

POWER MANAGEMENT : Setting and Configuration guide

CENTRAL INVERTER



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INTRODUCTION

This manual contains instructions for setting the parameters for the management of active and reactive power. Changing the default settings will be specifically requested in the Regulation of Electricity Distributor. It is recommended, unless specifically requested, do not activate the functions of management of reactive power in order to not unnecessarily reduce the inverter efficiency.

FIRMWARE VERSION-SOFTWARE

This manual has been prepared on the basis of the system drive with firmware revision 02:02 (19r04) and Touch Screen software ver. 1.2.3. For earlier versions, not all settings may be available. Contact Technical Support AROS Solar Technology for possible upgrade.

CONVENTION FOR THE POWER FACTOR

In this document, the convention used for the reactive power and the sign of the power factor is as follows:

- Sign + → generation of inductive reactive power (over-excited operation). The inverter behaves as a "capacitor".
- Sign - → absorption of inductive reactive power (under-excited). The inverter behaves as an "inducer"

CAPABILITY



SIRIO AROS Solar Technology inverters have a capability of type semicircular.



ACCESS TO SETUP MENU

The settings of the active / reactive power is done on the inverter panel through a series of menus which can be accessed with an appropriate code. This guide refers to inverter with alphanumeric 40x2 display.

For inverter with touch screen display it is necessary to enter in terminal mode. From the main

menu of display press the button  and then press . In this way it is possible to interact with a virtual keypad with 8 keys.

Enter the following commands

press

NORMAL OPERATION
S100, OUT= 87 %W, (87.2kW), 5=OFF

(3)

press

2= AC limits view 4= Display contrast
5= Customize/Cod. 7= OFF command

(5)

press

Cod. ?

(436215 7)

2=Reactive (var), 3=Active(W)
6=MPPT-MODE, 7= Ident.

In this menu you can access to different function by pressing the associated number. In particular:

- 2 Management of reactive power production
- 3 Managing the active power limitation
- 6 Setting a fixed voltage MPPT mode (MPPT OFF)
- 7 Identifier SYSTEM SLOT for communications

REACTIVE POWER MANAGEMENT

By pressing the key 2, the following menu appears where you can select the reactive power mode production. Only one of these modes can be active. The activation of one of them disable the other.

2=FIX_PF, 3=FIX_Q, 4=PF(P), 5=Q(V), 6=CAP
1< (OFF), (OFF), (OFF), (OFF), (CIR)

KEY 2: FIXED POWER FACTOR MODE

FIX_PF= OFF, (CAP/OVEREXC=+), PF=+0. 0
1<, 3=OFF, 4=ON; 5=-, 6=+, 7-/8+

The keys 3 and 4 respectively deactivate and activate the mode.
The inverter produces reactive power by a factor of constant power adjustable in the range 0.1-1 (capacitive and inductive). The 5 and 6 buttons allow the selection of the sign while the keys 7/8 regulating the value of the power factor.

The 1 key is used to return to the previous menu.

KEY 3: CONSTANT REACTIVE POWER MODE

FIX_Q=OFF, (CAP/OVEREXC=+), Q= + 0 VAR
1<, 3=OFF, 4=ON; 7-/8+

The keys 3 and 4 respectively deactivate and activate the mode.
The inverter produces constant reactive power adjustable with buttons 7/8 in the range -100% / 100% of the rated power of the inverter (capacitive and inductive).

The 1 key is used to return to the previous menu.

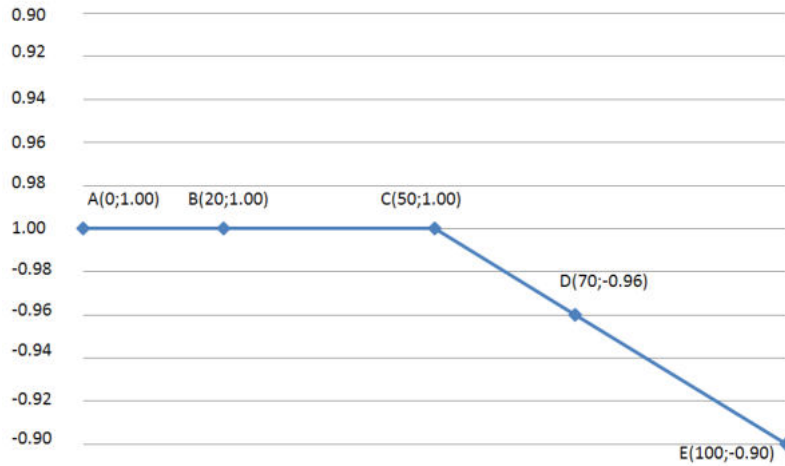
KEY 4: MODE POWER FACTOR FUNCTION OF THE ACTIVE POWER (NOT ACTIVE BY DEFAULT).

PF_P=OFF: V_lock_in=105%,V_lock_out=100%
1<,2>, 3=OFF,4=ON, 5-/6+, 7-/8+

- Buttons 3 and respectively deactivate and activate the mode.
- The 5/6 buttons regulate the lock_in voltage at which the function is activated
- The 7/8 button to adjust the LOCK_OUT voltage at which the function is deactivated

The characteristic curve is always defined by 5 points A, B, C, D, E, each point is characterized by a pair of values (the active power output percentage P / P_n , power factor) . If the curve has to be set with less than 5 points you still need to enter all the points that need to have x-coordinate (the percentage power) different.

The standard curve for is as follow:



The 2 key provides access to the set of the first point of the characteristic curve (A)

PF.A: W= 0%, PF=+1.00, (CAP/OVEREXC=+)
 1<,2>, 3-/4+, 5-/6+, 7-/8+

The 3/4 keys change the percentage power of point A, the 5/6 define the value of the power factor and the 7/8 button define the sign.

Key 2 allows to pass to the set of the next point (B) in a manner similar to what was seen for the point A.

PF.B: W= 20%, PF=+1.00, (CAP/OVEREXC=+)
 1<,2>, 3-/4+, 5-/6+, 7-/8+

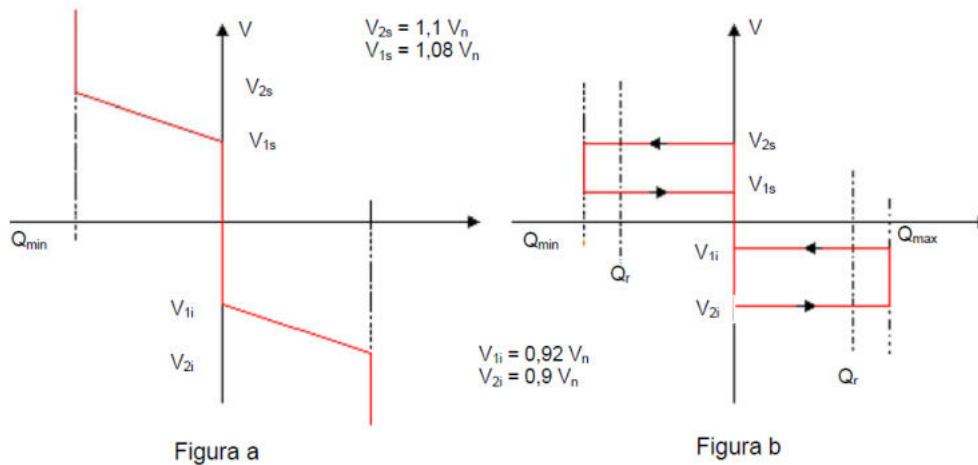
To pass the following points (C, D, E), press the 2 key in sequence. In the menu on the point E, pressing the 2 button takes you to the home menu from which you can exit by pressing 1.

To return to the "basic" press the 1 key.

KEY 5: REACTIVE POWER MODE FUNCTION OF THE SUPPLY VOLTAGE

Q(V)=OFF: P_lock_in= 20%,P_lock_out= 5%
 1<,2>, 3=OFF,4=ON, 5-/6+, 7-/8+

- Buttons 3 and 4 respectively deactivate and activate the mode.
- The 5/6 buttons adjust the active power lock_in value at which the function is activated
- The 7/8 button to adjust the active power lock-out value at which the function is deactivated



The 2 key allows you to access the points of the characteristic curve defined in the graph. The first two points that are adjusted are V_{1i} , and V_{2i} expressed as a percentage of the nominal voltage of the inverter.

Q(V) (1i): $V_{1i} = 92\%$, $V_{2i} = 90\%$
 1<, 2>, 5-/6+, 7-/8+

Pressing 2 will proceed to the next points: V_{1s} and V_{2s} .

Q(V) (1s): $V_{1s} = 108\%$, $V_{2s} = 110\%$
 1<, 2>, 5-/6+, 7-/8+

Pressing the key 2 it is possible to select the characteristic a or b of the figure (5/6 buttons). The keys 7/8 set the power factor used by curve b. If the curve is set to a the PF is not used.

Q(V) (A/B): Type = A, PF = +0.95
 1<, 2>, 5-/6+, 7-/8+

the 2 key return to the first menu, from which you can quit using the key 1.

KEY 6: REACTIVE POWER CAPABILITY AND NIGHT (NIGHT Q)

NIGHT Q=OFF, Capability = Standard
 1<, 3=ON, 4=OFF, 7=Circular, 8=Standard

Through the 6 button select the desired capability for the inverter. The selection is made between "Standard" (rectangular capability, power factor is limited to 0.9) or Circular (Circular capability that allows you to get up to 100% * S_n reactive power).

In the same menu you can also set the mode "Night Q" (only for inverters with input DC switch motorized). Enabling this mode, the inverter still remain connected to the network producing the reactive power demand even when the sunlight is insufficient. If the inverter disconnects from the grid for internal or external causes and the solar irradiation is low, inverter will not be able to connect to the network again unless it is equipped with the optional PRE-CHARGING KIT.

FUNCTION Q (P): REACTIVE POWER FUNCTION OF ACTIVE POWER (ONLY FOR INVERTERS WITH TOUCH DISPLAY).

Inverters with touch panel is available function Q (P) used to compensate for the consumption of reactive power components placed between the delivery point and the inverter (cables, overhead lines and transformers).

The function Q (P) requires two parameters:

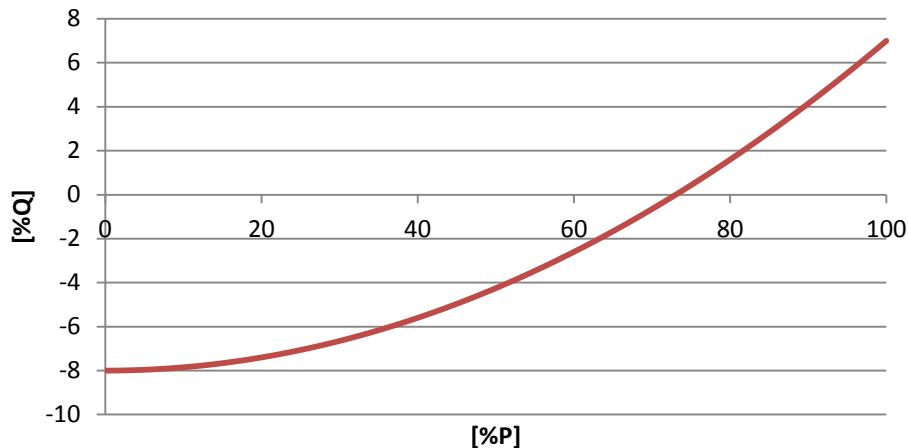
Q =% reactive power with zero active power

Q100% = reactive power with 100% active power

The two parameters can be set in the range [-50, 50]% S_n

Between the two points the trend is parabolic. In the example below $Q_0 = -8\%$, $Q_{100\%} = 7\%$. The inverter has an inductive behavior (compensation MV line in cable load) while at full power becomes capacitive (compensation transformer and line inductors).

Funzione Q(P)

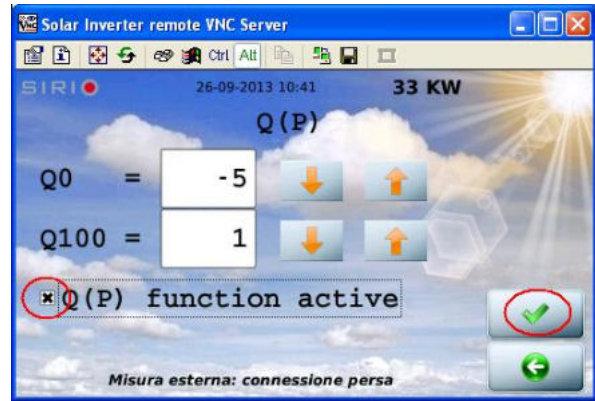
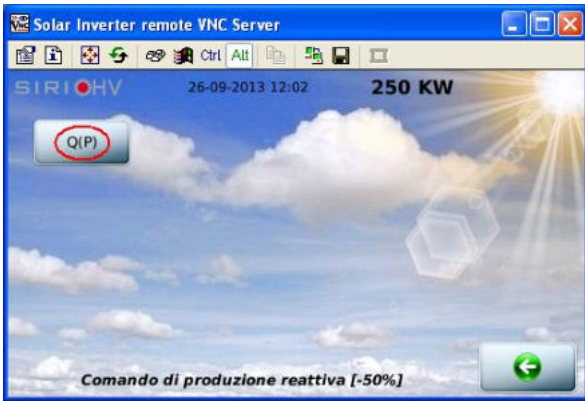


The function Q (V) is alternative and with major priority to MODBUS reactive commands and operation at constant power factor. Any Modbus commands of reactive power generation and / or constant power factor will then be rejected with error code (see the documentation for the MODBUS protocol for details).

Press the "wrench" and enter the password "696c64". Press the "lock"



Enter in the Q(P) function menu of set the parameters Q0 and Q100 (in percent of Sn inverter) for reactive power compensation. Activate the function and confirm with "tick".



Exit with the arrow pointing to the left.

In the lower part of the screen should display the message "Command production reactive" with percentage function of the parameters and output percentage of inverter.

ACTIVE POWER MANAGEMENT

From the "General" menu described above (access via 3 5 436215 3 7):

2=Reactive (VAR), 3=Active(W)
5=RS232, 6=MPPT-MODE, 7= Ident.

By pressing the key 3, the following menu appears. You can select the active power management option. The two modes can be active simultaneously.

2 = P(f), 3 = P(V)
1< (ON), (OFF)

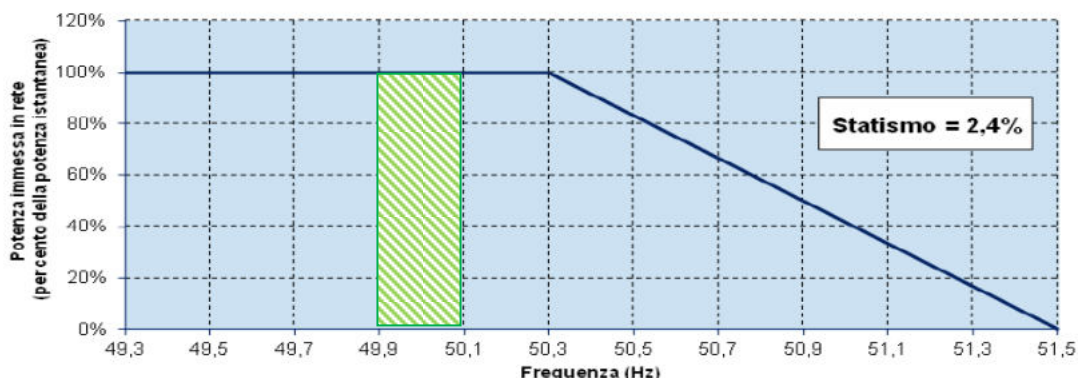
The key 2 provides access to the setup menu "Limitation of power as a function of the grid frequency" while the button 3 provide access to "active power limitation for high ac voltage on the network"

KEY 2: MAXIMUM POWER FUNCTION OF FREQUENCY).

P(f)=ON : fstart= 50.3Hz, STAT%= 2.4%
1<, 2>, 3=OFF, 4=ON, 5- /6+, 7- /8+

- Buttons 3/4 respectively deactivate and activate the mode.
- The 5/6 buttons adjust the start frequency reduction (default 50.3Hz)
- The 7/8 adjust the statism (default 2.4%)
- The button 2 allows you to adjust the time within the frequency must remain in the band 49.9-50.1 before allow power increasing above the pre-fault value.

Wait Time after over freq.: T = 300sec.
1<- , 7-8+



When the grid frequency is above the fstart value , maximum active power output is reduced according to a parameter called " statismo ." The default value of 2.4 % brings the power to zero at

a frequency of 51.5Hz . For example, if the mains frequency reach the value 50.95Hz, then the maximum power is reduced to 45% of the power fed in the instant in which the frequency has exceeded 50.3Hz (Pm) .

Active power can only increase above the value stored Pm if the frequency remains in the range 49.9 - 50.1Hz for at least the time set. After this waiting time the power is increased with a maximum gradient 20% Sn/min.

The 1 key is used to return to the previous menu .

KEY 3: MAXIMUM ACTIVE POWER FUNCTION OF THE

P(V)=OFF:	Vstart=110%,	Vstop=109%
1<, 3=OFF, 4=ON,	5-/6+,	7-/8+

- Buttons 3 and 4 respectively deactivate and activate the mode.
- The 5/6 buttons set the voltage at which it begins to reduce the active power output
- keys 7/8 to modify the voltage below which increases the maximum power limit.
- The 1 key is used to return to the previous menu.

When this mode is enabled and the voltage exceeds the value Vstart, every 5 seconds, the maximum output power is decreased by 1% of the rated power of the inverter. The display show a message in the status bar.

When the mains voltage is below the threshold Vstop, every 5 seconds the maximum threshold power is increased by 1% to the maximum.



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