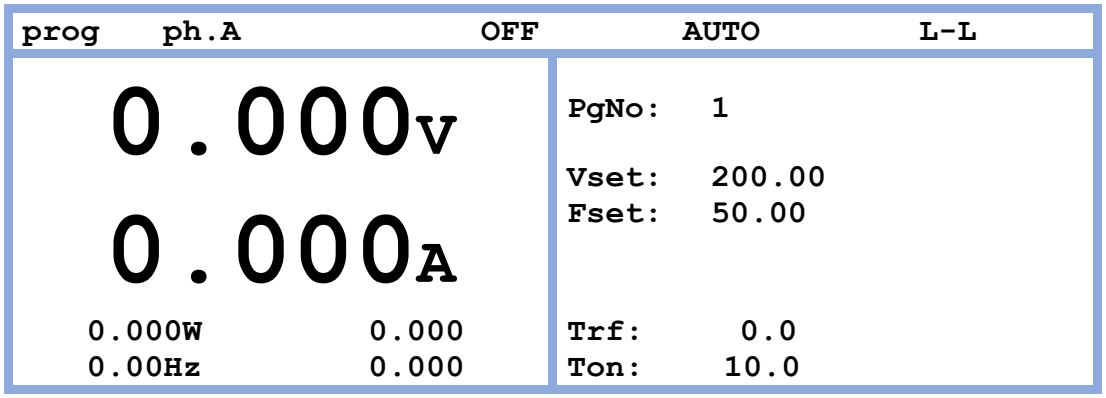
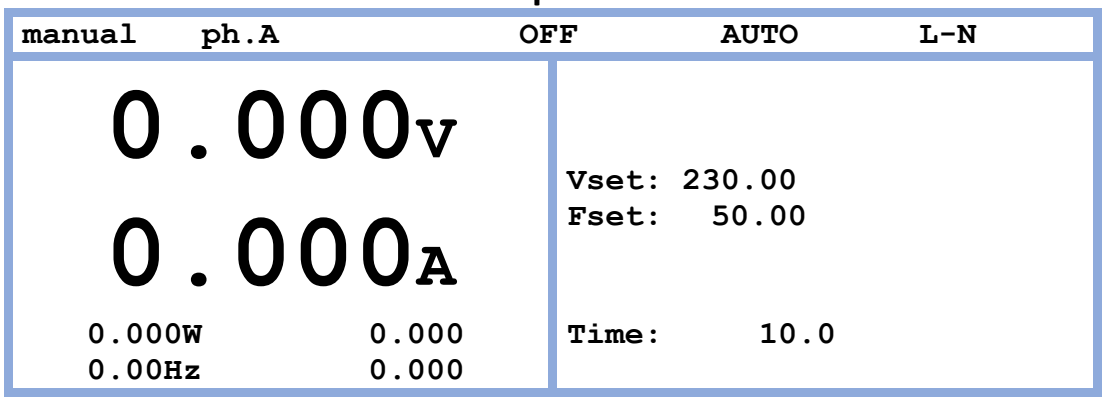


Note: the "ph.A" and “L-N” or “L-L” notations are not present in the single-phase models and the line-to-line voltage data is not visible

5.4 How to Set Parameter and operate the unit in manual mode



For the three-phase models the user can choose to set the output voltage with phase voltage (L-N) or line voltage (L-L), the factory default phase voltage setting, the user can choose line voltage setting by themselves according to 5.6.5 on Page 27.

5.4.1 Vset (Voltage setting）

In the standby state (OUT: OFF), press the "∧" or" ∨" key to move the cursor to the voltage setting window, you can directly press the number keys to input the voltage value, and press the ENTER key after confirming that value is correct. if the value is wrong, press the ESC key to clear it and then re-input it; or press"<" or ">" key to increase or decrease the original value.

In the output state (OUT: ON), press the "∧" or" ∨" key to move the cursor to the voltage setting window, and press the "＜" or" ＞" key to directly increase or decrease the original voltage value.

NOTE: In a three-phase network, the phase voltage is related to the line-to-line voltage with the factor √3 (root of 3). E.g. the phase voltage corresponding to 400Vac three phase is 230Vac. By pressing the ON button the display shows the phase voltage and the line voltage in the left section

5.4.2 Fset (Frequency setting）

In the standby state (OUT: OFF), press the "∧" or" ∨" key to move the cursor to the frequency setting window, you can directly press the number keys to input the frequency value, and press the "ENTER" key after confirming that value is correct. if the value is wrong, press the "ESC" key to clear it and then re-input it; Or Press"<" or " ＞" key to increase or decrease the original value.

In the output state (OUT: ON), press the "∧" or" ∨" key to move the cursor to the frequency setting window, and press the "＜" or" ＞" key to directly increase or decrease the original frequency value.

5.4.3 ON Button

After confirming that the setting in 5.4.1 and 5.4.2 are correct, press the "ON" key, and the unit is in the output state (load is on now), as shown in the figure below.

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manual ph.A	ON	AUTO
220.11V		Vset: 220.00
0.000A		Fset: 50.00
0.000W	0.000	Time: 0.0
50.00Hz	381.26	

To display phase B (Ph.B on the display) or phase C (ph.C), then phase A (ph.A) again, push the “dot” button  on the keyboard and display the values of each phase

5.4.4 OFF Button

In the output state, press the "OFF" key and the unit will stop output as shown in the figure below.

manual ph.A	OFF	AUTO
0.000V		Vset: 220.00
0.000A		Fset: 50.00
0.000W	0.000	Time: 0.0
0.00Hz	0.000	

Note: If the output has error, the unit will stop output automatically and alarm up, the LCD screen will display "N/A"; If you press “OFF” key once, the alarm (Alarm) will stop.

5.5 How To Set Parameter and operate the unit in programmable mode

prog ph.A	OFF	AUTO
0.000V		PgNo: 1
0.000A		Vset: 220.00
0.000W	0.000	Fset: 50.00
0.00Hz	0.000	Trf: 0.0
		Ton: 1.0

Note: In the programmable mode, the unit can automatically run 32 group of data, cycle 99999 times.
For the three-phase models the user can choose to set the output voltage with phase voltage (L-N) or line voltage (L-L), the factory default phase voltage setting, the user can choose line voltage setting by themselves according to 5.6.5 on Page 27.

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5.5.1 PgNo（Data group setting）

In the standby state (OUT: OFF), press the "∧" or" ∨" key to move the cursor to the PgNo setting window, Press"<" or " > " key to increase or decrease the original value. Press ENTER to confirm the value or ∨ to confirm the value and go to next setting.

5.5.2 Vset (Voltage setting）

In the standby state (OUT: OFF), press the "∧" or" ∨" key to move the cursor to the voltage setting window, you can directly press the number keys to input the voltage value, and press the "ENTER" key after confirming that value is correct. if the value is wrong, press the "ESC" key to clear it and then re-input it; Or Press"<" or ">" key to increase or decrease the original value. Press ∨ to confirm the value and go to next setting.

5.5.3 Fset (Frequency setting）

In the standby state (OUT: OFF), press the "∧" or" ∨" key to move the cursor to the frequency setting window, you can directly press the number keys to input the frequency value, and press the "ENTER" key after confirming that value is correct. if the value is wrong, press the "ESC" key to clear it and then re-input it; Or Press"<" or ">" key to increase or decrease the original value. Press ∨ to confirm the value and go to next setting.

5.5.4 Trf (Output voltage rising time setting)

In the standby state (OUT: OFF), press the "∧" or" ∨" key to move the cursor to the Trf setting window, you can directly press the number keys to input the value of the delay times, and press the "ENTER" key after confirming that value is correct. if the value is wrong, press the "ESC" key to clear it and then re-input it; Or Press"<" or ">" key to increase or decrease the original value. Press ∨ to confirm the value and go to next setting.

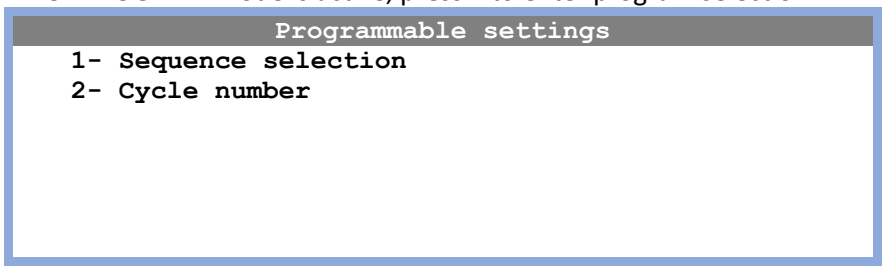
5.5.5 Ton (Running time setting for each group of data)

In the standby state (OUT: OFF), press the "∧" or" ∨" key to move the cursor to the Ton setting window, you can directly press the number keys to input the value of the running time, and press the "ENTER" key after confirming that value is correct. if the value is wrong, press the "ESC" key to clear it and then re-input it; Or Press"<" or ">" key to increase or decrease the original value.

If value is set to “0” there is no end to the program step, which end only if you push the OFF button.

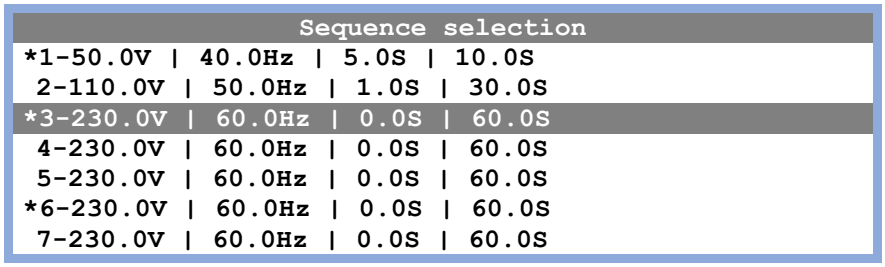
PROGRAM SETTING

When PROGRAM mode is active, press > to enter program selection



Press 1 for selection of memory step sequence to run. There are 128 executable memory sets.

Memory sets to be run are marked with an asterisk. The line that can be modified is the one selected in grey.



Press ↑ or ↓ to move the selection from step 1 to step 128.

Press ← or → to activate (* displayed) or deactivate (* not displayed) the memory step to be performed.

When starting the sequence, only the steps marked with an asterisk will be executed.

At the end of the selection, press ESC to return to the "Programmable settings" menu.

Press 2 if you want to determine a number of cycles to run:

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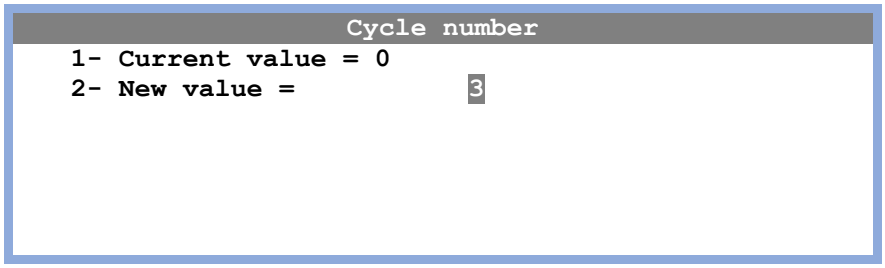
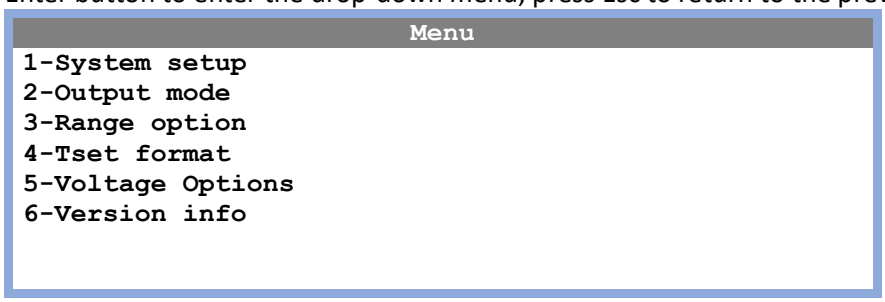


If the value is “0” the number of cycles is infinite and the power supply will remain active until the OFF key is pressed
If the value is “n”, n+1 test cycles will be performed when the ON key is pressed. At the end of the test cycles the power supply will be deactivated automatically

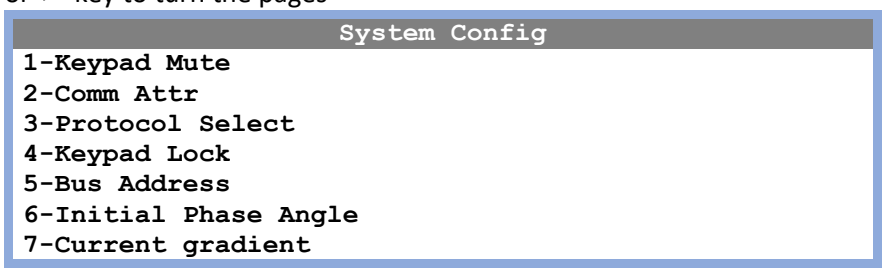
5.6 Menu (system parameter setting)

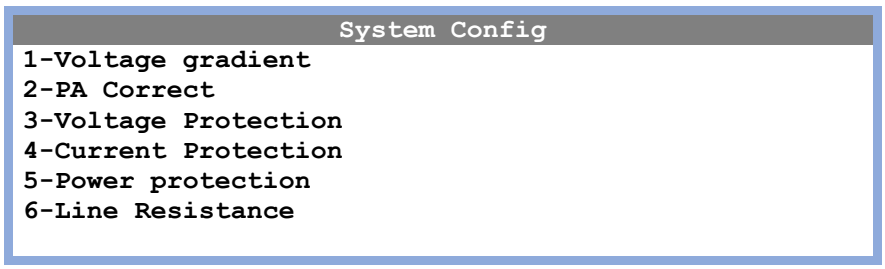
In the standby state (OUT:OFF), press Menu button to set the system parameters as shown in figure below.
Press the number keys to select one from the five options on the screen below, then press
Enter button to enter the drop-down menu, press Esc to return to the previous menu.



5.6.1 System setup

In the Menu column, press the "1" key to select the system setup which is shown in the figure below, press the "<" or">" key to turn the pages





5.6.1.1 Kaypad Mute

1.Keypad sound mute,Press "﹀" or "﹀" key to set mute or Non-mute
'* Disable' stand for mute,'*Enable' stand for non-mute

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```
Keypad Mute
  Disable
* Enable
```

5.6.1.2 Comm Attr (Communication)

2.Communication Serial port baud rate setting: Modifying the baud rate will restart the unit.

```
Comm Attr
    2400,8,n,1
    4800,8,n,1
*   9600,8,n,1
    19200,8,n,1
    38400,8,n,1
    57600,8,n,1
```

5.6.1.3 Protocol Select

3.Serial port protocol settings: Modbus-RTU is the standard MODBUS RTU protocol (default), SCPI is the character protocol, SMART MB is the internal custom simple modbus protocol, APS8K_C is the internal custom hexadecimal protocol, Com backhaul test is the serial port test and Return the sent content, Com disable is to disable the serial port function. Change the protocol selection the unit will restart.

```
Protocol Select (Need to reboot)
*   Modbus-RTU
    SCPI
    SMART MB
    APS8K_C
    Com Backhaul test
    Com disable
```

5.6.1.4 Keypad Lock

4.'*When communication' means lock the keyboard when the unit is in communication with PC/PLC
'Never': unlocked

```
Keypad Lock
    When Communication
*   Never
```

5.6.1.5 Bus Address

5.Serial port address setting: maximum 247

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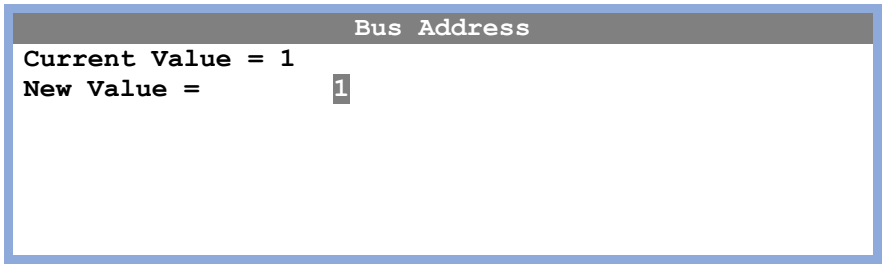
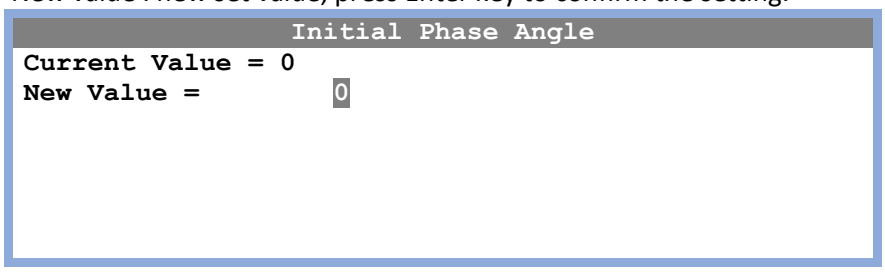


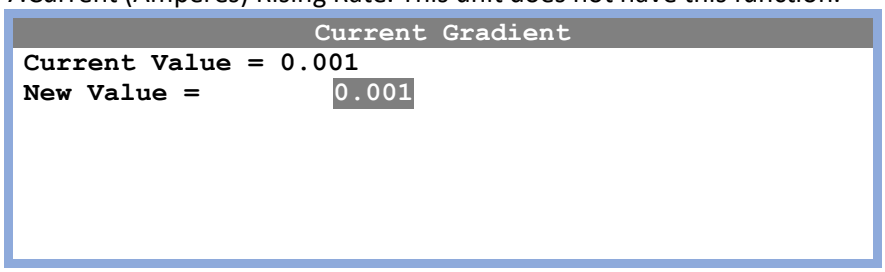
5.6.1.6 Initial phase angle

6.This unit does not have this function
'Current value = ? ': The last set value of the unit
'New value': new set value, press Enter key to confirm the setting.



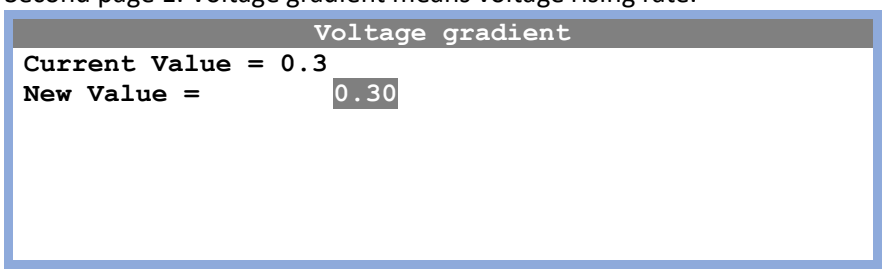
5.6.1.7 Current gradient

7.Current (Amperes) Rising Rate. This unit does not have this function.



5.6.1.8 Voltage gradient

Second page 1. Voltage gradient means voltage rising rate.



5.6.1.9 PA correct

Second page 2. PA Correct means Power measurement correction function, the default is 1.

5.6.1.10 Voltage protection

Second page 3. Overvoltage protection setting, the unit will stop output when voltage exceed setting value.

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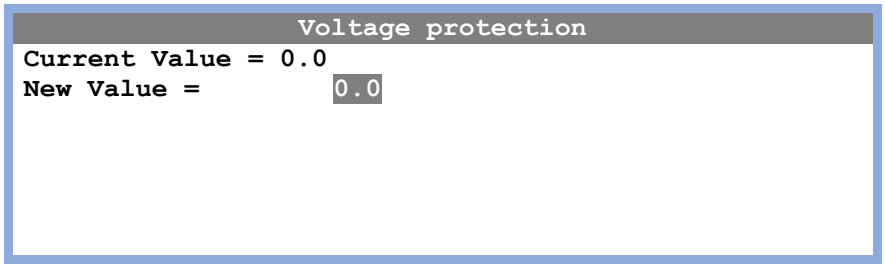
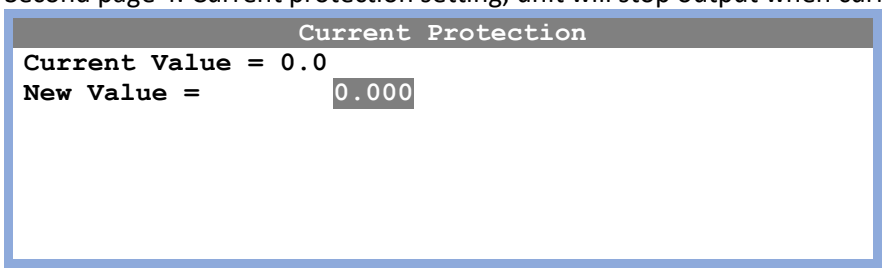


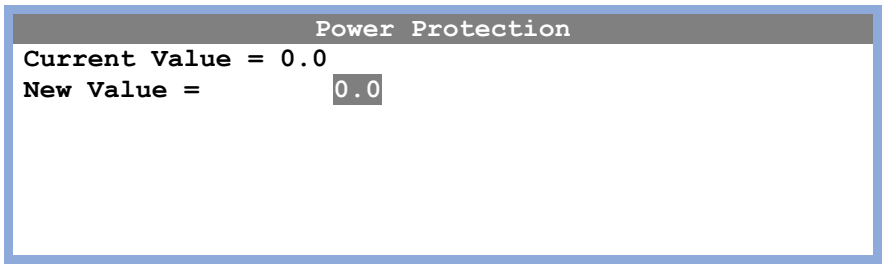
5.6.1.11 Current protection

Second page 4. Current protection setting, unit will stop output when current exceed setting value.



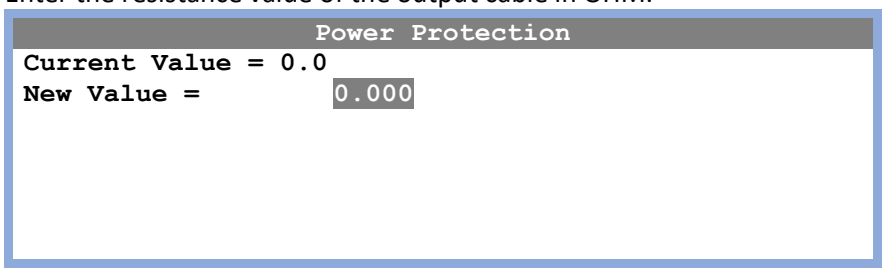
5.6.1.12 Power protection

Second page 5. Power protection setting, the unit will stop output when power exceed setting value.



5.6.1.13 Line Resistance

Second page 6. This is a voltage drop compensation function. When the cable length from the power supply output to the load is too long, voltage drop occurs. After adding the resistance value of the cable over that distance, the power supply will automatically increase its output voltage to compensate for the voltage drop at the load side. Enter the resistance value of the output cable in OHM.



5.6.2 Output mode

In the Menu column, press the "2" key to select the output mode which is shown in the figure below
'* Manual': means normal mode
'PG': means Programmable mode

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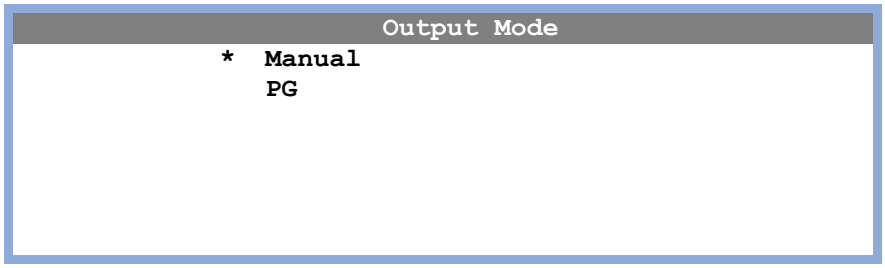
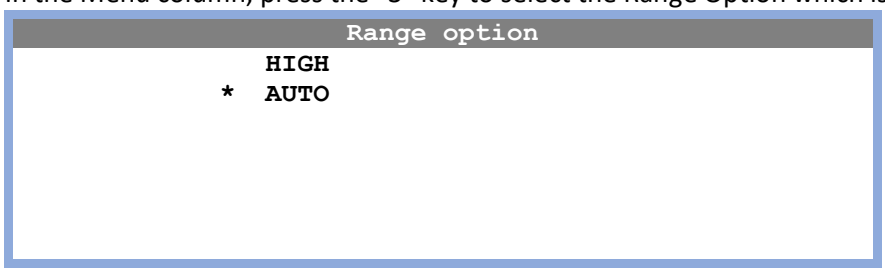


5.6.3 Range option（HIGH/AUTO Range Selection）

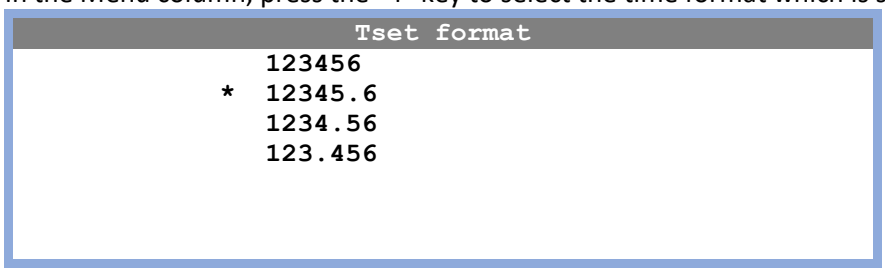
In the Menu column, press the "3" key to select the Range Option which is shown in the figure below



In HIGH mode the system does not automatically change the working range but remains in the maximum voltage range. In AUTO mode the system automatically changes the working range passing to the maximum intermediate voltage with double current to ensure use at maximum power in the low voltage range up to the limit indicated in the technical characteristics.

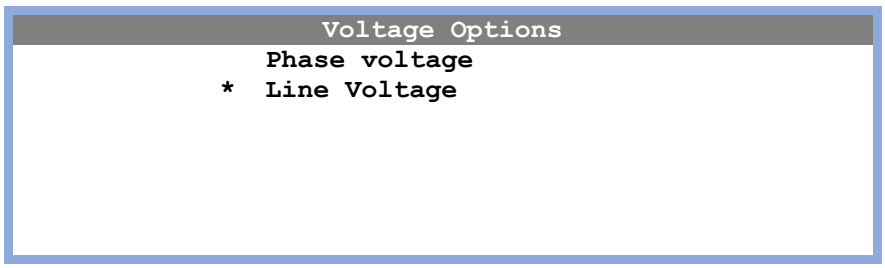
5.6.4 Tset format (time value decimal point setting)

In the Menu column, press the "4" key to select the time format which is shown in the figure below:



5.6.5 Voltage Options (Phase voltage/Line voltage setting selection)

In the Menu column, press the "5" key to select Phase voltage/Line voltage setting which is shown in the figure Below



Press the "﹀" or" ﹀" key to pick phase voltage or line voltage setting, then press “Enter” key to confirm

5.6.6 Version info

In the Menu column, press the "5" key to select the version info to see software version information:

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```
Version Info
1-firmware
2-pn
```

Press the 1 key for firmware information

```
Version Info
appver: X.XX
Date&time: mmm dd aaaa hh:mm:ss
```

Press the 2 key for product information

```
Version Info
PN: 12345678
Vmax: xxx.x
Imax: xxx.x
Pmax: xxxxxx
Fmax: xxx.x
Fmin: xxx.x
```

Press ESC to exit settings

5.7 Save Button

The unit can store 32 groups of data (voltage/frequency/time) in Manual Mode
In MANUAL mode, after finishing the voltage, frequency and time settings, press SAVE button to store the first group and the second group. . . Up to 32 groups. If the duration is 0.0S the selection has no end and the dispensing will be stopped when the OFF key is pressed.

```
Recall save menu
   1. [01]230.0V-60.0Hz-10.0S
   2. [02]230.0V-60.0Hz-10.0S
   3. [03]230.0V-60.0Hz-10.0S
   4. [04]230.0V-60.0Hz-10.0S
   5. [05]230.0V-60.0Hz-10.0S
   6. [06]230.0V-60.0Hz-10.0S
   7. [07]230.0V-60.0Hz-10.0S
```

5.8 Recall Button

Data group memories can only be recalled when the system is in MANUAL mode.
A data group is a combination of voltage, frequency, and run time.
To recall the 32-group data memory, press the RECALL key

```
Recall call menu
   1. [01]230.0V-60.0Hz-10.0S
   2. [02]230.0V-60.0Hz-10.0S
   3. [03]230.0V-60.0Hz-10.0S
   4. [04]230.0V-60.0Hz-10.0S
   5. [05]230.0V-60.0Hz-10.0S
   6. [06]230.0V-60.0Hz-10.0S
   7. [07]230.0V-60.0Hz-10.0S
```


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Press ↑ or ↓ to move the selection from step 1 to step 32. The selected row is marked in gray.
Press ENTER to accept and select a value
Press ON to activate the output corresponding to the selected data group

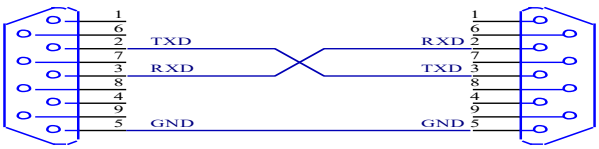
5.9 Lock Button

Press Lock button to lock the keyboard. If the unit is controlled by PC, the panel control is invalid.

5.10 RS232 Serial port instruction (Optional)

The hardware of the serial port is a D-type 9-pin interface, and the pin definitions are as below

RS232: 2---TXD, 3---RXD, 5---GND;



AC POWER SOURCE HOST COMPUTER

Note: In case there is overload or short circuit, please turn off the output before resetting

5.10.1 SYNC Connector (optional)

SYNC is a synchronous signal for the output. When the ABP unit starts output, it synchronously output a 5V TTL high level signal towards other instruments, to notify other test instruments and let them start recording data in automatic test. (optional, this is available only when the unit comes with RS232/485)

5.11 Decimal point "." Button

For the 3 phase output units, pressing "**.**" button makes the display switching the parameter of A/B/C phase on the screen.

Chapter 6 ABP Soft Start Function.

In electrical circuits, a large current is sometimes generated when the load is energized. This large current is equivalent to a short-circuit current, which is called an inrush current. This phenomenon mainly occurs in the following three load types:

6.1 Capacitive load - such as capacitors,

6.2 Inductive load - Such motor, transformer, electric fan, ballasts for fluorescent lamps

6.3 Non-linear rectifier load, non-linear load refers to the load containing rectifier equipment. In electronic circuits, the changes between voltage and current are not linear.

Common typical nonlinear loads are:

6.3.1 Soft starter (thyristor, motor starter).

6.3.2 Switching power supply, UPS, inverter element, battery charger.

6.3.3 Manufacturing process controller of frequency-controlled motors, cranes, elevators, pumps, etc.

6.3.4 Electronic image equipment - such as radio transmission equipment such as TV, controllable lighting equipment.

6.3.5 Rectifiers, fluorescent lamps, etc.

For example, the inrush current for a capacitor is equivalent to a short circuit at the time of power-on, and the instantaneous current is theoretically infinite.

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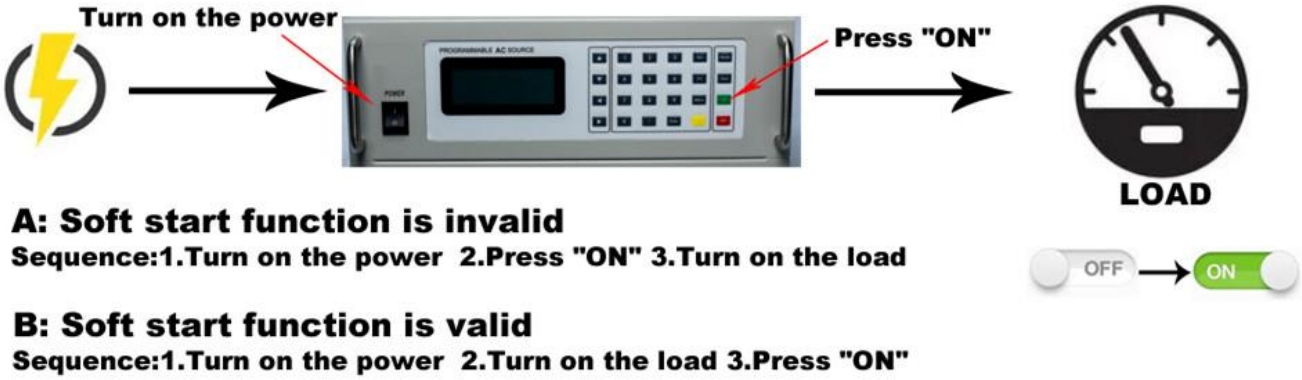
To solve the problem that the ABP cannot start such a load due to its excessive inrush current, we add a soft start function to the ABP units. The principle is that when the ABP outputs the voltage, the voltage can slowly rise from 0V to the rated voltage, this can effectively restrain the inrush current of the load when it is powering on.

But the soft start will only work when the load is connected in the following order, if the order is reversed, the soft start will not work.

A: when the users don't want the soft-start function work, the sequence is to turn on the ABP, press the" ON" button on front panel to turn on the output of ABP unit, and then turn on the load through its switch. At this time, the ABP's output voltage is the rated voltage of the load, and there is no slow rising process. The soft start function is ineffective. At this time, the load will generate a large inrush current, which may exceed the maximum output current allowed by the ABP, so the ABP's overcurrent protection will be triggered to automatically cut off the output.

B: when the users want the soft-start function work, they need to change the loading sequence, turn on the load switch first, then press the" ON" button on front panel to turn on the output of ABP unit. In this way, The ABP output voltage slowly rises can reduce the load inrush current. In other words, the load must be in a normally "ON" state, Or the "on/off" of the load can only be controlled by the output button of the ABP. The soft start function is effective in this way.



The user can decide whether it is necessary to use the soft-start function for your load, or decide whether it is suitable to use the soft-start function for your loads. If soft-start is required, please confirm whether your load can be normally "ON" and whether your load allows the power supply voltage rise slowly or not.

Generally, the factory default rise rate is 0.1% of the rated output voltage, for example for a 300V machine, voltage rising rate is 0.3V/10mS. Usually, users do not need to change this value by themselves. If they really need to, the allowable range is 0.01V/10mS~1.00V/10mS. The smaller the value, the slower the rise. The setting value stands for rising value for every 10 milliseconds, and the minimum is 0.01V/10 mS. Check the chapter 5.6.1.8 Voltage gradient when you need to change.

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Chapter 7 Trouble Shooting &Fault Code list

7.1 What happened: No output, and the display unit (LED lights) does not light up

Why: No input power supply
Solution: A- Make sure the switch/input breaker is turned on. B. Make sure the fuse is not blown.

7.2 What happened: No output, the frequency meter shows normal, the voltage meter shows "0" and there is a alarm

Why: Overload or abnormal loading b. The loads have too big starting current (inrush current) to start by the ABP unit
Solution: Turn off the output, press "ON/OFF" button to Reset, then reduce or check the load then try again.

7.3 Serial port communication failed

Solution A: Check whether the unit has the same the communication address and communication baud rate as the host computer(software), if they are different, make the setting to be same.

Solution B: Disconnect the connection between the ABP unit and the host computer, measure the serial port's signal between ABP unit and the host computer. The TXD to GND of ABP unit and the host computer should have a voltage of -8V～-12V; If the measuring value you got is out of this range, the problem comes from the serial port or the wiring between both

7.4 What happened: Data can be received during serial communication, but the data is wrong.

Solution: Check whether the wiring connection between the ABP unit and host computer is tight enough.
If the interference in environment is large, the wires should be shielded and grounded

7.5 Fault Code list and description of fault code

7.5.1 **OCP** code stands for over current protection, it is software protection. When the output current reaches the overcurrent protection point set by the software; the power supply will alarm and stop output. It gets normal after the load is reduced.
7.5.2 **OVP** code stands for over voltage protection, it is software protection. When the output voltage reaches the over voltage protection point set by the software, the power supply will alarm and stop output. It gets normal after reducing the setting voltage.
7.5.3 **ALA** Code is hardware fault code, such as IGBT module faulty, fuse blown down etc.
7.5.4 **NA** Code, please contact us for further trouble shooting.

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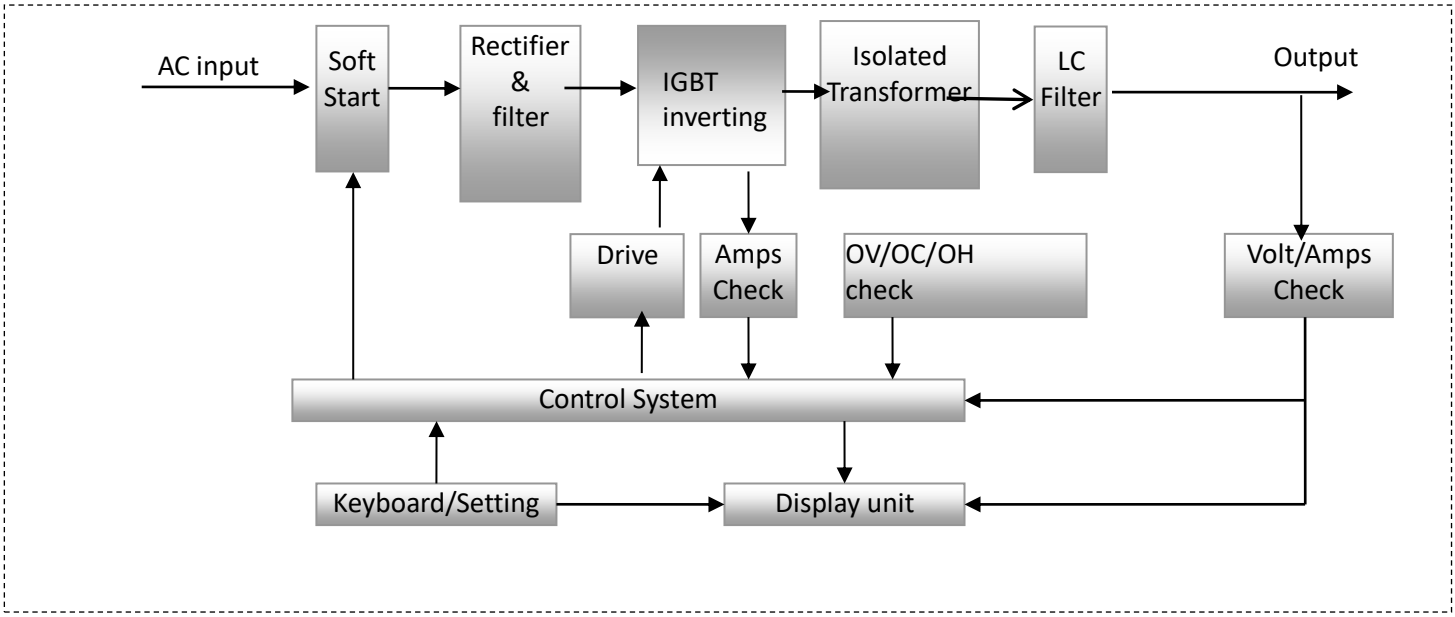
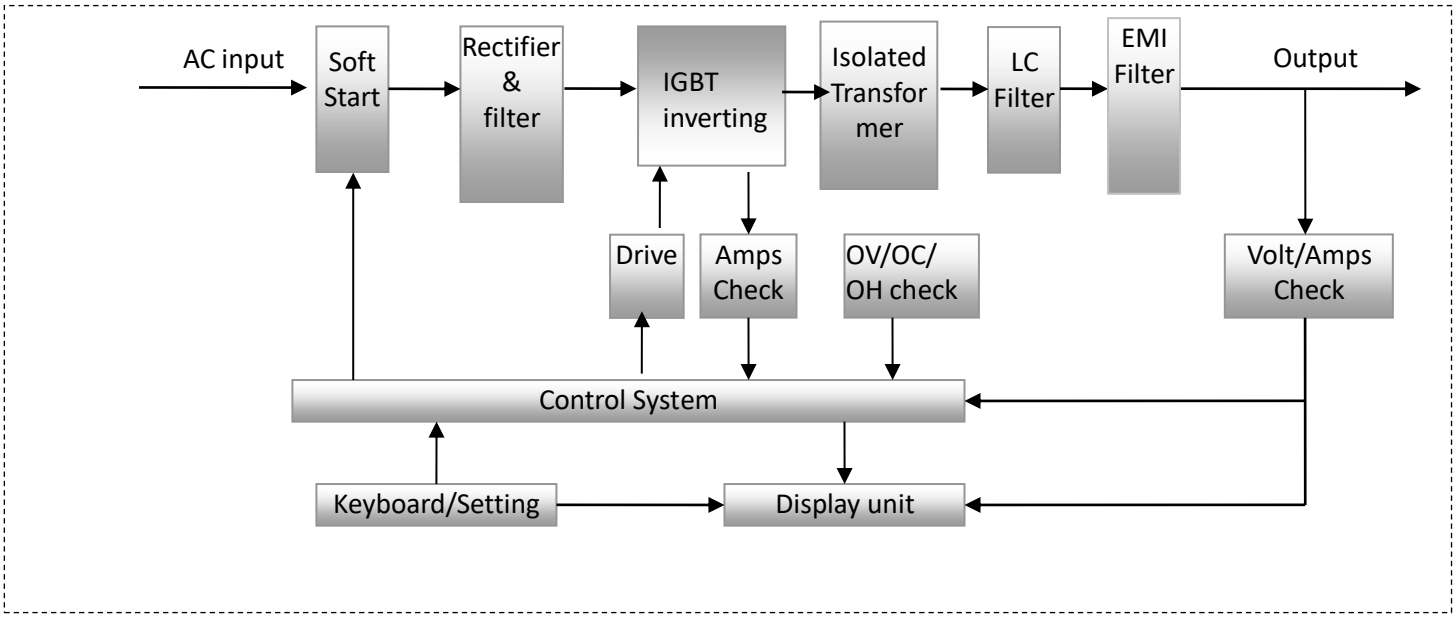
Chapter 8 ABP Series Block Diagram

8.1 Standard Unit



8.2 Option 1 (Output end with EMI filter)



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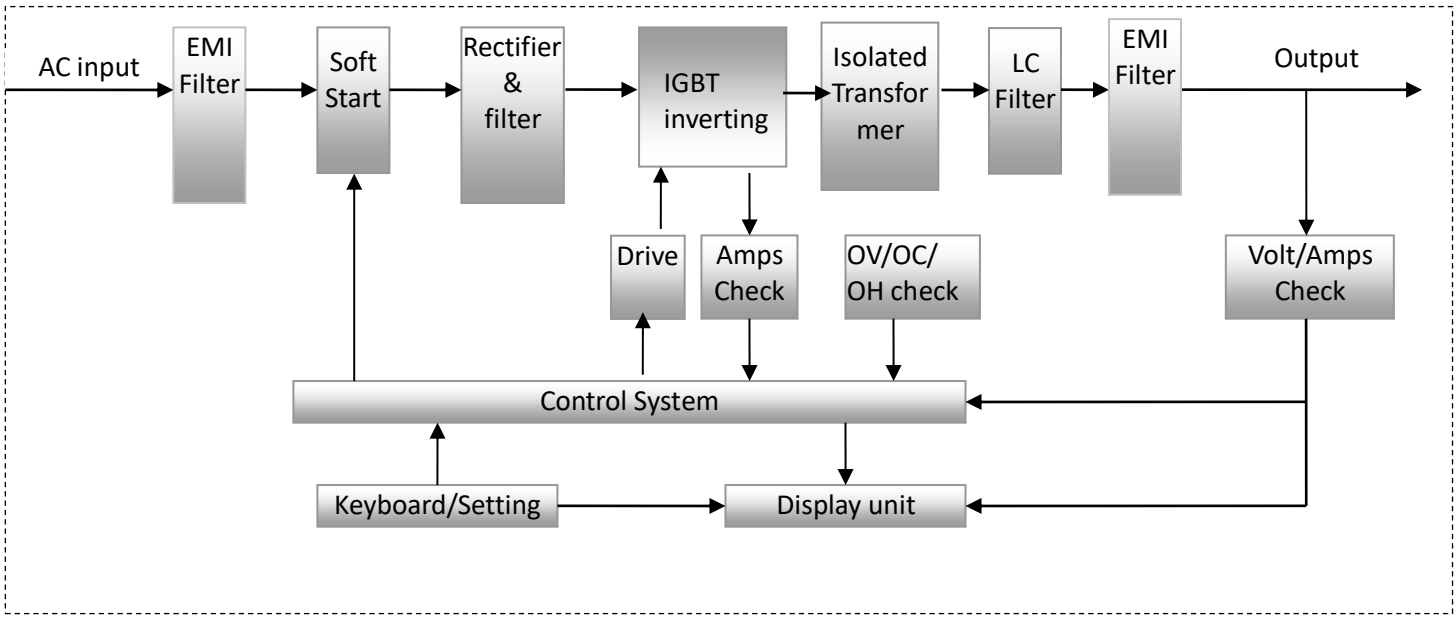
8.3 Option 2 (Input/Output ends with EMI filter)



Chapter 9 How to choose the right size for the ABP units

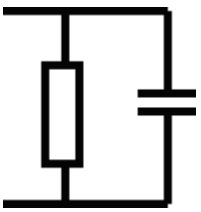
ABP units are capable of having many types of loads, including inductive, resistive, and rectifying loads. But please pay attention to choosing the appropriate capacity for the ABP unit.

The load types are as following.

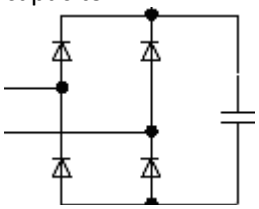
-Linear load
-Resistive load
-Power factor corrected load

-Inductive load

-Capacitive load



-Non-linear load
-Rectified filter type load with electrolytic capacitor



-For resistive/linear load: ABP's kVA = 1.1×load power
·For Inductive load: ABP's kVA = load starting current / load rated current × load power
·For rectified load: ABP's kVA = load current crest factor/1.5×load power
·For mixed load: ABP's kVA = The sum of power required for each load type above
Note: For inductive loads such as refrigerators and air conditioners, the ABP unit's capacity should be selected according to the starting power (Starting power is generally 5-7 times of rated power).

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Chapter 10 MODBUS RTU communication protocol (Optional)

For the units which have RS232/RS485 interface

10.1 Byte format

Byte transmission includes 1 start bit, 8 data bits, no parity bit, and 1 stop bit. The byte transmission time sequence is shown in the table below.

Start bit	D0	D1	D2	D3	D4	D5	D6	D7	Stop bit

10.2 Data transmission method

Data type	Number of registers	Number of bytes	Description
Byte data	1	1	
Shaped data	1	2	High byte first, low byte second
Long integer number	2	4	High word first, low word second
Floating point data			

10.3 Frame format

10.3.1 Read holding register (function code 03H)

10.3.1.1 Frame format sent by the host computer

Order	Code	Description
1	Address	Correspondence address (1-127)
2	03H	Function code
3	Start register address high byte	Register start address
4	Start register address low byte	
5	Number of registers high byte	Number of consecutive registers
6	Low byte of register number	
7	CRC16 low byte	CRC check data
8	CRC16 high byte	

10.3.1.2 Normal response frame format

Order	Code	Description
1	Address	Correspondence address (1-127)
2	03H	Function code
3	Data field bytes (N)	
4	Byte 1	
……	……	
	Byte N	
N+4	CRC16 Low byte	
N+5	CRC16 high byte	

10.3.1.3 Abnormal response

Order	code	description
1	Address	The communication address of the instrument

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		(1-127)
2	83H	function code
3		Error code 01H: wrong register address or number 02H: data error; 05H: IO error
4	CRC16 low byte	
5	CRC16 high byte	

10.3.2 Continuous write holding register (function code 10H)

10.3.2 .1 Frame format sent by the host computer

Order	code	description
1	Address	Correspondence address (1-127)
2	10H	Function code
3	Register start address high byte	Start register address
4	Low byte of register start address	
5	Number of registers high byte	Number of registers
6	Low byte of register number	
7	Bytes (N)	
8	Byte 1	
	Byte 2	
	Byte 3	
	……	
	Bytes N	
M+8	CRC16 Low byte	CRC check data
M+9	CRC16 high byte	

10.3.2.2 Normal response

Order	Code	Description
1	Address	Correspondence address (1-127)
2	10H	Function Code
3	Start address high byte	Register start address
4	Start address low byte	
5	register number high byte	
6	Low byte of register number	
7	CRC16 low byte	CRC check data
8	CRC16 high byte	

10.3.2.3 Abnormal response

Order	Code	Description
1	Instrument address	Communication address of the instrument (between 1-255)
2	90H	Function code
3		Error code 01H: wrong register address or number 02H: Data error

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		05H: IO error
4	CRC16 low byte	
5	CRC16 high byte	

10.3.3 Read-only register (function code 04H)

10.3.3.1 Frame format sent by the host computer

Order	Code	Description
1	Address	Correspondence address (1-127)
2	04H	function code
3	Start register address high byte	Register start address
4	Start register address low byte	
5	Number of registers high byte	Number of consecutive registers
6	Low byte of register number	
7	CRC16 low byte	CRC check data
8	CRC16 high byte	

10.3.3.2 Normal response frame format

Order	Code	Description
1	Address	Correspondence address (1-127)
2	04H	function code
3	Data field bytes (N)	
4	byte 1	
.....	.....	
	bytes N	
N+4	CRC16 low byte	
N+5	CRC16 high byte	

10.3.3.3 Abnormal response

Orer	Code	Description
1	Address	Correspondence address (1-127)
2	84H	function code
3		Error code 01H:wrong register address or number; 02H:data error 05H:IO error
4	CRC16 low byte	
5	CRC16 high byte	

10.4 Communication baud rate

You can set the communication baud rate in the menu. please read the relevant chapters of manual for more detail

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	Optional baud rate
1	2400bps
2	4800bps
3	9600bps
4	19200bps
5	38400bps

10.5 The instrument address

The instrument address is the communication address, which can be set in the menu. please refer to the relevant chapters of the manual.

10.6 Communication function code

10H: Write setting parameters, control power output stop
03H: Read setting parameters
04H: Read measurement data and status

10.7 Communication data CRC check

```
static const unsigned char aucCRCHi[] = {
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41,
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41,
    0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41,
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,
    0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41,
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41,
    0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41,
    0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
    0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
    0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41,
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41,
    0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41,
    0x00, 0xC1, 0x81, 0x40
};

static const unsigned char aucCRCLo[] = {
    0x00, 0xC0, 0xC1, 0x01, 0xC3, 0x03, 0x02, 0xC2, 0xC6, 0x06, 0x07, 0xC7,
    0x05, 0xC5, 0xC4, 0x04, 0xCC, 0x0C, 0x0D, 0xCD, 0x0F, 0xCF, 0xCE, 0x0E,
    0x0A, 0xCA, 0xCB, 0x0B, 0xC9, 0x09, 0x08, 0xC8, 0xD8, 0x18, 0x19, 0xD9,
    0x1B, 0xDB, 0xDA, 0x1A, 0x1E, 0xDE, 0xDF, 0x1F, 0xDD, 0x1D, 0x1C, 0xDC,
    0x14, 0xD4, 0xD5, 0x15, 0xD7, 0x17, 0x16, 0xD6, 0xD2, 0x12, 0x13, 0xD3,
    0x11, 0xD1, 0xD0, 0x10, 0xF0, 0x30, 0x31, 0xF1, 0x33, 0xF3, 0xF2, 0x32,
```


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```
    0x36, 0xF6, 0xF7, 0x37, 0xF5, 0x35, 0x34, 0xF4, 0x3C, 0xFC, 0xFD, 0x3D,
    0xFF, 0x3F, 0x3E, 0xFE, 0xFA, 0x3A, 0x3B, 0xFB, 0x39, 0xF9, 0xF8, 0x38,
    0x28, 0xE8, 0xE9, 0x29, 0xEB, 0x2B, 0x2A, 0xEA, 0xEE, 0x2E, 0x2F, 0xEF,
    0x2D, 0xED, 0xEC, 0x2C, 0xE4, 0x24, 0x25, 0xE5, 0x27, 0xE7, 0xE6, 0x26,
    0x22, 0xE2, 0xE3, 0x23, 0xE1, 0x21, 0x20, 0xE0, 0xA0, 0x60, 0x61, 0xA1,
    0x63, 0xA3, 0xA2, 0x62, 0x66, 0xA6, 0xA7, 0x67, 0xA5, 0x65, 0x64, 0xA4,
    0x6C, 0xAC, 0xAD, 0x6D, 0xAF, 0x6F, 0x6E, 0xAE, 0xAA, 0x6A, 0x6B, 0xAB,
    0x69, 0xA9, 0xA8, 0x68, 0x78, 0xB8, 0xB9, 0x79, 0xBB, 0x7B, 0x7A, 0xBA,
    0xBE, 0x7E, 0x7F, 0xBF, 0x7D, 0xBD, 0xBC, 0x7C, 0xB4, 0x74, 0x75, 0xB5,
    0x77, 0xB7, 0xB6, 0x76, 0x72, 0xB2, 0xB3, 0x73, 0xB1, 0x71, 0x70, 0xB0,
    0x50, 0x90, 0x91, 0x51, 0x93, 0x53, 0x52, 0x92, 0x96, 0x56, 0x57, 0x97,
    0x55, 0x95, 0x94, 0x54, 0x9C, 0x5C, 0x5D, 0x9D, 0x5F, 0x9F, 0x9E, 0x5E,
    0x5A, 0x9A, 0x9B, 0x5B, 0x99, 0x59, 0x58, 0x98, 0x88, 0x48, 0x49, 0x89,
    0x4B, 0x8B, 0x8A, 0x4A, 0x4E, 0x8E, 0x8F, 0x4F, 0x8D, 0x4D, 0x4C, 0x8C,
    0x44, 0x84, 0x85, 0x45, 0x87, 0x47, 0x46, 0x86, 0x82, 0x42, 0x43, 0x83,
    0x41, 0x81, 0x80, 0x40
};

Unsigned short
usMBCRC16( unsigned char * pucFrame, unsigned short usLen )
{
    unsigned char               ucCRCHi = 0xFF;
    unsigned char               ucCRCLo = 0xFF;
    int                 iIndex;

    while( usLen-- )
    {
        iIndex = ucCRCLo ^ *( pucFrame++ );
        ucCRCLo = ( unsigned char )( ucCRCHi ^ aucCRCHi[iIndex] );
        ucCRCHi = aucCRCLo[iIndex];
    }
    return ( unsigned short )( ucCRCHi << 8 | ucCRCLo );
}
```

10.8 Data register address

Register address (decimal)	Description	Unit	Data range	Function code	Data format
40000	Maximum voltage	Voltage value *1000		03H	S32
40002	Maximum current	Current value * 1000			S32
40004	Maximum frequency	Frequency value * 1000			S32
40006	Minimum frequency	Frequency value * 1000			S32
40008	Maximum power	Power value * 1000			S32
40100		Part number			
41001	Voltage setting	Voltage value*1000		10H	S32
41003	Current setting	Current value*1000			S32
41007	Frequency setting	Frequency value*1000			S32
41009	High/Low range setting	N/A	0:high range 1:Low range		U16

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46001	output	N/A	any value	10H	U16
46002	stop	N/A	any value		U16
36000	Measuring VRMS value	Voltage value / 1000	S32	04H	S32
36002	Measuring IRMS value	Current value / 1000	S32		S32
36004	Measuring active power value	Power value/1000	S32		S32
36006	PF value measurement	PF value/1000	S32		S32
36008	Measuring apparent power value	Power value/1000	S32		S32
36010	Measuring VPEAK value	VPEAK value/1000	S32		S32
36012	Measure IPEAK value	IPEAK value/1000	S32		S32
36014	Measuring frequency FR value	Value/1000	S32		S32
35999	status word	N/A	see appendix 1 below		U16

Note:
S32 signed long integer
U16 unsigned short integer
The Register Address needs to minus 1 at actual operation, please check the example in 10.10 in details as below

10.9 Description of Status Words

BIT15~BIT4	BIT3	BIT2	BIT1	BIT0
Reserved	0	0	1:There is an alarm 0: no alarm	1:output 0:stop

10.10 Command VS code

Output command:01 10 B3 B0 00 01 02 00 00 3E AB

46001-1=46000 HEX B3 B0

The actual operating address minus one

Return:01 10 B3 B0 00 01 26 AA

Order	Code	Description	
1	Address	Correspondence address (1-127)	01
2	10H	function code	10
3	Register start address high byte	Start register address	B3
4	Register start address low byte		B0
5	Number of registers high byte	Number of registers	00
6	Low byte of register number		01
7	bytes (N)		02
8	bytes 1		00
	bytes 2		00
M+8	CRC16 low byte	CRC check data	3E
M+9	CRC16 high byte		AB

stop output command:01 10 B3 B1 00 01 02 00 00 3F 7A
46002-1=46001 HEX B3 B1
Return:01 10 B3 B1 00 01 77 6A

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Voltage measuring RMS command:01 04 8C 9F 00 02 6B 75

Order	Code	Description	
1	Address	Correspondence address (1-127)	01
2	04H	function code	04
3	Start register address high byte	Register start address	8C
4	Start register address low byte		9F
5	Register number high byte	Number of consecutive registers	00
6	Low byte of register number		02
7	CRC16 low byte	CRC check data	6B
8	CRC16 high byte		75

Return:01 04 04 00 03 5C FE B3 04 /00 03 5C FE=220414/1000=220.414V

Order	Code	Description	
1	Address	Correspondence address (1-127)	01
2	04H	Function code	04
3	Data field bytes (N)		04
4	byte 1		00
5	byte 2		03
6	byte 3		5C
7	byte 4		FE
N+4	CRC16 low byte		B3
N+5	CRC16 high byte		04

All measured value commands:01 04 8C 9F 00 0C EA B1
VRMS register address-1=35999 DEC 8C9F
Read data from 12 register addresses starting at 35999 registers.

Order	Code	Description		DEC
1	Address	Correspondence address (1-127)	01	
2	04H	function code	04	
3	Start register address high byte	Register start address	8C	
4	Start register address low byte		9F	
5	Number of registers high byte	Number of consecutive registers	00	
6	Low byte of register number		0C	12
7	CRC16 low byte	CRC check data	EA	
8	CRC16 high byte		B1	

Return:01 04 18 00 00 E7 DA 00 00 08 E2 00 02 10 1C 00 00 03 E8 00 02 0E 6C 00 00 03 75 C8 9E
Return:
Return data of 12 register addresses starting from 35999 registers, our measurement data is 32-bit data occupying 2 register addresses. Return 6 sets of data

Order	Code	Description	
1	Address	Correspondence address (1-127)	01
2	04H	function code	04
3	Data field bytes (N)		18
4	byte 1	VRMS	00

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5	byte 2	00 00 E7 DA 59354/1000=59.354V	00
6	byte 3		E7
7	byte 4		DA
	byte 5	IRMS 00 00 08 E2 2274/1000=2.274A	00
	byte 6		00
	byte 7		08
	byte 8		E2
	byte 9	active power 00 02 10 1C 135196/1000=135.196 W	00
	byte 10		02
	byte 11		10
	byte 12		1C
	byte 13	PF 00 00 03 E8 1000/1000=1.000	00
	byte 14		00
	byte 15		03
	byte 16		E8
	byte 17	Apparent power 00 02 0E 6C 134764/1000=134.764 VA	00
	byte 18		02
	byte 19		0E
	byte 20		6C
	byte 21	VPEAK value 00 00 03 75 885/1000=0.885V	00
	byte 22		00
	byte 23		03
	byte 24		75
N+4	CRC16 low byte		B3
N+5	CRC16 high byte		04

Set voltage 100V command:01 10 A0 28 00 02 04 00 01 86 A0 3B CE
0186A0=100000/1000=100.000V

Order	Code	Description	
1	Address	Correspondence address (1-127)	01
2	10H	function code	10
3	Start register address high byte	Register start address	A0
4	Start register address low byte		28
5	Number of registers high byte	Number of consecutive registers	00
6	Low byte of register number		02
7	bytes N		04
8	byte 1		00
	byte 2		01
	byte 3		86
	……		A0
M+8	CRC16 low byte	CRC check data	3B
M+9	CRC16 high byte		CE

Return:01 10 A0 28 00 02 E3 C0
Current register 41003-1 = 41002 HEX A0 2A 30A current 30 * 1000 = 30000
Command for setting current 30A:01 10 A0 2A 00 02 04 00 00 75 30 AF 4B
Set current 100A command:01 10 A0 2A 00 02 04 00 01 86 A0 BA 17 0186A0=100000/1000=100.000A

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Return:01 10 A0 2A 00 02 42 00
Set frequency 100hz command:01 10 A0 2E 00 02 04 00 01 86 A0 BB E4
0186A0=100000/1000=100.000HZ
Return: 01 10 A0 2E 00 02 03 C1

Set voltage 100V current 1A command:01 10 A0 28 00 04 08 00 01 86 A0 00 00 03 E8 D9 7A
0186A0=100000/1000=100.000V

Set high range command: 01 10 A0 30 00 01 02 00 00 03 AA
41009-1=41008 HEX A0 30

order	code	description	
1	Address	Correspondence address (1-127)	01
2	10H	function code	10
3	Register start address high byte	Start register address	A0
4	Register start address low byte		30
5	Number of registers high byte	Number of registers	00
6	Low byte of register number		01
7	bytes (N)		02
8	bytes 1		00
	bytes 2		00
M+8	CRC16 low byte	CRC check data	03
M+9	CRC16 high byte		AA

Return: 01 10 A0 30 00 01 23 C6
OVP over voltage setting, 100V 0186A0=100000/1000=100.000V
Send:01 10 9C A7 00 02 04 00 01 86 A0 72 EF
Return: 01 10 9C A7 00 02 DE 7B
OCP over current setting: 1A , 03 E8=1000/1000=1.000A
01 10 9C A9 00 02 04 00 00 03 E8 C0 05
01 10 9C A9 00 02 BF B8
Voltage rising rate setting: 1V , 03 E8=1000/1000=1.000V
01 10 9C A3 00 02 04 00 00 03 E8 40 7A
01 10 9C A3 00 02 9F BA

Status command:01 04 8C 9E 00 01 7A B4
Return:01 04 02 00 00 B9 30 //OFF
01 04 02 00 01 78 F0 //ON
01 04 02 00 02 38 F1 //ALARM
01 03 9C 3F 00 0A DB 91 9C 3F=39999 40000-1 Maximum voltage register
01 03 14 00 02 22 E0 00 00 1B 58 00 03 0D 40 00 00 AF C8 00 00 00 00 AB AA
Read the part number
01 03 9C A3 00 04 9A 7B
01 03 08 31 32 33 34 35 36 00 08 1E CF

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10.11 APPENDIX A - SCPI COMMUNICATION PROTOCOL

THREE PHASE SCPI COMMUNICATION PROTOCOL

DATA	COMMAND	RESPOND OR DATA UNIT	MEASURE UNIT/REMARKS
READ FREQUENCY	FREQ?	40.0 ~ 500.0	Hz
READ VOLTAGE PHASE A	VOLT:AC:LA?	0.0 ~ V(MAX)	V
READ VOLTAGE PHASE B	VOLT:AC:LB?	0.0 ~ V(MAX)	V
READ VOLTAGE PHASE C	VOLT:AC:LC?	0.0 ~ V(MAX)	V
READ CURRENT PHASE A	CURR:AC:LA?	0.000 ~ I(MAX)	A
READ CURRENT PHASE B	CURR:AC:LB?	0.000 ~ I(MAX)	A
READ CURRENT PHASE C	CURR:AC:LC?	0.000 ~ I(MAX)	A
READ POWER PHASE A	POW:AC:LA?	0.0 ~ P(MAX)	W
READ POWER PHASE B	POW:AC:LB?	0.0 ~ P(MAX)	W
READ POWER PHASE B	POW:AC:LC?	0.0 ~ P(MAX)	W
READ PF PHASE A	POW:AC:PFAC:LA?	0.000 ~ 1.000	10
READ PF PHASE B	POW:AC:PFAC:LB?	0.000 ~ 1.000	10
READ PF PHASE C	POW:AC:PFAC:LC?	0.000 ~ 1.000	10
START OUTPUT	OUTP ON		
STOP OUTPUT/CLEAR FAULT	OUTP OFF		
VOLTAGE SETTING	VOLT X	X = 0.0 ~ 300.0	V
FREQUENCY SETTING	FREQ X	X= 40.0 ~ 500.0	Hz
RANGE SETTING	RANG X	X=HIGH or X=AUTO	
OVERVOLTAGE PROTECTION SETTING	SYS:PROT:OVP X	X = 0.0 ~ 300.0	V
MAX CURRENT SETTING (1)	CURR X	X = 0.000 ~ I(MAX)	A
RANGE STATUS (2)	VOLT:RANG?	HIGH or AUTO	
OUTPUT STATUS	OUTP:STAT?	ON or OFF	
OVERCURRENT PROTECTION SETTING	SYS:PROT:OCP X	X = 0.0 ~ I(MAX)	A
*IDN	*IDN?	AC POWER SOURCE IDENTIFICATION	
INFO ABOUT THE UNIT (3)	CAPABILITY?	VMAX, AMAX, FMAX, FMIN	V, A, Hz, Hz

SINGLE PHASE SCPI COMMUNICATION PROTOCOL

DATA	COMMAND	RESPOND OR DATA UNIT	MEASURE UNIT/REMARKS
READ FREQUENCY	FREQ?	40.0 ~ 500.0	Hz
READ VOLTAGE	VOLT:AC?	0.0 ~ V(MAX)	V
READ CURRENT	CURR:AC?	0.000 ~ I(MAX)	A
READ POWER	POW:AC?	0.0 ~ P(MAX)	W
READ PF PHASE A	POW:AC:PFAC?	0.000 ~ 1.000	10
START OUTPUT	OUTP ON		
STOP OUTPUT/CLEAR FAULT	OUTP OFF		
VOLTAGE SETTING	VOLT X	X = 0.0 ~ 300.0	V
FREQUENCY SETTING	FREQ X	X= 40.0 ~ 500.0	Hz
RANGE SETTING	RANG X	X=HIGH or X=AUTO	
OVERVOLTAGE PROTECTION SETTING	SYS:PROT:OVP X	X = 0.0 ~ 300.0	V
MAX CURRENT SETTING (1)	CURR X	X = 0.000 ~ I(MAX)	A
RANGE STATUS (2)	VOLT:RANG?	HIGH or AUTO	
OUTPUT STATUS	OUTP:STAT?	ON or OFF	
OVERCURRENT PROTECTION SETTING	SYS:PROT:OCP X	X = 0.0 ~ I(MAX)	A

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*IDN	*IDN?	AC POWER SOURCE IDENTIFICATION	
INFO ABOUT THE UNIT (3)	CAPABILITY?	VMAX, AMAX, FMAX, FMIN	V, A, Hz, Hz

(1) "Max current setting": this function only works for the AC constant source which can set the output current. Standard units don't have this function.
(2) "Range status" command is available for units from June 2024.
(3) "Capability" data are similar to the following response: 300.0,17.400,500.0,40.0: they mean max output voltage (300V), max current (17.400A), max frequency (500.0), min frequency (40.0). Response will be different according to model and actual settings.

NOTE: With SCPI protocol, the refresh rate of each data is about 200 milliseconds. For example, if 12 data are to be read, then it is 200ms*12=2400ms (2.4S).

10.12 APPENDIX B - RJ45 ETHERNET CONNECTOR OPTION

RJ45 ETHERNET CONNECTOR OPTION
- Connect the RJ45 connector to an Ethernet network. The default address is 192.168.1.200. If you connect from ABP directly to a PC via Ethernet cable, we suggest setting a static IP for the computer (e.g. 192.168.1.100)
- Type the default network address 192.168.1.200 into a browser to access the system's web server. There is no password for the first connection, press enter to access the settings page. It is possible to change the network settings.
- Since this is a converter, do not change the serial settings unless you change the ABP system settings in the same way. Otherwise, the converter will not communicate with the system.
- If you want to use the Modbus TCP protocol to control the power source, in the Multi-master settings window set the Modbus RTU to Modbus TCP protocol.

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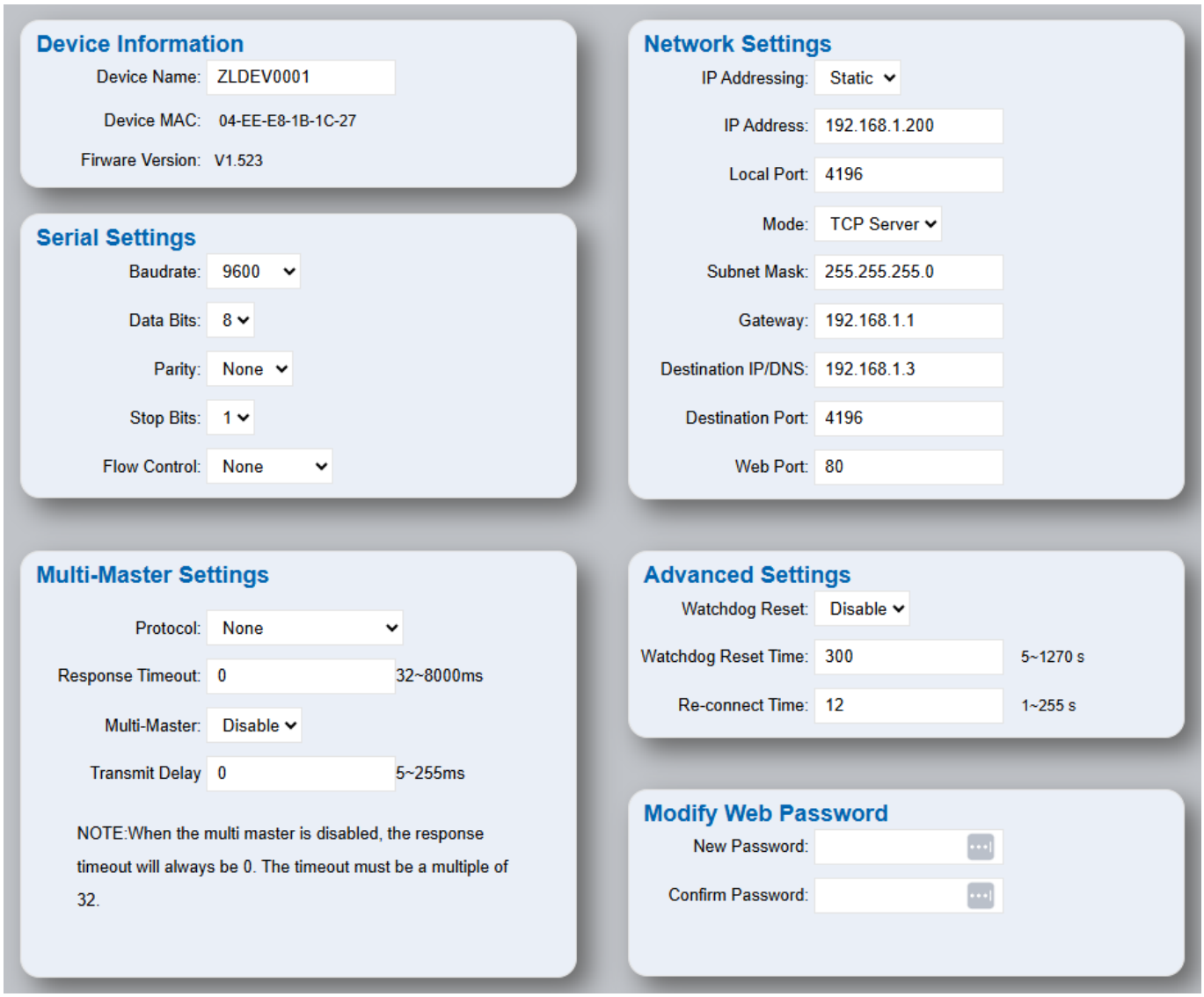

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