PX SERIES PROGRAMMABLE AC

POWER SUPPLY/FREQUENCY CONVERTER

USER MANUAL Version 1.7

Thank you for choosing our SFC products. Please read this user manual before operation

CONTENTS

Safety and Warranty Disclaimer Statements

PX Electronics guarantees that their 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. PX Electronics reserves the right to use its discretion on replacing the faulty parts or replacing the assembly or the whole unit. PX Electronics 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 PX Electronics as an acceptable part.

This warranty does not cover accessories not associated with PX Electronics

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Chapter 1 Safety Notification/Instructions

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

1.1 Safety Signs and Labels

The regulation Safety Signs below should be understood before use

 Hi-voltage / Hazardous Voltage Warning

 Danger Hi-voltage / Hi-voltage / Hazardous Voltage Warning

 Grounding point / Earthing Point

 Grounding or Chassis ground

1.2 Safety Statement

1.2.1 Do not open the cover of the PX unit to avoid getting electric shock. If maintenance is required, only qualified people can isolate and remove covers for troubleshooting or please contact us if any repair.
1.2.2 Be sure to Power off the PX 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 fans clear.

1.3 Maintenance

1.3.1 DON'T
- Most internal parts of the PX unit 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 exhaust fans and the electrolytic capacitors inside the unit must be carefully visually inspected at least once every 12 months to ensure the safety of users and the normal operation of the PX 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 PX 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 PX unit and check the provided accessories. The accessories include a user manual and a input power cord only for the 1kVA model. If the ordered unit is fitted with an interface, an interface cable is supplied.

2.2 Installation Attention

2.2.1 Input power supply selection

The PX series AC power supply uses single-phase 440V 60Hz three-phase 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 powering on the unit.

2.2.2 Please ensure that the PX unit is grounded, whether a single-phase or three-phase output.

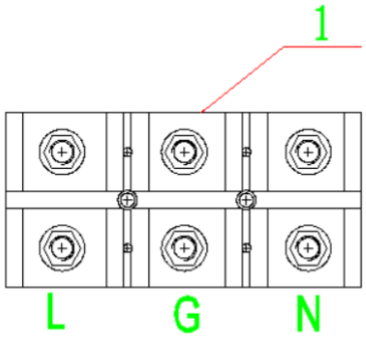
2.2.3 Each unit is equipped with fuse protection before leaving the factory. If you need to replace the fuse, replace it with the same specifications. Before replacing the fuse, you must turn off the PX unit to avoid electric shock risk.

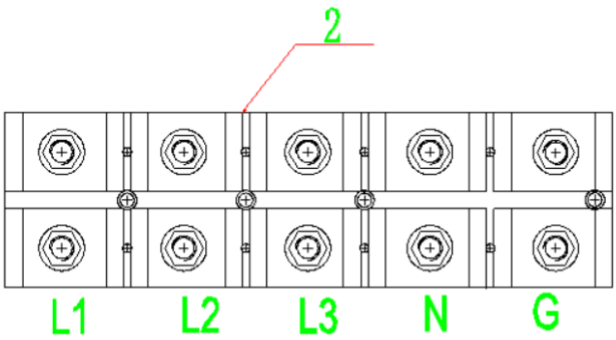
2.2.4 Application environment/condition

- ✧ Ambient Working Temperature: -10°C to +50°C, please derate when temperature exceeds 40°C.
- ✧ Storage Temperature:-20°C to +50°C
- ✧ Relative Humidity: Between 10-90%
- ✧ Height :Below 2000 meters altitude
- ✧ There must be no gas, steam, chemical deposition, dust dirt and other explosive and etching medium in the installation sites.
- ✧ Installation safety distance: The distance between the PX unit and the wall should be kept at 30~50cm

2.3 Wiring and how to install the SFC and Enclosure Cabinet details

Three phase input and Single phase output units





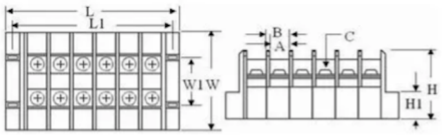
Single phase output

Three-phase input

Wiring conventions

L1 / RED / (European Brown)

L2 / YELLOW / (European Black)



TB Series Drawing

Item No.	TB-060
Specifications	
Total Length (L) [mm]	20.5 * n + 42.0
Ref. Length (L1) [mm]	20.5 * n + 26.5
Gap (A) [mm]	16.5
Pitch (B) [mm]	20.5
Width (W) [mm]	52.0
Ref. Width (W1) [mm]	30.0
Height (H) [mm]	34.0
Ref. Height (H1) [mm]	11.0
Screw (C) Steel, Zinc Plated	M6
Rated Torque [N-m]	2.5
Rated Torque [in-lb]	22.1
Poles / Positions	Any
Electrical Specifications	
Rated Voltage	600V
Rated Current	60A
Wire Size [mm^2]	16.0 mm^2
Wire Size [AWG]	AWG 6

L3 / BLUE / (European Grey)

G (Ground) Yellow/Green stripe Earth / European Yellow/Green stripe Earth

Chapter 3 Technical Parameters

Model	PX –_____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	Over load, Over current, Over heat, Short Circuit Protection (cut off the output automatically and make alarm)
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_____
Over Load	□ Standard unit:100% for continuous,101-200% shut down in 200mS □ Optional:≤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

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 that wiring to the input and output terminals is correct and if 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 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.

manual ph.A OFF AUTO	
0.000V 0.000A	Vset: 200.00 Fset: 50.00
0.000W 0.000 0.00Hz 0.000	Time: 10.0

Note: the "ph.A" notation is not present in the single-phase models and the line-to-line voltage data is not visible

prog ph.A OFF AUTO	
0.000V 0.000A	PgNo: 1 Vset: 200.00 Fset: 50.00
0.000W 0.000 0.00Hz 0.000	Trf: 0.0 Ton: 10.0

Note: the "ph.A" notation is 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

manual ph.A OFF AUTO	
0.000V 0.000A 0.000W 0.000 0.00Hz 0.000	 Vset: 230.00 Fset: 50.00 Time: 10.0

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.

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.

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

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 0.000A 0.000W 0.000 0.00Hz 0.000	 Vset: 220.00 Fset: 50.00 Time: 0.0

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 0.000A 0.000W 0.000 0.00Hz 0.000	PgNo: 1 Vset: 220.00 Fset: 50.00 Trf: 0.0 Ton: 1.0

Note: In the programmable mode, the unit can automatically run 128 group of data, cycle 99999 times.

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.

PROGRAM SETTING

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

Programmable settings
Sequence selection
Cycle number

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.

Sequence selection
*1-50.0V | 40.0Hz | 5.0S | 10.0S
2-110.0V | 50.0Hz | 1.0S | 30.0S
*3-230.0V | 60.0Hz | 0.0S | 60.0S
4-230.0V | 60.0Hz | 0.0S | 60.0S
5-230.0V | 60.0Hz | 0.0S | 60.0S
*6-230.0V | 60.0Hz | 0.0S | 60.0S
7-230.0V | 60.0Hz | 0.0S | 60.0S

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

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, 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

System Config
1-Keypad Mute
2-Comm Attr
3-Protocol Select
4-Keypad Lock
5-Bus Address
6-Initial Phase Angle
7-Current gradient

System Config
1-Voltage gradient
2-PA Correct
3-Voltage Protection
4-Current Protection
5-Power protection

5.6.1.1 Sound Mute

1.Keypad sound mute, Press "∧" or "∨" key to set mute or Non-mute

'* Disable' stand for mute,'*Enable' stand for non-mute

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
	115200,8,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

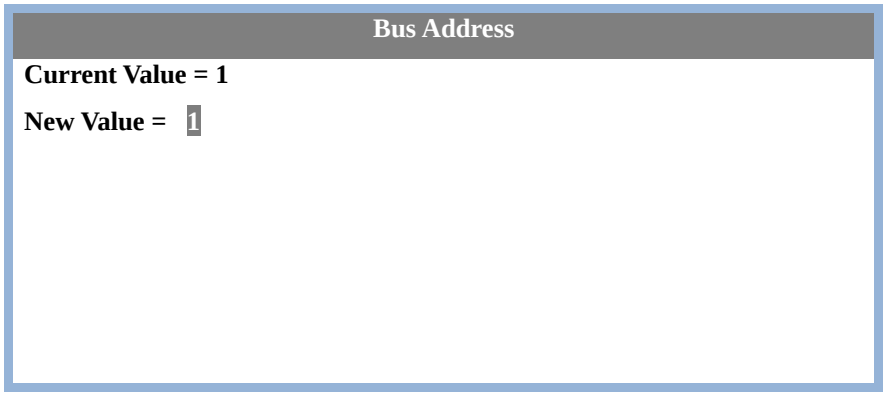
4.'*When communication' means lock the keyboard when the unit is in communication with PC/PLC

'Never': unlocked

Keypad Lock	
	When Communication
*	**Never**

5.6.1.5 Bus Address

5.Serial port address setting: maximum 247

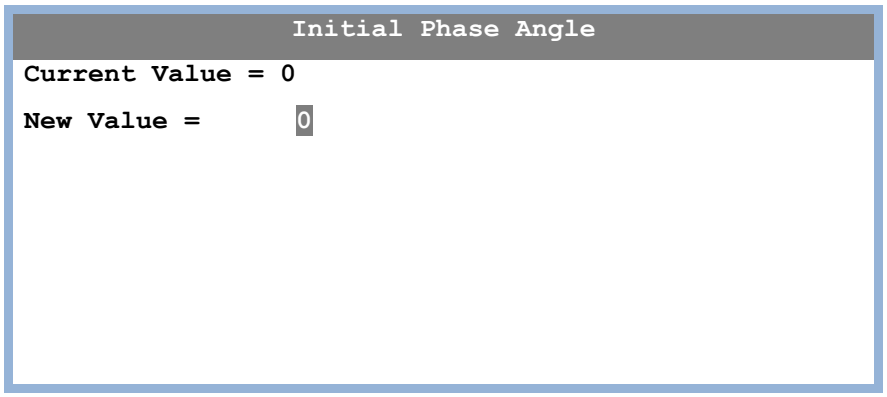


5.6.1.6 Initial phase angle

6.This unit does not have this function

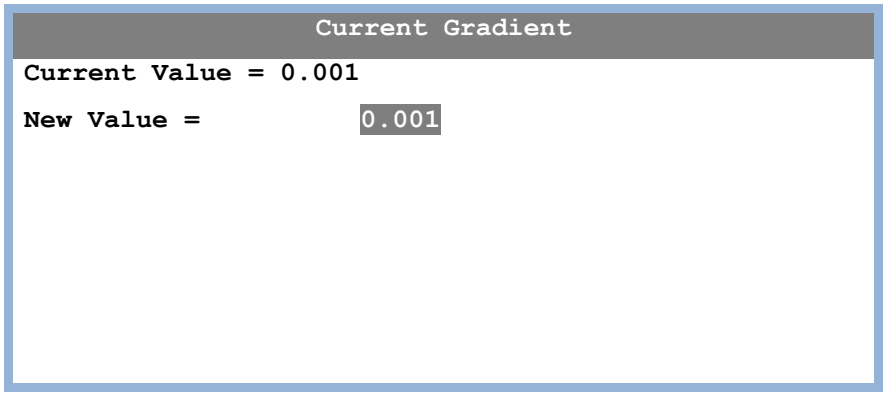
'Current value = ? ': The last set value of the unit

'New value': new set value, press Enter key to confirm the setting.



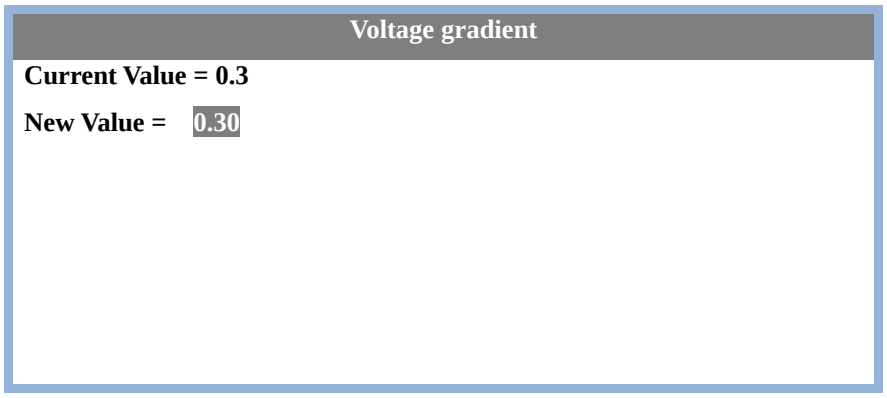
5.6.1.7 Current gradient

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.

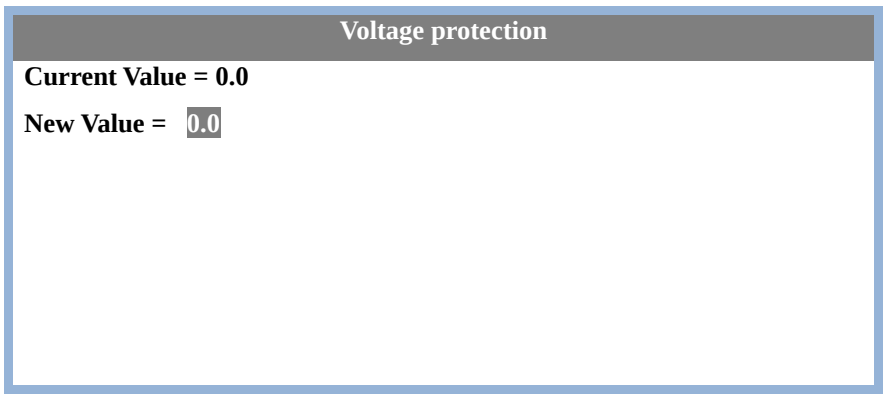


5.6.1.9 PA correct

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

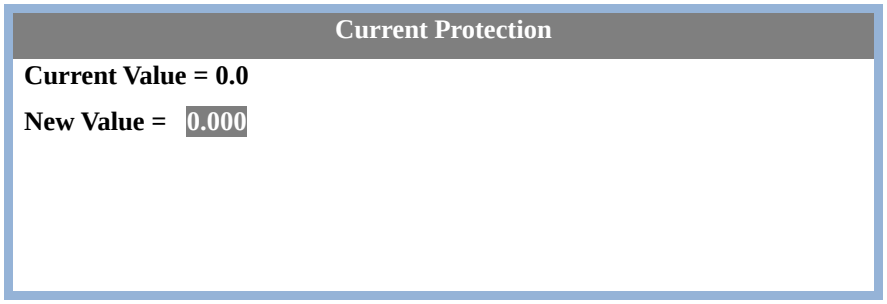
5.6.1.10 Voltage protection

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



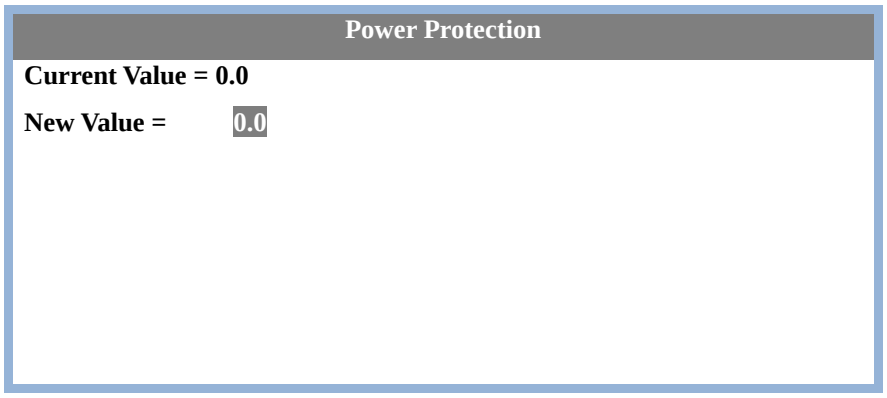
5.6.1.11 Current protection

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.

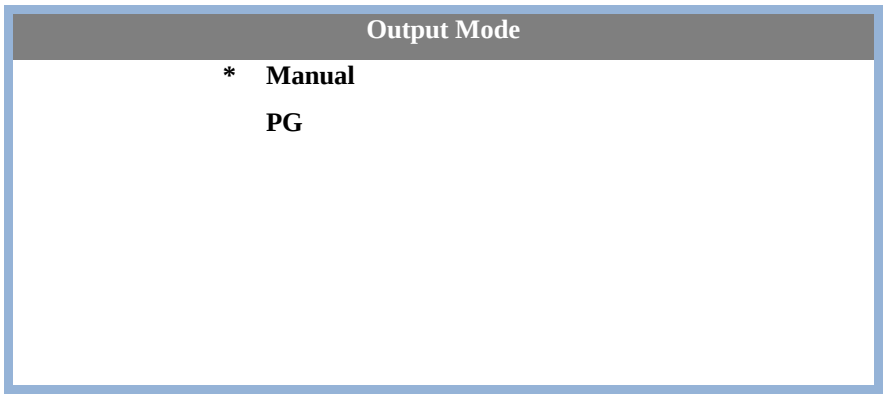


5.6.2 Output mode

In the Menu column, press the "2" key to select the output mode which is shown in the figure below

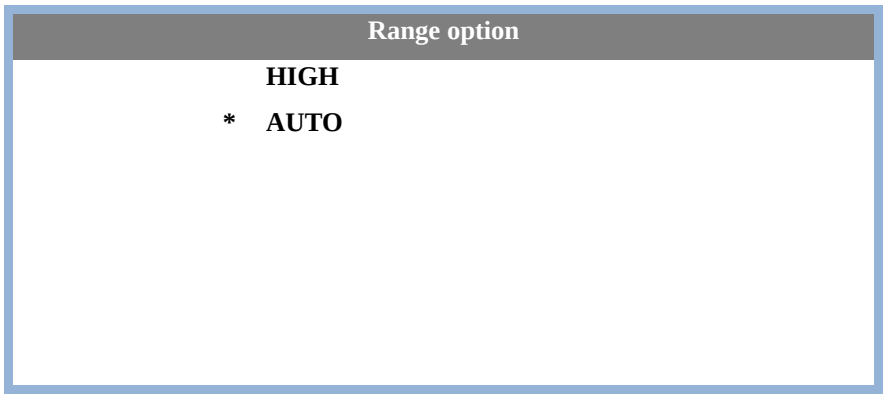
'* Manual': means normal mode

'PG': means Programmable mode



5.6.3 Range option（HIGH/AUTO Range Selection）

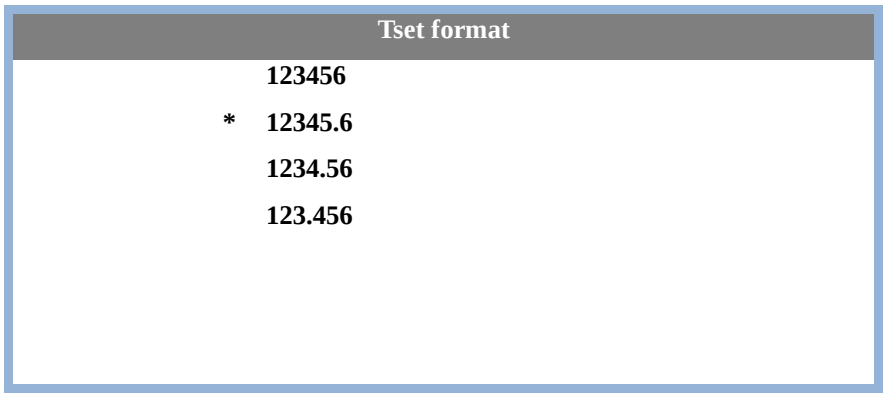
In the Menu column, press the "3" key to select the Range Option which is shown in the figure below



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.

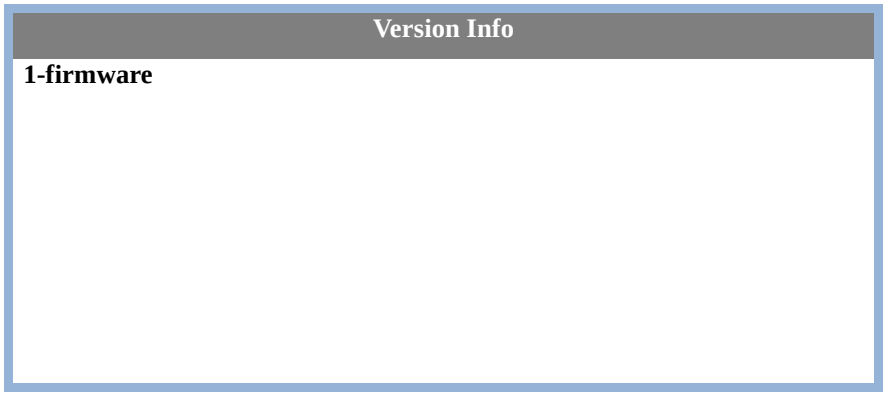
5.6.4 Test format (time value decimal point setting)

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

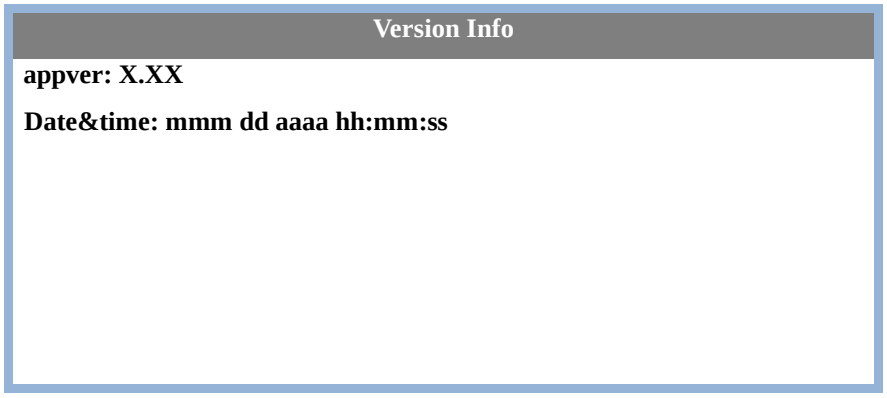


5.6.5 Version info

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



Press the 1 key for firmware information



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

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

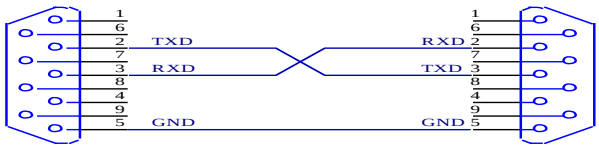
5.9 Lock Button

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

5.11 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 PX’ s 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 is 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.

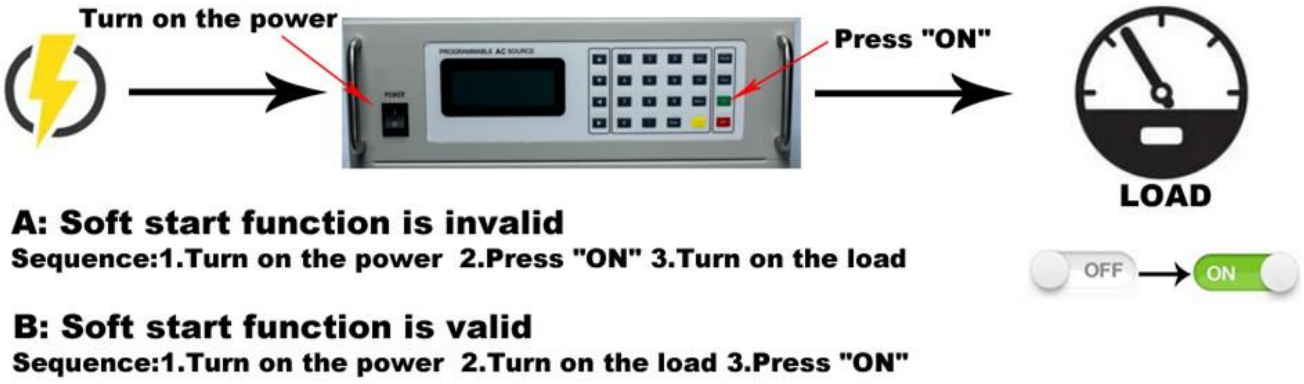
For example, the inrush current for a capacitor is equivalent to a short circuit at the moment of power-on, and the instantaneous current is theoretically infinite.

In order to solve the problem that the PX unit cannot start such a load due to its excessive inrush current, we add a soft start function to the PX units. The principle is that when the PX 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 PX Unit, press the" ON" button on front panel to turn on the output of PX unit, and then turn on the load through its switch. At this time, the PX'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 PX unit, so the PX'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 PX unit. In this way. The PX Unit 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 PX Unit. 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.

Chapter 7 Trouble Shooting and Fault Code list

7.1 What happened: No output, and the display unit (LCD screen) 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 fused.

7.2 What happened: No output, the frequency meter shows normal, the voltage meter shows "0" and there is an alarm
Why: Over load or abnormal loading b. The loads have too big starting current (inrush current) to start by the PX unit
Solution: Turn off the output, press "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 PX unit and the host computer, and measure the serial port's signal between PX unit and the host computer. The TXD to GND of PX unit and the host computer should have a voltage of -8V～-12V, If the measuring value you got is out of this range, it tells 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 PX 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, it stands for over current protection, it is software protection. When the output current reaches the over current protection point set by the software, the power supply will alarm and stop output. It gets normal after the load is reduced.

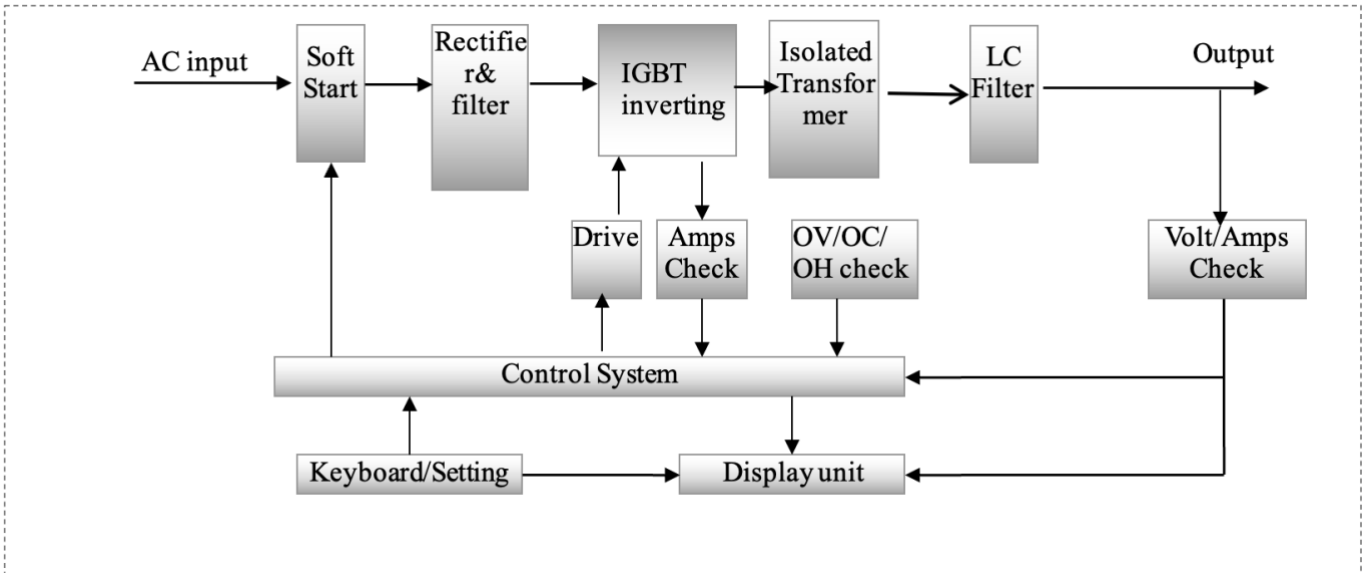
7.5.2 OVP code, it stands for over voltage protection, it is software protection. When the output voltage reaches the over voltage protection point set by the software, the power supply will alarm and stop output. It gets normal after reducing the setting voltage.

7.5.3 ALA Code, It is hardware fault code, such as IGBT module faulty, fuse blown down etc.

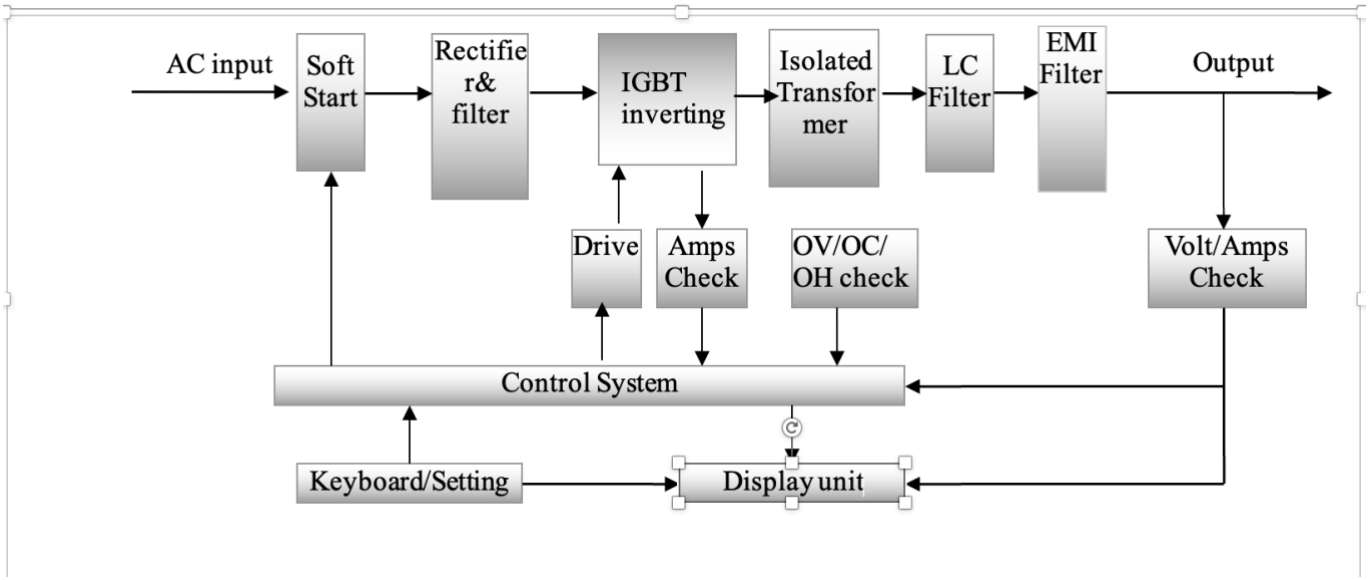
7.5.4 NA Code, please contact with us for further trouble shooting.

Chapter 8 PX Series Block Diagram

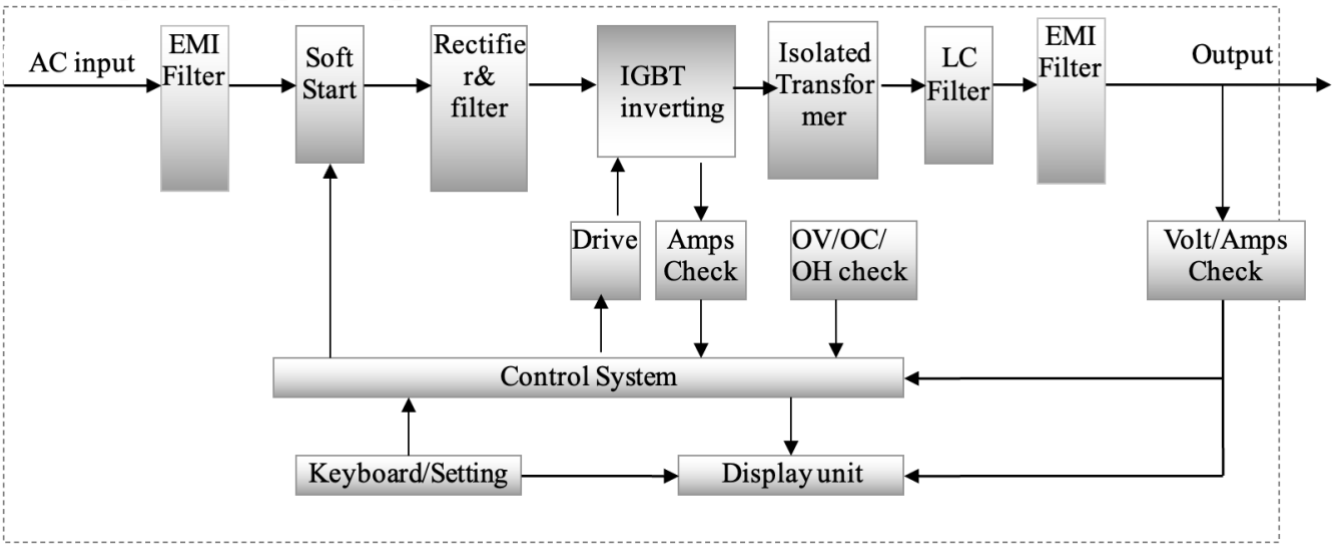
8.1 Standard Unit



8.2 Option 1 (Output end with EMI filter)



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



Chapter 9 How to choose the right size for the PX units.

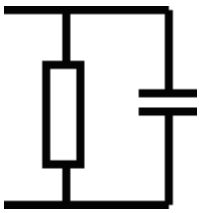
PX units can have different types of loads, including inductive, resistive, and rectifying loads. But please pay attention in choosing the appropriate capacity for the PX unit.

The load types are as following.

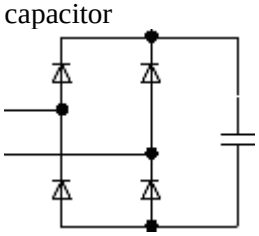
-Linear load
-Resistive load
-Power factor corrected load

-Inductive load

-Capacitive load



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



-For resistive/linear load: PX's kVA = 1.1×load power

·For Inductive load: PX's kVA = load starting current / load rated current × load power

·For rectified load: PX's kVA = load current crest factor/1.5×load power

·For mixed load: PX's kVA = The sum of power required for each load type above

Note: For inductive loads such as refrigerators and air conditioners, the PX unit's capacity should be selected according to the starting power (Starting power is generally 5-7 times of rated power).

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 (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 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

	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,
    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
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

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

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 00 E7 DA 59354/1000=59.354V	00
5	byte 2		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
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

Chapter11 PX's Product Range

- Frequency Converter / AC Power Supply
- Marine Frequency Converter/Shore AC Power Supply
- Programmable AC Power Supply
- Programmable DC Power Supply
- Uninterruptible Power Supply (UPS)
- Resistive/Electronic Load Bank
- Static Voltage Stabilizer
- Servo Voltage Stabilizer
- DC To AC Inverter
- Solar Inverter

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