



SG110CX

Grid Support

SUNGROW

1. Introduction

This document only applies to SG110CX products.

2. SG110CX Grid Support

This product meets the requirements of Germany 4105, 4110, 4120, Australia/New Zealand AS/NZS 4777.2, and China 32004-2018.

In reactive power control, it has four functions: pf (fixed power factor), Qt (fixed reactive power ratio), Q(U) (voltage and reactive power regulation), Q(P) (active and reactive power regulation).

In active power control, it has power grid dispatching function and active power response time regulation function.

3. Active & Reactive Power Control

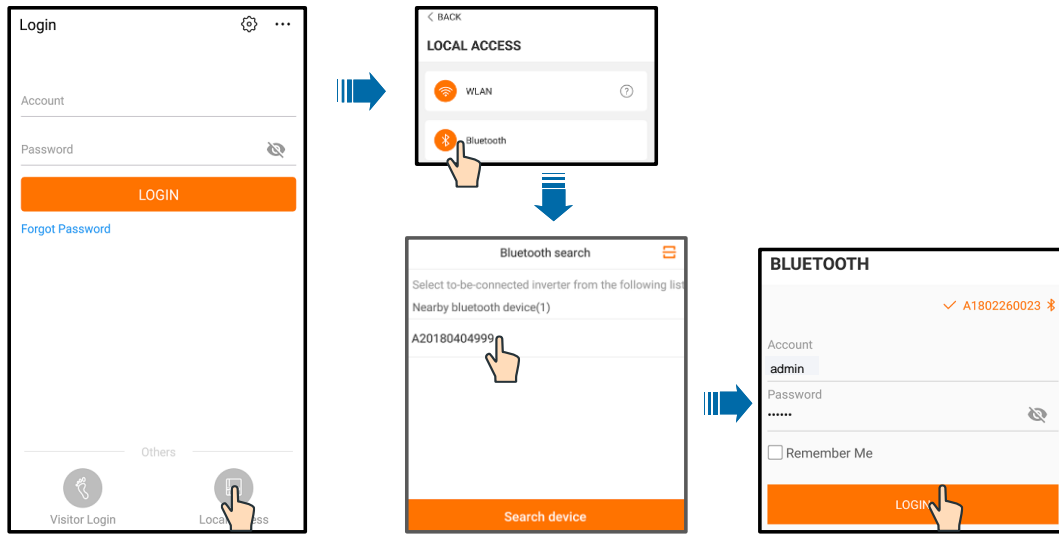
3.1. Reactive Power Control

3.1.1. PF mode

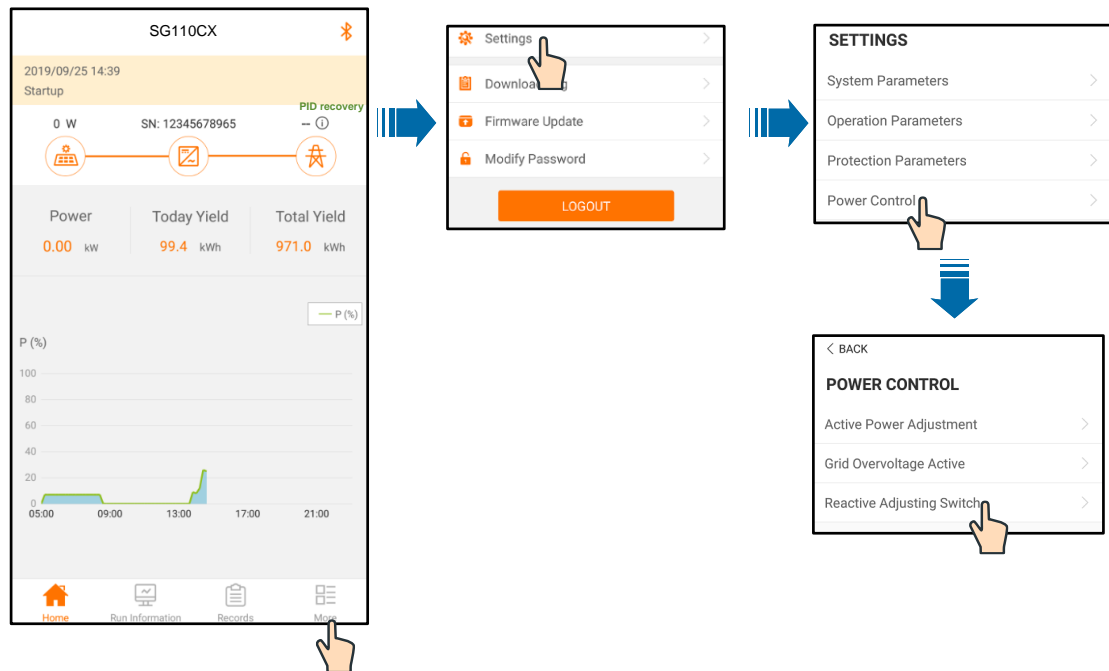
PF mode: the power factor is fixed and reactive power setpoint is calculated according to the current power.

The steps to set the PF mode via iSolarCloud APP are:

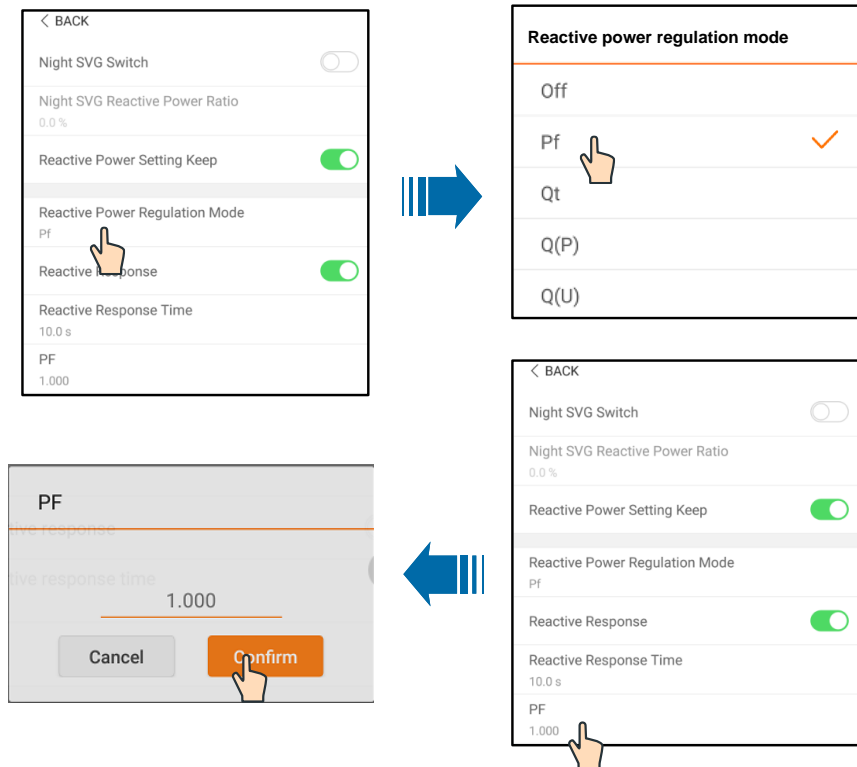
1. Access the app via Bluetooth, enter the account name "admin" and the password "pw8888" to enter the main page.



- Click "More" > "Parameter Settings" > "Power Control" > "Reactive Adjusting Switch" to enter the "Reactive Adjusting" interface.



- Enable the "Reactive Power Adjustment Mode" to "PF" and set the power factor value.



The adjustable range of the power factor Pf is -0.8~0.8, and the adjustment curve in the PF mode is shown in the figure below. The shaded area in the figure shows the P-Q capability of the inverter in PF mode

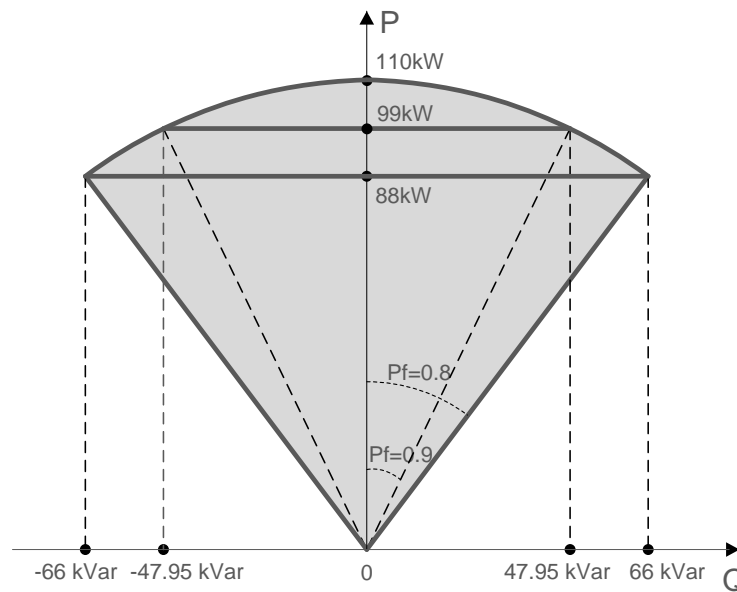


Fig.1. SG110CX P-Q diagram (Pf mode)

The rated output active power $P_n=100kW$, the max. output active power $P_{max}=110kW$, the max. output apparent power $S_{max}=110kVA$, and the output reactive power ranges from $-66kVar\sim66kVar$.

3.1.2. Q(t) mode

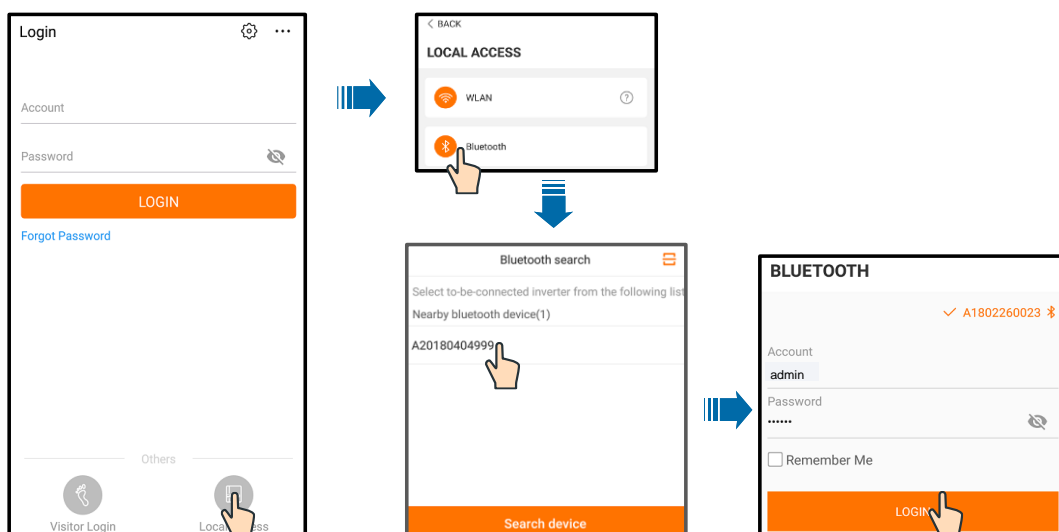
In the Q(t) mode, system rated reactive power is fixed, and the system outputs reactive power according to the delivered reactive power ratio.

For example, the rated reactive power of SG110CX is $0.6S_{max}$ (corresponding reactive power ratio is 100%) ($S_{max}=1.1P_n=110kVA$), and the "Reactive power limit" (namely Reactive power ratio value) is set through the APP. The DSP outputs reactive power according to the set value. If the parameter "Reactive power limit" is set to 40.0%, the reactive power output is $(0.6S_{max}) \times 40\% = (0.6 \times 110) \times 40\% = 26.4kVar$.

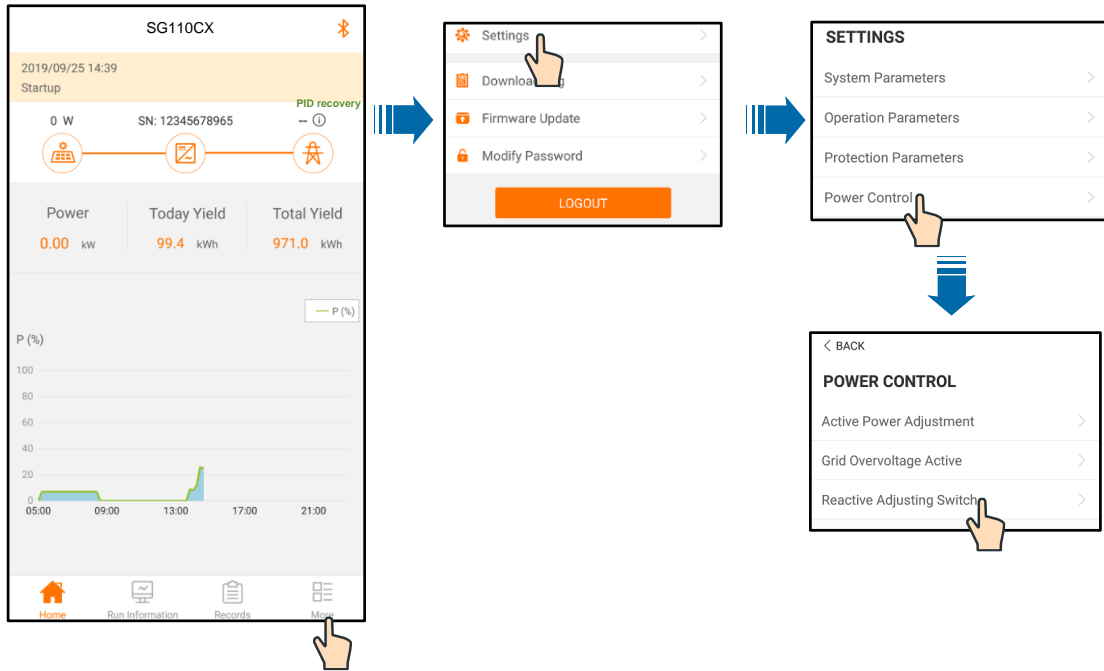
The setting range of the reactive power ratio is 0~100% or 0~-100%, corresponding to the ranges of inductive and capacitive reactive power regulation respectively.

The steps to set the Q(t) mode via iSolarCloud APP are:

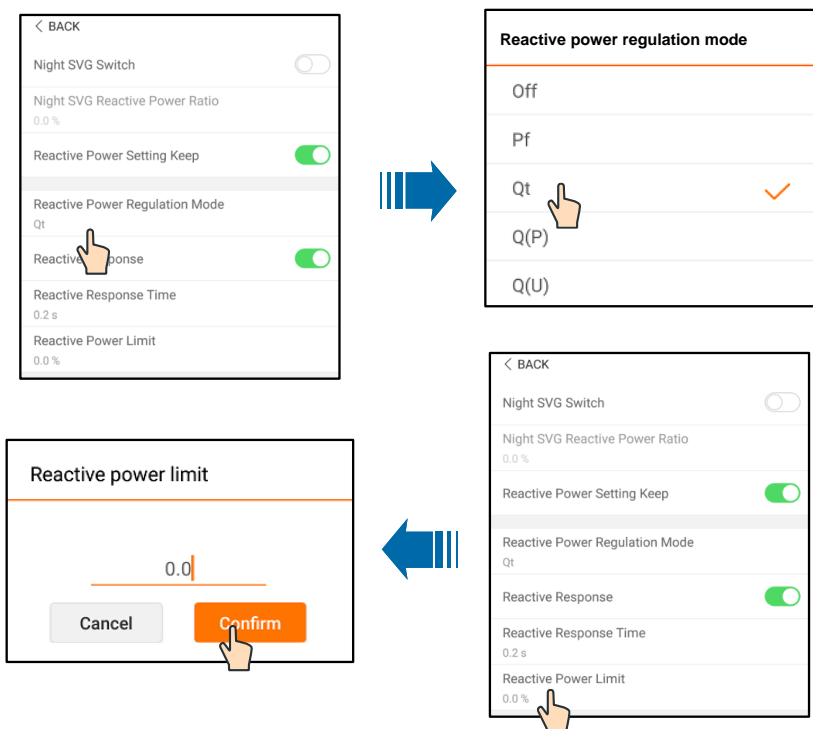
1. Access the app via Bluetooth Direct mode; enter the account name "admin" and the password "pw8888" to enter the main page.



- Click "More" > "Parameter Settings" > "Power control" > "Reactive adjusting switch" to enter the "Reactive adjusting " interface.



- Enable the "Reactive Power Adjustment Mode" to "Q(t)" and set the reactive power limit.



The setting range of the "reactive power limit" is -100.0% to 100.0%, and the setting accuracy is 0.1%. The figure below shows the adjustment curve in Q(t) mode. The shaded area in the figure shows the P-Q capability of the inverter in Q(t) mode.

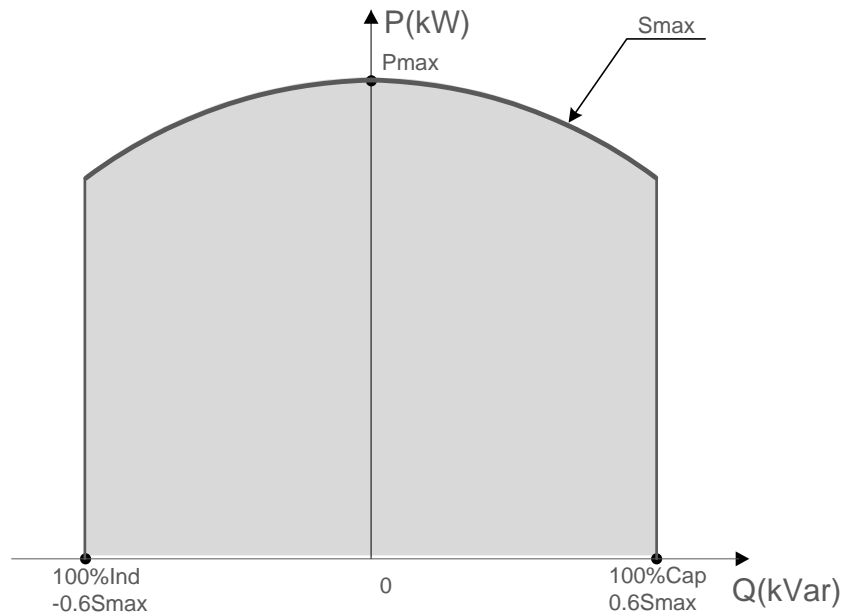


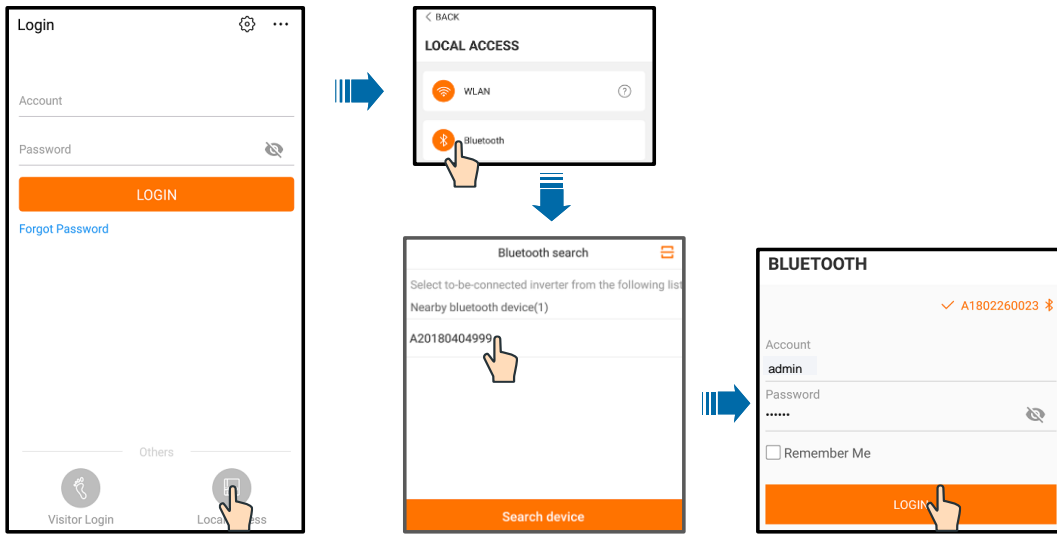
Fig.2. P-Q diagram [Q(t)mode]

Parameter	Definition	Unit	Value
Pn	Nominal output power	kW	100
Pmax	Max. output active power, equal to 1.1 times Pn	kW	110
Smax	Maximum apparent power, equal to 1.1 times Pn	kVA	110

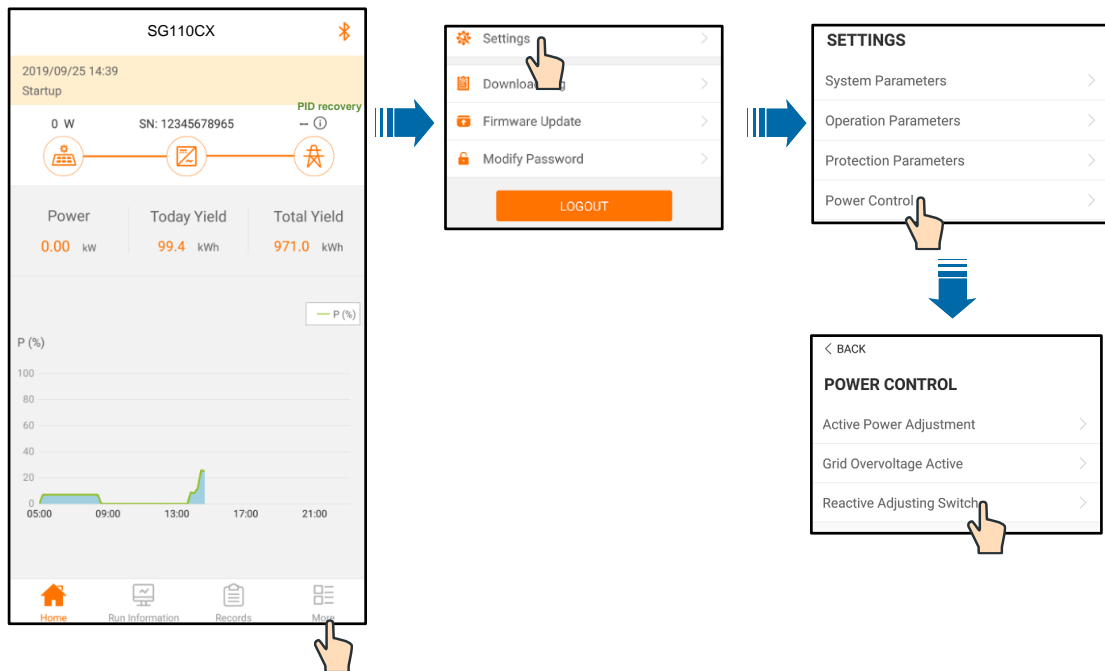
3.1.3. Q(P) Mode

The steps to set the Q(P) mode via iSolarCloud APP are:

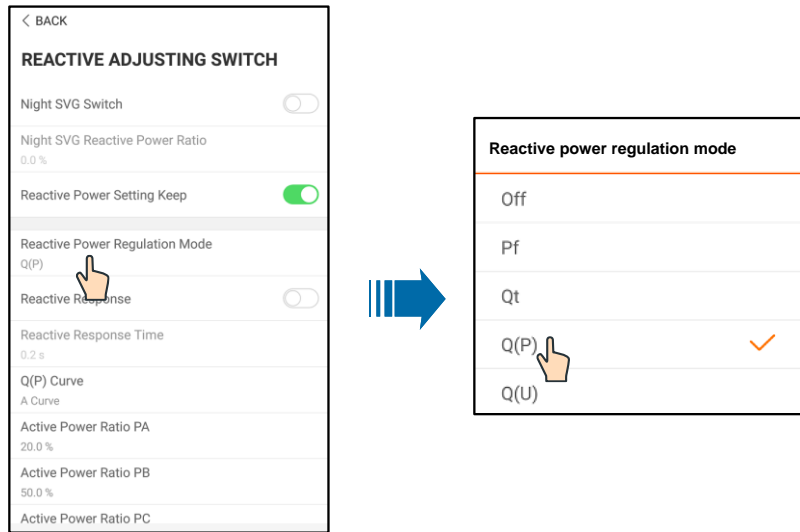
1. Access the app via Bluetooth Direct mode; enter the account name "admin" and the password "pw8888" to enter the main page.



- Click "More" > "Parameter Settings" > "Power control" > "Reactive adjusting switch" to enter the "Reactive adjusting" interface.



- Enable the "Reactive Power Adjustment Mode" to "Q(P)" and set the reactive power limit.



Tab.1. Reactive power regulation

Parameter	Definition/Setting description	Range
Reactive response*	Switch for enabling/disabling reactive response function	Enabled/Disabled
Reactive response time*	Ends time of reactive response	0.1s~600.0s
Q(P) curve	Selection of Q(P) curve	Curve A/Curve B/Curve C**
Active Power Ratio PA	Pre-set active power starting point PA based on active power	10.0%~100.0%
Active Power Ratio PB	Pre-set active power starting point PB based on active power	20.0%~100.0%
Active Power Ratio PC	Pre-set active power starting point PC based on active power	20.0%~100.0%
Reactive Power Ratio / Power Factor Corresponding to Active Power Ratio PA Point	Pre-set reactive power ratio value corresponding to the starting point PA of the active power reactive power	Curve A/ Curve C: 90.0%~100.0% Curve B: -60.0%~60.0%
Reactive Power Ratio / Power Factor Corresponding to Active Power Ratio PB Point	Pre-set reactive power ratio value corresponding to the starting point PB of the active power reactive power	Curve A/ Curve C: 90.0%~100.0% Curve B: -60.0%~60.0%
Reactive Power Ratio / Power Factor Corresponding to Active Power Ratio PC Point	Pre-set reactive power ratio value corresponding to the starting point PC of the active power reactive power	Curve A/ Curve C: 90.0%~100.0% Curve B: -60.0%~60.0%
Voltage Ratio Point for Q(P) Function Enabling	Pre-set Q (P) function to enable the voltage proportional point of the enable	100.0%~110.0%
Voltage Ratio Point for Q(P) Function Disabling	Pre-set Q (P) function to disable the voltage proportional point of the enable	90.0%~100.0%
Power Ratio Point for Q(P) Function Disabling	Pre-set Q (P) function to disable the power proportional point of the enable	1.0%~20.0%
Unconditional Enabling and Disabling of Q(P) Function	Pre-set unconditional entry and exit Q (P) function switch	Enabled/Disabled

*Parameter that can be set by professional personnel.

**Curve C is reserved and consistent with Curve A currently.

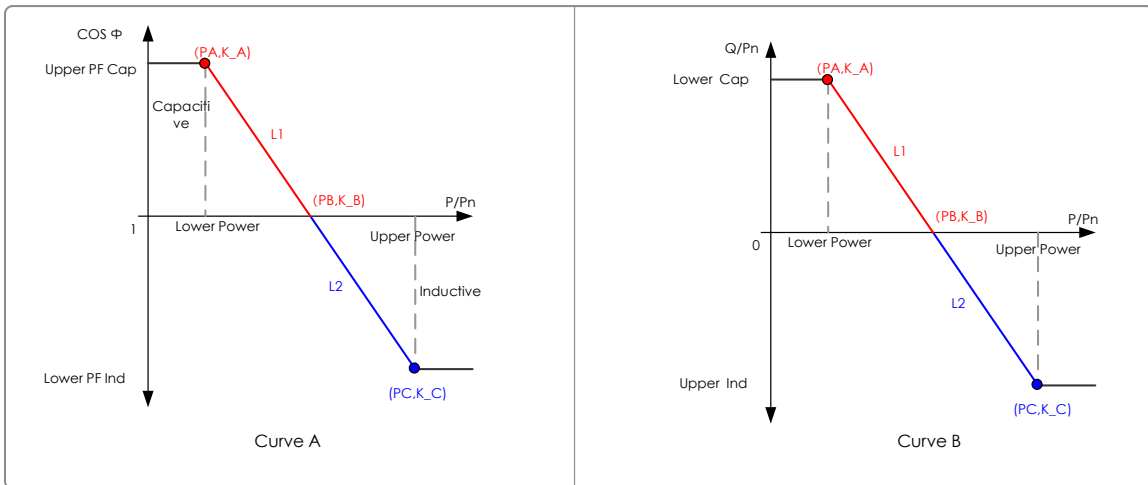
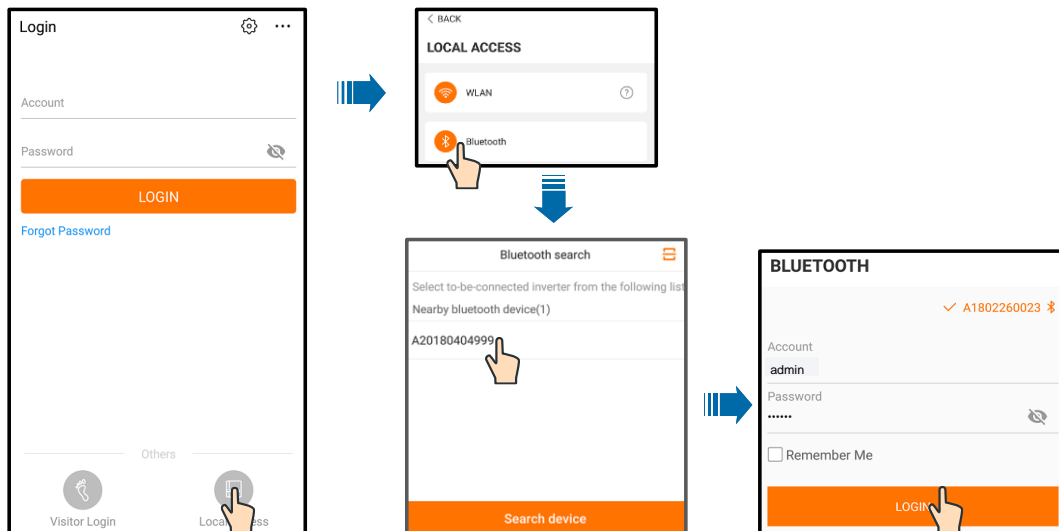


Fig.1. Q(P) curve

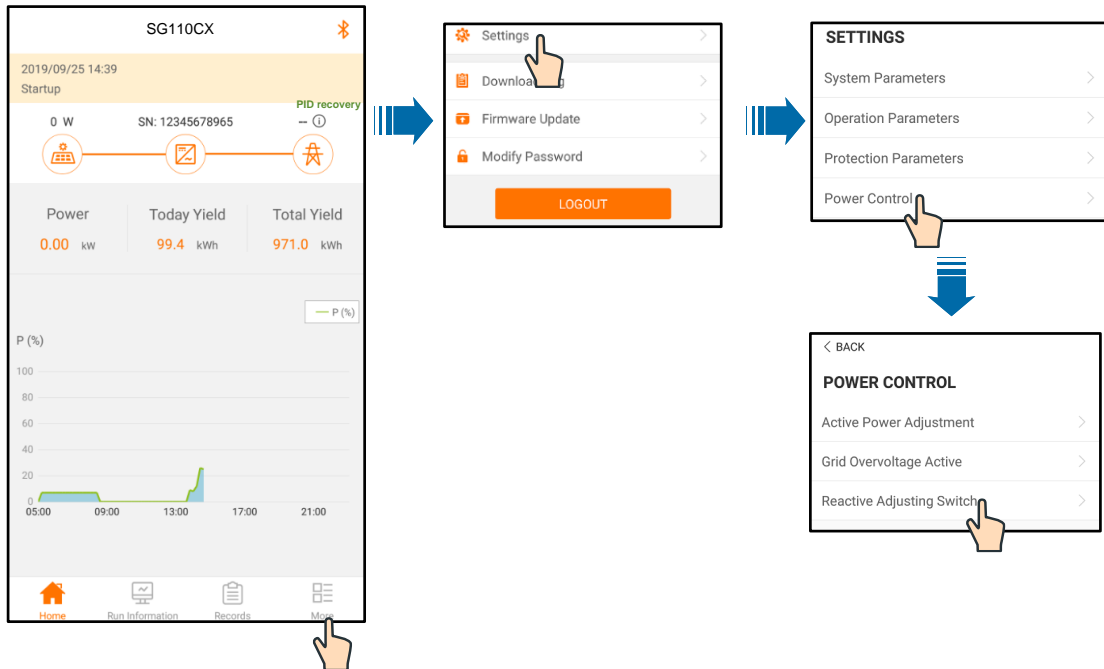
3.1.4. Q(U) Mode

The steps to set the Q(U) mode via iSolarCloud APP are:

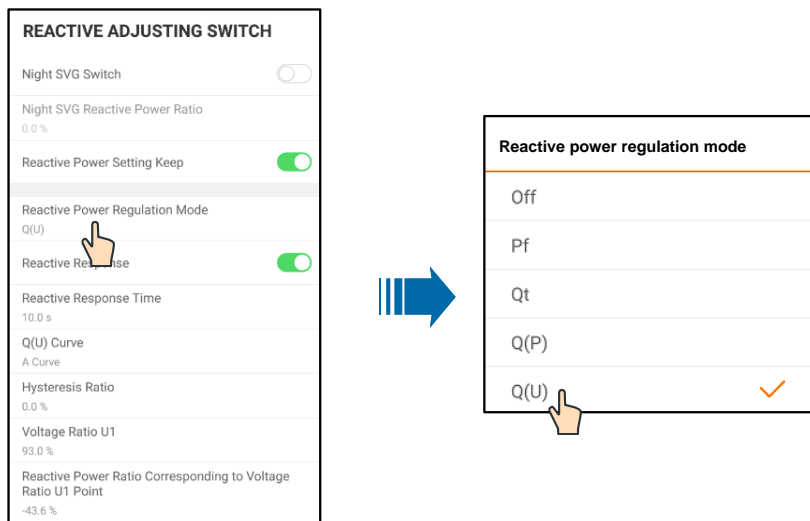
4. Access the app via Bluetooth Direct mode; enter the account name "admin" and the password "pw8888" to enter the main page.



5. Click "More" > "Parameter Settings" > "Power control" > "Reactive adjusting switch" to enter the "Reactive adjusting" interface.



6. Enable the “Reactive Power Adjustment Mode” to “Q(U)” and set the reactive power limit.



Tab.2. Reactive power regulation

Parameter	Definition/Setting description	Range
Reactive response*	Switch for enabling/disabling reactive response function	Enabled/Disabled
Reactive response time*	Ends time of reactive response	0.1s~600.0s
Q(U) curve	Selection of Q(U) curve	Curve A/Curve B/Curve C**
Hysteresis Ratio	Pre-set hysteresis ratio	0~5.0%
Voltage Ratio U1	Pre-set grid voltage U1 that is reactive according to the grid voltage	80.0%~100.0%

Parameter	Definition/Setting description	Range
Reactive Power Ratio Corresponding to Voltage Ratio U1 Point	Pre-set proportion of reactive power according to the grid voltage U1	-60.0%~0
Voltage Ratio U2	Pre-set grid voltage U2 that is reactive according to the grid voltage	80.0%~100.0%
Reactive Power Ratio Corresponding to Voltage Ratio U2 Point	Pre-set proportion of reactive power according to the grid voltage U2	-60.0%~60.0%
Voltage Ratio U3	Pre-set grid voltage U3 that is reactive according to the grid voltage	100.0%~120.0%
Reactive Power Ratio Corresponding to Voltage Ratio U3 Point	Pre-set proportion of reactive power according to the grid voltage U3	-60.0%~60.0%
Voltage Ratio U4	Pre-set grid voltage U4 that is reactive according to the grid voltage	100.0%~120.0%
Reactive Power Ratio Corresponding to Voltage Ratio U4 Point	Pre-set proportion of reactive power according to the grid voltage U4	0%~60.0%
Power Ratio Point for Q(U) Function Enabling	Pre-set active power point enabled by the Q (U) function	20.0%~100.0%
Power Ratio Point for Q(U) Function Disabling	Pre-set active power point disabled by the Q (U) function	1.0%~20.0%
Unconditional Enabling and Disabling of Q(U)Function	Pre-set unconditional entry and exit Q (U) function	Enable / Disable / Limit PF Value
Q(U) Reactive PF Value	Pre-set PF value of the Q (U) function enabled	0~0.95

*Parameter that can be set by professional personnel.

**Curve C is reserved and consistent with Curve A currently.

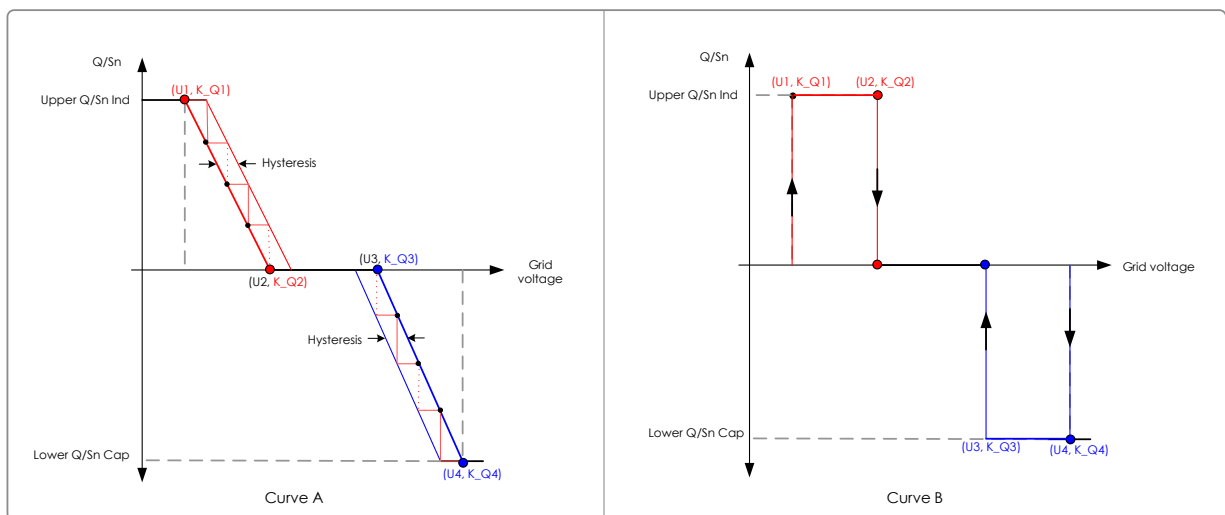


Fig.2. Q(U) curve

3.2. Active Power Control

3.2.1. Frequency Derating Function

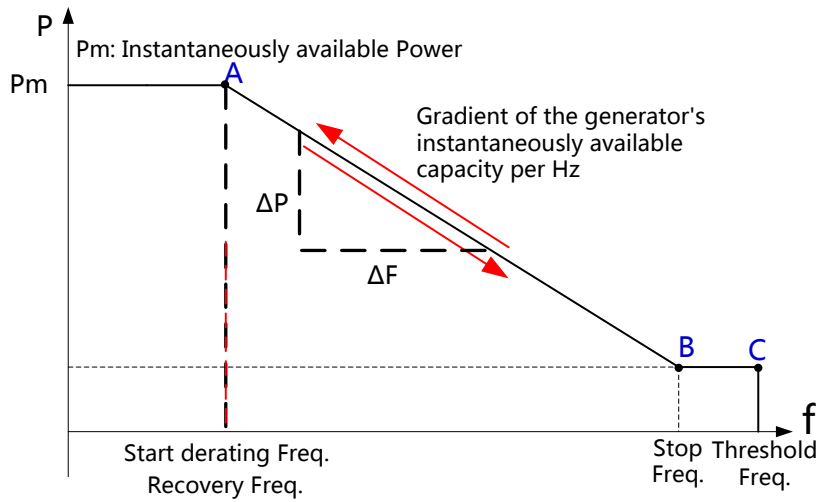
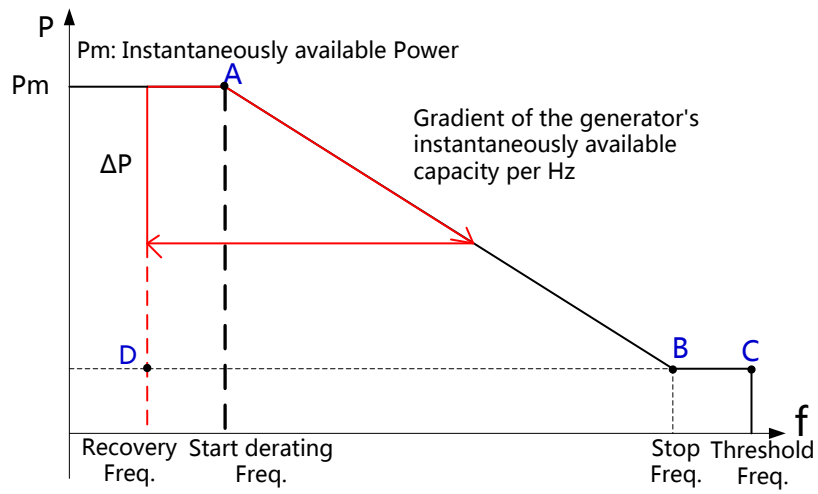


Fig.3. Frequency Derating Curve

3.2.2. LVRT

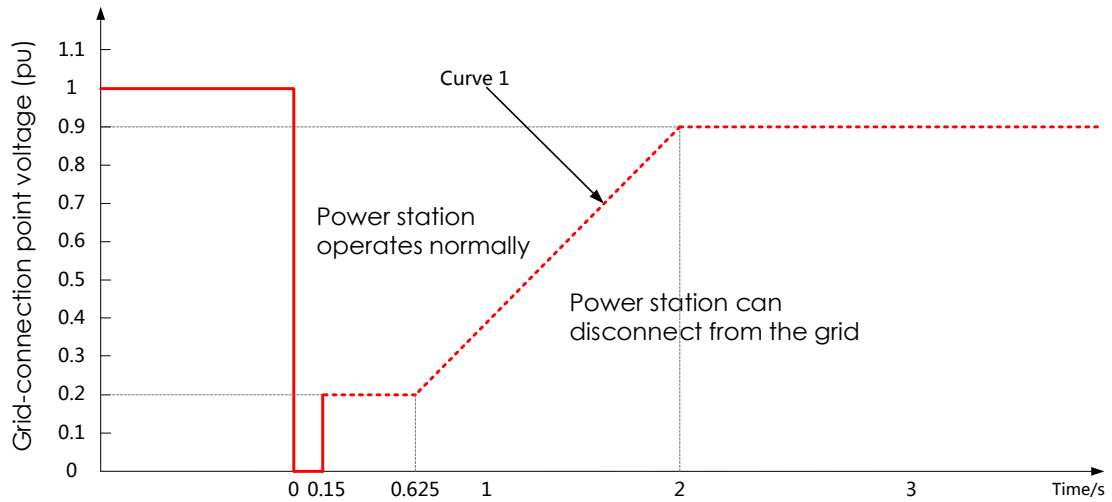
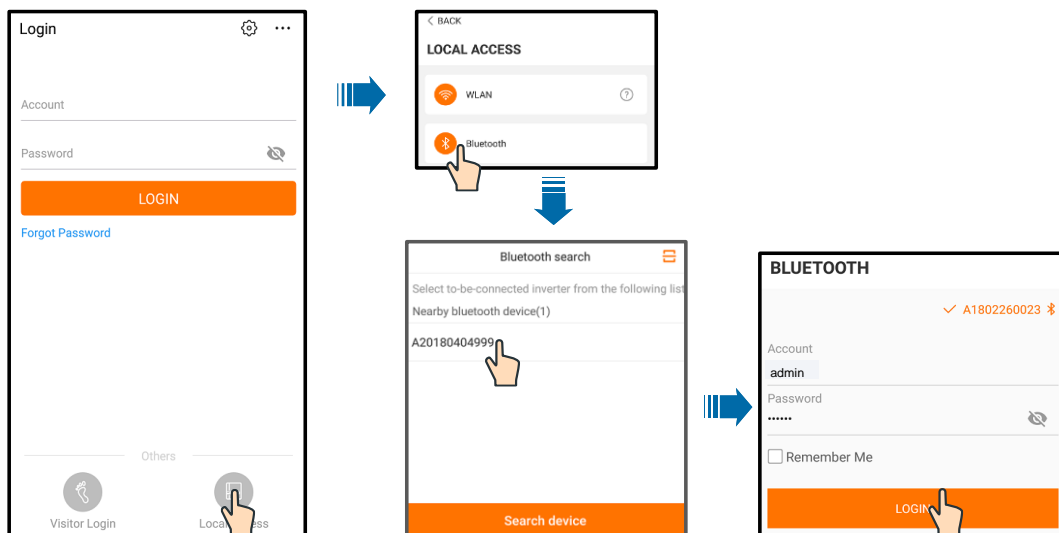


Fig.4. LVRT Curve

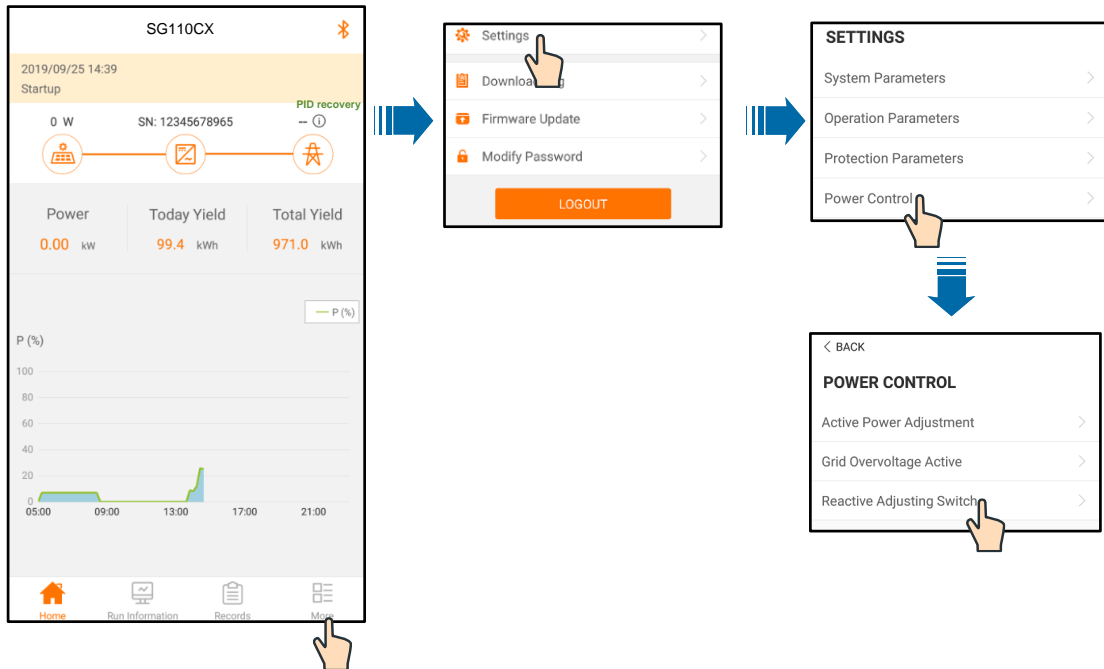
4. Grid Overvoltage Active

The steps to enter this function menu are:

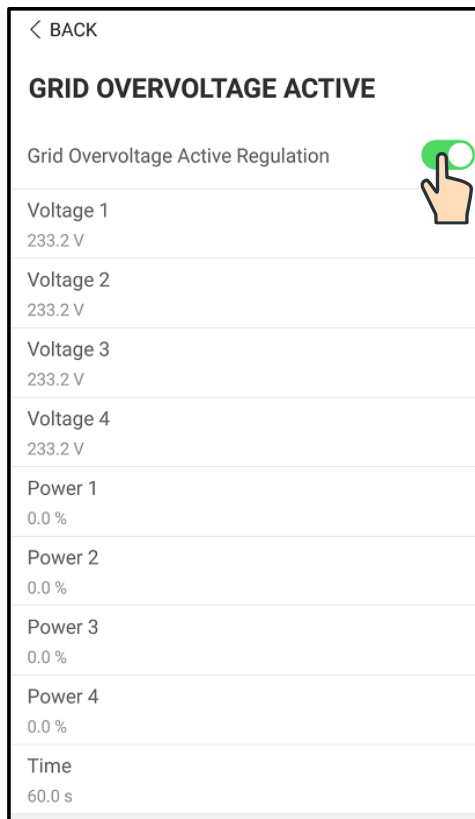
1. Access the app via Bluetooth Direct mode; enter the account name "admin" and the password "pw8888" to enter the main page.



2. Click "More" > "Parameter Settings" > "Power control" > "Grid Overvoltage Active" to enter the "Grid Overvoltage Active" interface.



3. Enable the “Grid Overvoltage Active Regulation” function and set related parameters.



Tab.3. Grid Overvoltage Active Regulation

Parameter	Definition/Setting description	Range(Vn=230V)
Voltage1	Starting point voltage of grid overvoltage active derating	0.8Vn~1.4Vn
Voltage2	2nd point voltage of grid overvoltage active derating	0.8Vn~1.4Vn
Voltage3	3rd point voltage of grid overvoltage active derating	0.8Vn~1.4Vn
Voltage4	4th point voltage of grid overvoltage active derating	0.8Vn~1.4Vn
Power1	Active power value corresponding to the Starting point voltage of grid overvoltage active derating	0~100.0%
Power2	Active power value corresponding to the 2nd point voltage of grid overvoltage active derating	0~100.0%
Power3	Active power value corresponding to the 3rd point voltage of grid overvoltage active derating	0~100.0%
Power4	Active power value corresponding to the 4th point voltage of grid overvoltage active derating	0~100.0%
Time	The time required to reach the target value	0.1s~600.0s

When setting the above parameters, you need to ensure:

$$\text{Voltage1} \leq \text{Voltage2} \leq \text{Voltage3} \leq \text{Voltage4}$$

$$\text{Power1} \geq \text{Power2} \geq \text{Power3} \geq \text{Power4}$$

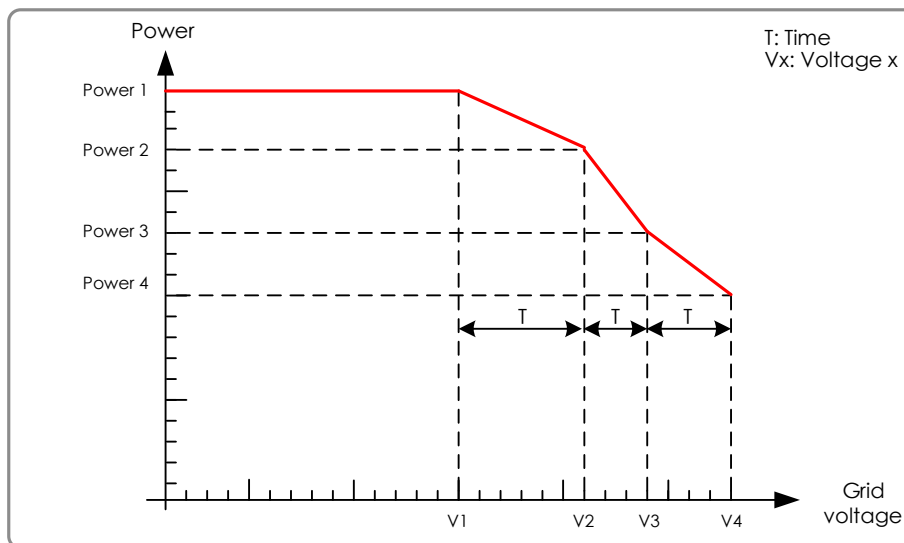


Fig.5. Grid Overvoltage curve