User manual of super-intelligent wind and solar hybrid controller

Suitable for1000W 48V Wind turbines

Product model：MAX-T4-WS-10-NNHN-1

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1 . Comprehensive introduction of products

1-1 Basic information

Super-intelligent wind/solar hybrid controller is a new type of special high performance control device for new energy application which is designed on the basis of controller. It contains many years of application experience (such as waterproof, dustproof, salt spray, wiring error, wind resistance limit control of Wind turbines, energy management etc.), it has done to ultimate no matter it applied to the charging control or street light control. In order to meet variety of applications, the controller adopts a hierarchical and modular structure, all functions can be achieved with different functional plates according to actual application, and it is convenient for rapid customization and application.

1-2 Characteristics

❖ **Waterproof**

Three defenses for circuit board, hierarchical design, even if small amount water enters, it will not damage the device

❖ **RS232 communication**

Standard configuration RS232 communication, it is easy to do the monitoring with the computer software. (RS485, short-range wireless is optional). Using a USB to RS232 members, more convenient to exchange data with a computer (computer with USB interface can be used).

❖ **Safety wire connecting**

Terminalsare treated with injection molding process, wiring short circuit and cross will not occur, more safety for customers' operating.

❖ **Automatically alarming of battery reverse**

Battery input terminal will not be damaged with continuous reverse, and it has buzzer alarm. Avoid equipment damage and fire caused by wiring errors, and better protect the battery.

❖ **Automatically alarming of Photovoltaic panels reverse**

Photovoltaic panels will not be damaged with continuous reverse, and it has buzzer alarm. It will not cause wiring errors especially when work at night. (Note: reverse connection detection in the night needs manually keys intervention)

❖ **Continuous short-circuit output protection**

Discharge output terminal has continuous short-circuit protection, and over current protection. It is recovered after the abnormal excluded. Avoid damage of the controller or fire caused by electrical equipment fault (especially the short circuit).

❖ **Patented Wind turbines steady speed generation control technology**

Patented Wind turbines steady speed generation control method, which makes the Wind turbines not run with super speed, the Wind turbines can keep generation with a limited set speed even in the high winds, avoid direct stop of Wind turbines with over speed caused by strong wind. Greatly improve the Wind turbines generation energy and keep the safe running of the Wind turbines.

❖ **Patented Wind turbines stall current limit control technology**

Patented Wind turbines stall current limit control m
not run over current, avoid the damage of expensive generator caused by h
current.

❖ **Wind turbines input MPPT generation technology (boost)**

Controller can provide automatically Wind turbines input maximum power tracking mode, or the 5 segments match curve input configuration mode(input rev to input current; or output voltage to input current curve), which makes the high efficient generation of the Wind turbines, but with low speed.

❖ **Support multiple output mode selection**

This controller provides optional multiple output modes(light control, time control, light on in the

morning, PWM dimming, reverse direction), which can satisfy a variety of applications.

- **Statistics the cumulative generating capacity, remaining power, speed, current, temperature and other data**

  The controller screen displays not only the current, voltage, power of conventional Wind turbines, PV, battery, and the output terminal; but also the cumulative generating capacity of Wind turbines and PV, the remaining battery power, Wind turbines speed, unloading current, and the temperature of controller.

- **Alarm function when terminals up**

  When the terminals are up, the controller will alarm, which requires customers to use with the correct install direction, avoid the possibility of damage caused by water comes into the controller when used in the open air or due to bad weather.

2.Product Parameter

MAX-T4-WS-10-NNHN-1	
Battery parameters	
Applied battery voltage	48V
Battery protect method	Reverse connection protection (do not burn any components, with voice prompt); over voltage protection, under voltage protection (for street light and such kind of load)
Voltage at the over voltage protection point	58.0V±0.3V
Voltage at the over voltage recovery point	55.0V±0.3V
Voltage at the under voltage protection point	42.0V±0.3V
Voltage at the under voltage recovery point	46.0V±0.3V
Battery temperature compensation	5mv/℃/2V (settable) (optional component)
Wind turbines input parameters	
Rated power of applied Wind turbines	1000W/48V
Rated power of the terminal	25A dc (after rectification)
Max. input current of the terminal	30A dc (after rectification)
The default speed of the Wind turbines generation with limited speed	500 Rpm (settable)
The default current of the Wind turbines generation with limited current	25A (settable)
Wind turbines protection method	over rev protection, over current protection, induction lightening protection
Unloading method	outer unloading device
MPPT function	Boost MPPT model (automatic tracking or 5 segments curve tracking)
Input current of MPPT channel	12A
PV input parameters	
Rated input current of applied PV	1000W/48V（standard） 2000W/48V（optional）
Rated input current of terminal	15A（standard） 30A（optional）
Charging voltage drop	<0.2V
PV protection methods	Reverse connection protection (voice prompt)
Unloading method	Open circuit unloading
Others	
Auxiliary function	Monitor of air temperature inside controller, temperature of unloading parts and Wind turbines MPPT components, and also the monitor of control terminals installed on the inversion (with voice prompt)
Display mode	Liquid crystal (LCD) display
Communication mode	RS232(5V electrical level) (standard),RS485/ Short-range wireless (optional)
Displayed parameters	Wind turbines input voltage/current/power/generated energy/rev/unloading current PV input voltage/current/power/generated energy Battery voltage/charging current/power/total charging capacity/battery status information
Power consumption in standby mode(screen backlight closed)	About 20ma /24V system
Operating mode	3M foil key operation (4 keys)
Working temperature / humidity range (environment)	-40~+80℃/20~85%RH（non condensing）
Protection grade	IP41
Controller size (L*W*H)	235mm*148mm *84mm
Net weight	2.5KG

3. Installation and use

3-1 Installation attention

⚠

4 Parameters setting instructions

4-1 Key Function

The controller can cooperate with the system to work properly by setting the appropriate parameters. Accordingly, the controller can monitor and display the set parameters, or dynamic input and output data; it's easy for debugging and maintenance.

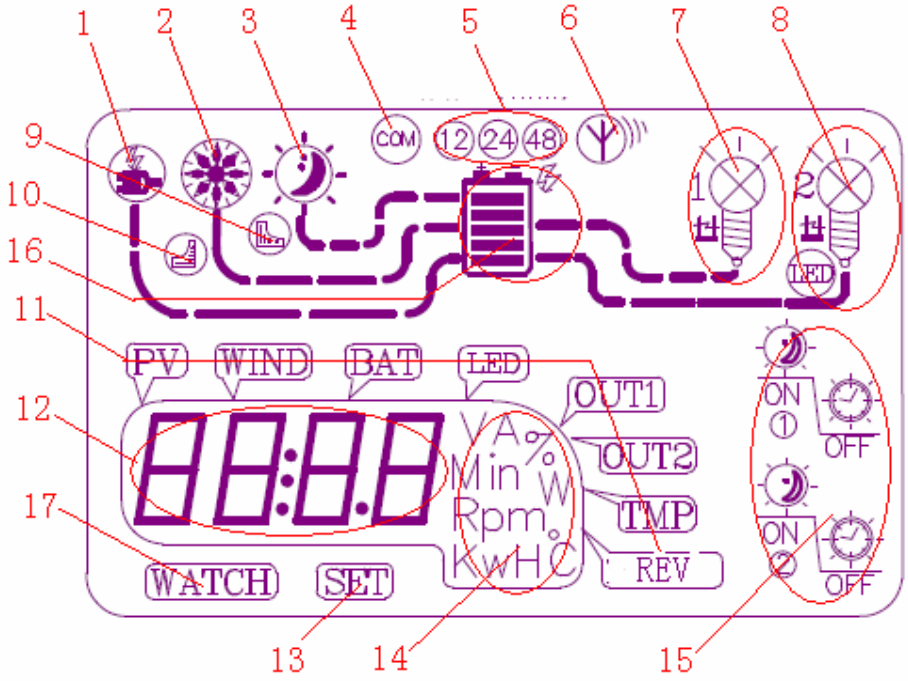
The controller enters into the work standby status ([RUN] words flashing) as soon as it is powered and initialized. The controller displays different information according to the different function types, the specific kind to prevail.

There are 4 operation buttons on the panel:

Function description
Page up
Page down
Escape
Confirm / Enter

4-2 LCD screen display

LCD screen can display the following information:



1. Mains electricity supply, displayed when mains electricity exits
2. Wind turbines graph, the graph rotates when the rotate; when brakes, displays brakes box
3. Daytime, night indication symbol. In the daytime displays sun, at night displays moon.
4. Communication display symbol, temporarily retained
5. Battery voltage level symbol, 12V displays 12; 24V displays 24; 48V displays 48
6. Wirelesscommunicationdisplay, displays the symbol when has wirelessmodule, displays dynamic symbol during

communication

7. The No.1 output status display, when close the output, the symbol not light, When short circuit, short circuit symbol displays; when has morning lighting function, and in the state of waiting for morning lighting, light symbol flashing indicates waiting.

8. The No.2 output status display, when close the output, the symbol not light, When short circuit, short circuit symbol displays; when has morning lighting function, and in the state of waiting for morning lighting, light symbol flashing indicates waiting(for no used LED driver module output, then LED symbol displays

9. Solar MPPT symbol, displays when has solar MPPT components, the symbol flashing when the MPPT works

10. Wind turbines MPPT symbol, displays when has Wind turbines MPPT components, the symbol flashing when the MPPT works

11. PV parameter symbol
Wind turbines parameter symbol
Battery parameter symbol
LED drive output parameter symbol
No.1 output parameter symbol
No.2 output parameter symbol
Temperature symbol
Rev symbol

12. Digital display parameter / status symbol

13. Parameter setting symbol

14. Parameter unit

15. No. 1/2 output/ close status display symbol, displays when has output module, ON corresponding to output open status, OFF to the close status

16. Battery status symbol, displays the rest battery power, after over voltage, displays the over voltage symbol

17. Data checking symbol

4-3 Browsing of input and output parameters

In the standby screen, press the [ENTER] button, the screen displays the word "WATCH", and press [ENTER] again, first displays the words "PV", which means can check the PV input parameters, in this state, press the page up or down buttons, can switch to other dynamic parameters, corresponding to "PV", "WIND ", " BAT", "OUT1", "OUT2", "TMP", "REV." After selecting the information need to be displayed, press [ENTER], you can enter the parameters class to be displayed currently, each parameter class following several subproject parameters, they can be displayed through up / down buttons. Any time after shows subprojects parameter class, press the [ENTER] can skip to the next parameter class. Any time press [ESC] can exit the parameter display step by step until you return to the standby screen.

For example (in the standby screen)

standby screen press [ENTER] press [ENTER] press [ENTER]

Below shows all the displayed parameters:

PV------ PV input parameters
S-U--------Solar input voltage (1 decimal point) Unit: V
S-I---------Solar input current (1 decimal point) Unit: A
S-P--------- Solar input power (no decimal point) Unit: W
S-d---------Solar input generated energy (no decimal point) Unit: Kwh

E-U--------Analog voltage of external photosensitive resistor (1 decimal point) Unit: V
(Use external photosensitive resistor to do day/night checking instead of PV panel)

WIND----- Wind turbines input parameters
n-U-------- Wind turbines input voltage (DC voltage after rectification) (1 decimal point) Unit: V
n-I---------Wind turbines input current (DC current after rectification) (1 decimal point) Unit: A
n-P-------- Wind turbines input power (DC power after rectification) (no decimal point) Unit: W
n-d-------- Wind turbines input generated energy (DC generated energy after rectification) (no decimal point) Unit: Kwh
n-F---------Wind turbines input unloading current (DC) (1 decimal point) Unit: A
n-C---------Current of Wind turbines charging to battery (1 decimal point) Unit: A

BAT------- Battery charging parameters
b-U---------Battery voltage (1 decimal point) Unit: V
b-I----------Total charging current to battery (1 decimal point) Unit: A
b-P----------Total charging power to battery (no decimal point) Unit: W
b-d--------- Total charging capacity to battery (no decimal point) Unit: Kwh

TMP------- Controller internal temperature display
TNP-------Controller internal temperature (no decimal point) Unit: ℃

REV-------- Wind turbines rev parameter
NSP------Wind turbines rev display (no decimal point) Unit: Rpm

4-4 Working parameters setting

The controller can set part of the key parameters through LCD screen. However, some advanced parameters can be set by the extra USB monitoring communication data cable.
In standby state, press the [ENTER], then through the up/down buttons to select [SET], press the [ENTER] again, the controller will be prompted for a password, enter the correct password and press the [ENTER], then you can enter the menu. The default password is: 0000

The Key Operating Instructions:

Enter the menu password input interface, the bit flashes, and every time press Page Down, flashing skip to the next operation bit; every time press Page Up, changes in operating-bit data (+1). After you enter the correct password, you will be prompted to "YES" and then enter into the menu parameter selection area. If wrong, prompts “ERR".

Through page up and down to select the current menu. In the current menu, press "ENTER" to enter into the corresponding parameter setting interface immediately, displays the actual setting of parameters. Modify the parameters as above describes, after modifying the parameters, press the "OK" to save the parameter setting immediately, prompt "ERR" if there is an error, no error prompts "YES". Any time, pressing "ESC" to exit. Return to the previous level.

The controller can display all the setup parameters are as follows:
【Add】【 OEY】【 SYS】【 ndS】【 nUt】【 bEn】【 nbI】【 CLU】【 SrU】【nnI】【 nnS】

【OEY】----Enter the password configuration of parameter settings

Description: Through setting of this parameter, every time when you enter the menu to set the parameters, you need to enter the correct password (same with this parameter data) to perform menu operations, default value [000]

【SYS】----Select 24V system / 12V system / 48V system or automatic recognition settings

Description: Select 24V system [000], controller works under the configuration of 24V level.

Select the 12V system [001], controller works under the configuration of 12V level
Select the 24V systems [002], controller works under the configuration of 48V level
Select automatic system [003], controller works under the configuration of automatic voltage recognition.
Default: [000]

【NDS】------ Pole pair number set of the wind generator, used for measuring the Wind turbines speed
Generally, wind generators are permanent magnet synchronous gen
magnets inside, half is the number of pole pairs, for example, if there are 8 magnets, the number of pole pairs is 4.
Range: 2-100 default: 4 pairs

【NUT】-----Sustained braking time parameter set after Wind turbines braking,
After the Wind turbines brakes, Wind turbines can be released after the brake time set by this parameter, and continue to generate electricity (except: after Wind turbines brakes, if the brake current is too large, and do not reduce even last for some time, the controller will release the braking action, and recheck brake conditions after a period of time, if OK, re-brake, again and again, to avoid burn generator or controller due to large current, limited current set by [NNI] parameters)
Range: 1-59 default: 20 minutes

【BEN】----The buzzer sound enabled settings
When this parameter is set to [001], enable buzzer alarm
Following states will cause the buzzer ring:

1， A key input
2， The battery reversed
3， PV panels reversed
4， The temperature is too high
5， The 1st output is short circuit, over current
6， The 2nd output is short circuit, over current
7， The controller terminals is upward

【NBI】-------Wind turbines MPPT charging components maximum input current limit setting

1-In the automatic power tracking mode (only can be set by USB data wire)

This parameter is used to control the input current through the MPPT parts; and on the other hand, control the matching of Wind turbines input impedance, if the value is set too small, the MPPT algorithm is inefficient, but does not pin down the Wind turbines; If it is set too large, the MPPT algorithm is high efficient, but may be drag Wind turbines in low wind speed. So they need a reasonable set according to Wind turbines power curve.

For example, in the low wind speed (such as 4.5 m/s), the Wind turbines can output the maximum power under 2A current, and will not cause the stall run of Wind turbines (pin down the Wind turbines, speed can not be improved), then this parameter should be set to 2A, that is [NBI] = 20, there is a decimal point: 2.0A

Range 0-50 or 0-5A current. Specific depend on the maximum power configuration of MPPT module.

2- 5In the 5 segments matching mode (only can be set by USB data wire)

Through USB data wire to set the 5 points Wind turbines curve of rev-current, or voltage-current, the set current will be limited by the [NBI] parameter. As the controller includes the main charging passage of the Wind turbines, MPPT low voltage charging passage, so this parameter

restricts the maximum input current of MPPT low voltage charging, can avoid over current running of MPPT low voltage boost charging passage.

After set running in the curve matching, the controller will extract the input current from the Wind turbines to charge the battery according to this charging curve. Generally, recommend the experienced customers use this mode to match with the Wind turbines, to have the best generating effect.

【SrU】-------Starting voltage setting of MPPT charging input carried out by Wind turbines

When the input voltage of Wind turbines is over this setting parameter, MPPT stat charging, the controller does the maximum power tracking to Wind turbines input automatically (o 5 segments curve matching)

【CLU】-------Input voltage setting corresponding to close the Wind turbines charging

When the input voltage of Wind turbines is lower than setting parameter, close the charging to MPPT, can avoid stopping of Wind turbines under a very low speed.

【NNI】------ Wind turbines maximum input current setting

Wind turbines input current for generating exceeds the current set by this parameter, will cause a controlled braking action, combining [NUT] parameter, and finish the brake control.

Range 0-500, which is 0-50.0A default 18.0A

【NNS】----- Wind turbines maximum rev limit setting

When the Wind turbines speed reaches the speed set by this parameter, the controller controls the speed within this parameter setting value through unloading automatically, stable the maximum speed, if the Wind turbines speed is too large, exceeds the automatic steady speed range, continue for some time, will start braking, braking time decided by [NUT].

Range 0-3000 rev / min default 500

【Add】----- Communication code of the controller

Give a code to different device during the multiple communications; every controller code must be different with others, to avoid crosstalk.

Range 2 – 250 default 6

5. Special operations of controller

5-1 Manually unloading operation:

In standby mode (the controller displays 'RUN', and blinking), long press the [ESC] button for 3 seconds, the Wind turbines will enter into manual brake status immediately, the Wind turbines graphic symbol shows as a frame, and the Wind turbines is framed by it, which means it's braking now. If now you press [ESC] for 3 seconds, the braking action will be released slowly, and the Wind turbines generates again.

5-2 Controller warm reset start:

Press page up and down buttons simultaneously for 3 seconds, LCD digital part displays "RST", the controller is reset immediately, reinitialize working. The effect is the same as remove the power and then energized. Recommend to perform this operation to reset controller after setting all the parameters, or encounter problems.

5-3 Manual testing of PV input reverse (for wiring in the night)

When connect the solar panel in the night, this function is used to detecting whether there is a reverse function (when wiring in the daytime, this function is failure)

In standby mode (the controller displays 'RUN', and blinking), long press the page up button for 3 seconds, the controller displays '-C-', continuously check if the solar panel is reversed. If reverse is exists, displays 'Err', recheck after correcting, if OK, no error information will appear.

5-4 Removing of abnormal information

Abnormal failure can be removed manually, and the method is: enter the menu, then exit, and the failure is clear.

Buzzer installed inside the controller, different voices express different meanings

Operation	Voice
The controller is powered on	One " Drip " sound
A key input (press the button)	One " Drip " sound per pressing
The battery reversed	Long "Drip" sound
PV panels reversed	Long "Drip" sound
The controller terminals is upward	Long "Drip" sound
The internal temperature is too high(>95 ℃)	Intermittent "Drip" sound

6. Using of monitoring software (optional function)

⚠ **Only can be used after buying monitoring software and USB communication data wire**

6-1 Brief description

The controller can monitor and set parameters through LCD, and can also use computer monitoring software provided by our company to set or check the data information. Use monitoring software can provide more comprehensive regulatory measures.

Communications with computer contain TTL232 (standard configuration), 485 (optional), short-range wireless communications (optional, external module), specifically based on the practical application.