

# Mak Plus 10kVA - 80kVA Inverter Users Manual

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## IP31 AND IP20 SOLUTIONS

*Mak Plus Power Systems Pure Sinues Wave Inverter*  
*[www.mak-powersis.de](http://www.mak-powersis.de)*

### **1-Introduction:**

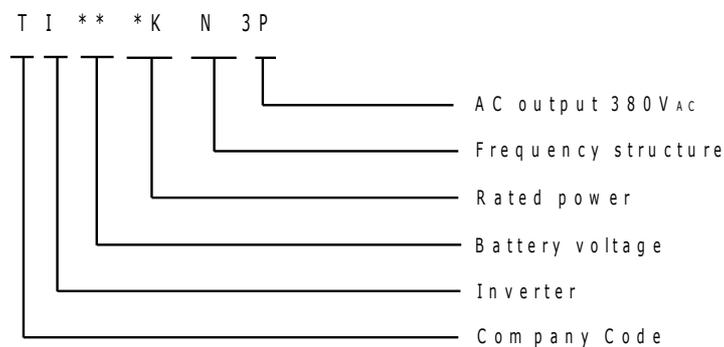
The series power is controller and inverter hybrid control, wide DC input voltage, output voltage is constant; steady frequency pure sine wave AC. It used in households, substation, integrated communications services industry or power generation systems, and remote communication capabilities through remote real-time data, on-line observations; charge MCU control circuit, the inverter circuit DSP control, makes the product applicability, protection function, low loss, high efficiency, new energy power generation system is modern in the core product.

Before use, please read this manual carefully!

### **1.1、 Key Features:**

- Fifth generation efficient IGBT power module of Mitsubishi ;
- Microchip's high-performance DSP chip production control;
- Closed-loop PID control algorithms to improve the dynamic response of the system output, improved quality of power output;
- LED / LCD display screen for easier operation;
- Protection function, LED display fault code;
- Low-power display status, further reducing their losses;
- Remote monitoring (RS485 / RS232 optional);
- Smaller, to meet the indoor and outdoor installation requirements;
- Maintenance simple, fast;

## 2 Model Description:



## 3 TECHNICAL DATA INSTRUCTION

### Inverter specification.

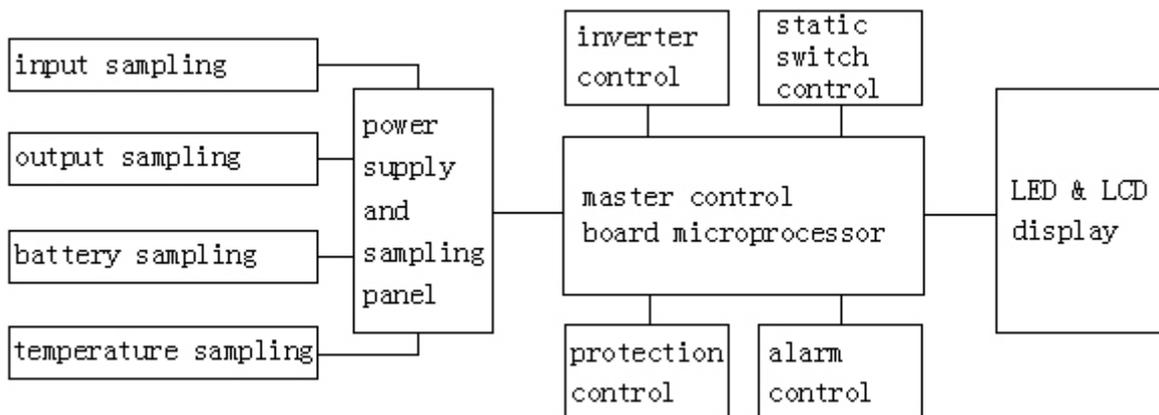
<b>Model</b>	TI36060KN3P
<b>Rated power</b>	60KW
<b>DC voltage</b>	360VDC( rated voltage)
<b>Phase</b>	Tri-phase+N+G
<b>Rated voltage</b>	380VAC±1%□steady-state load-380VAC±3%□fluctuation of load
<b>Rated frequency</b>	50Hz±0.05%
<b>Frequency stability: when no synchronous</b>	±0.05%
<b>Frequency stability: when synchronous</b>	±5%
<b>Crest factor</b>	3□1
<b>Output wave</b>	Pure sine wave
<b>THD</b>	linear load-3%, un-linear load□5%
<b>Dynamic load voltage transient(0-100% jump)</b>	±5%
<b>Recovery time</b>	10ms
<b>Balanced load voltage</b>	±1%±5%un-balanced load voltage□
<b>Overload capacity</b>	125% 1min-150% 1S

Inverter efficiency, load 100%	>90%
Computer communication interface	RS232-485, Network remote, optional□
working temperature	0-40°C
Relative humidity(non condensation)	30%-90%
Max. Altitude	<1000mts(decrease 1% when the high increase every 100mts,max.5000mts)
cooling method	forced cooling
noise dB @1m(according to the load and temperature)	45□55
Case color	Black(optional)
Input cable	bottom/front
easy maintenance	front/top/left and right side all can be opened
Weight(kg)	IP20 - 950KG / IP31 - 980KG
Dimension W×D×H□mm <sup>2</sup>	"IP20 1030*800*1735" & "IP31 1230*1000*1935"

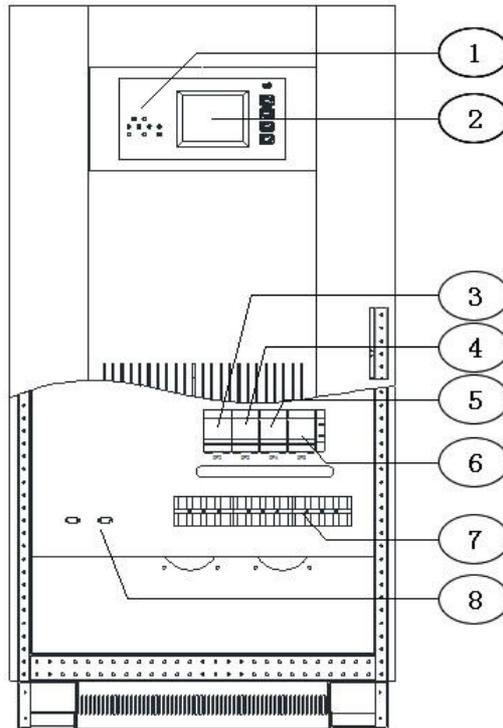
\*The above date just for reference, if any different please in kind prevail.

#### 4-WORKING PRINCIPLE.

TI Series inverter is highly integrated digital technology, improving the MTBF and reliability, control the whole system by a independent master plate control, use the high-speed microprocessor control to ensure the equipment stable and reliable operation.



#### 4.1、 FRONT PANEL INSTRUCTION



- (1) LED status instructions--indicate the working status
- (2) LCD display-- display the all kinds of data
- (3) By-pass switch--control the by-pass input(A type)
- (4) Output switch-- control the output
- (5) Battery switch--control the battery input
- (6) Repair the by-pass switch--control the AC by-pass(A type)
- (7) Line bank-- connect input, output, battery and earth line
- (8) RS232 communication interface, dry contact interface and etc.

**Remark: The 2P socket on front of machine is only for maintenance of use, please do not connect with any electric equipment! GSIB series do not include by-pass switch and maintenance bypass switch.**

## 5、INSTALLATION

Please read the "OPERATION INSTRUCTION" part carefully before installation

Install environment request:

- Temperature:-10°C~+40°C
- Relative humidity:30%~90%
- Altitude: under 1000mts, please decrease the capacity when higher than 1000mts.
- Install environment space request□L×W×H□:refer to the specification chart.
- Floor stress requirements: refer to the specification chart.

### **Make sure the indoor environment when install**

- No dust
- With suitable indoor temperature: inverter operates under temperature of -10~40°C, but the turn on temperature must be higher than 0°C. And the most ideal operating temperature is 25°C.
- Need a good cooling system.

A. Nature cooling system: only suit for low heat and large space

B. Artificial ventilation system: need install air conditioning when the casing temperature(TA) higher than peripheral temperature(TE), need increase the capacity of convulsions system when their temperature close.

**5.1、 Checking before installation**

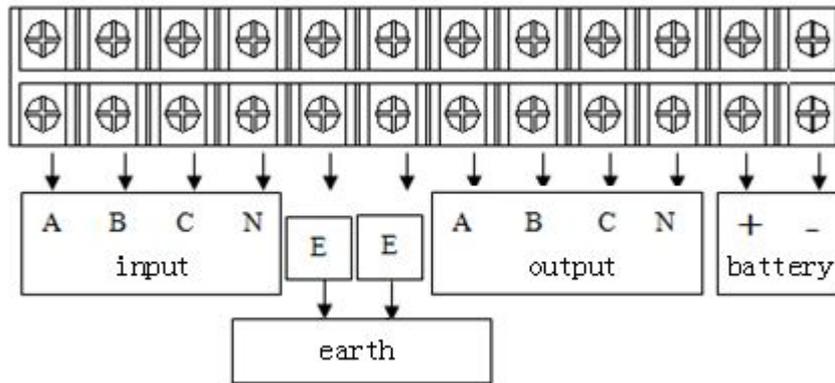
- Open the packing and take out machine, check if any damage during the transportation.
- Open the front door, and make sure all the switch is disconnected at the same time.
- Warranty card
- Operation manual
- Packing list (see the enclosed list)

**5.2、 Installation location**

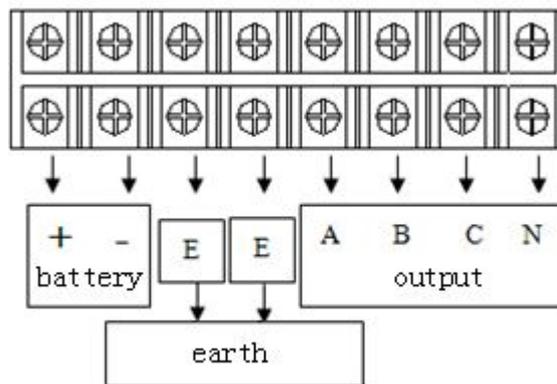
- Do not put anything on top of the machine
- Please leave enough space for repair on front and top of equipment.
- Power line must connect from bottom of machine.

**5.3、 Line bank connection chart:**

5.3.1 TI A series inverter terminal diagram



5.3.2 TI B series inverter terminal diagram



The entire switch must be disclosed before install.

Connect the Tri-phase line and center line as the above chart A,B,C,N; E connect to earth;+ - connect the positive and negative of battery.

**5.4 、 Inverter Tri-phase output system 10-80KVA cable specification: see below table (Unit:**

mm2)

Capacity	Output				Battery	
	A	B	C	N	+	-
10KVA	6	6	6	6	25	25
15KVA	6	6	6	6	35	35
20 KVA	6	6	6	6	35	35
30 KVA	10	10	10	10	50	50
40 KVA	16	16	16	16	70	70
50 KVA	25	25	25	25	90	90
60 KVA	25	25	25	25	90	90
80 KVA	35	35	35	35	120	120

**Input cable size can not smaller than the output cable size.**

### 5.5、 Connection inspection

**Connect all the input and output line, check the below matters:**

If all the cables are connected correctly and well contacted, and the input/output and earth line are correctly connected to the line bank.

### 6、 INVERTER POWER ON PROCEDURES

- 6.1. Close the DC input switch
- 6.2. Close the by-pass switch when the inverter indicator light on
- 6.3. Close the output switch when the load can supply power

**Remark: If you have not close the switch withing 10s when inverter connect the power, you will see the battery low-voltage alarm message. Please press F3 to cancel this alarm message and execute the above procedure at the same time.**

### 7. EMERGENCY SHUTDOWN PROCEDURES

This procedure just use in fire, electric shock, arc or cause other endangered. But it will cause no AC output risk.

**——Make all the switches down off**

### 8、 INTERFACE INSTRUCTION

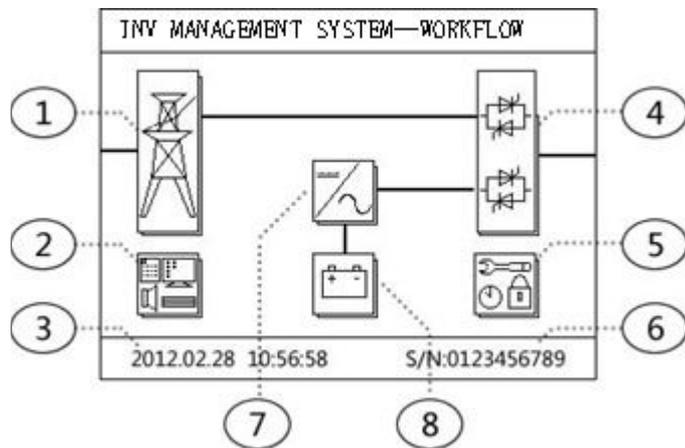
#### 8□1 Standby Screen

Standby Screen as figure one. Inverter will show this figure when power on. CPU will automatically cut off the touch screen backlight power when touch screen interval four minutes not be touched. --So can increase the backlight life, and at the same time back to the standby interface.(If inverter under alarm status, touch screen will show the alarm message in priority, CPU will not cut down the touch screen backlight and back to standby interface before the alarm message removed.)

# OFF-GRID INVERTER

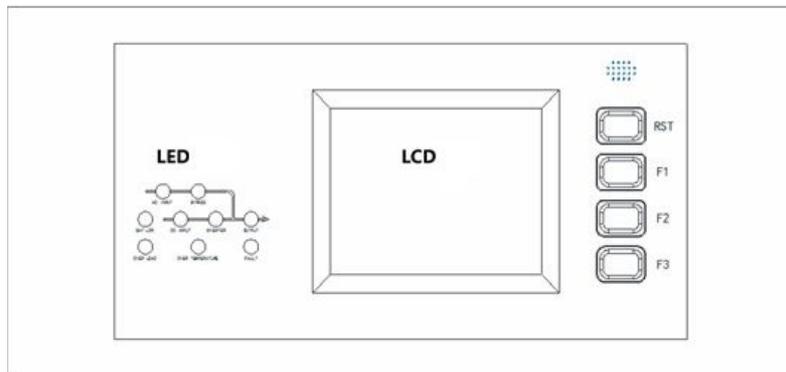
## 8-2 Flow chart display screen

Flow chart display screen as figure two. Touch anywhere of the screen under standby picture can enter into the flow chart display picture. You can find the inverter basic information and working status in this picture. The meaning of each part is as followings:



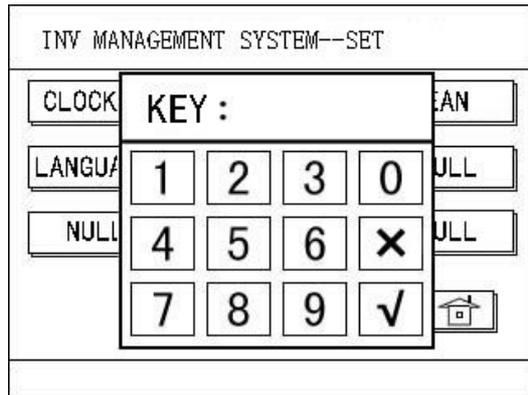
- (1) Mains key: Press this icon to check the input status and data of mains
- (2) System information: Press this icon to check the system basic status and event log information.
- (3) System time: real system date and time
- (4) Static switch: Press this icon to check the output status and data.
- (5) System setting: Press this icon to revise the system time, language, clear log, change the password.
- (6) Inverter serial number: Display the inverter's production serial number.
- (7) Inverter: Press this icon to check the working status and data of inverter.
- (8) Battery key: Press this key to check the data of battery.

## 8-3 Display panel instruction



1 The part of the LED instructions from left to right, from top to bottom is AC input, by-pass operation,





### 8.6 The event log query interface

Press system log icon under the system information interface to enter into event log query interface. This interface displays all events the system recorded. Interface is shown as figure 6. The each part meaning of the picture are as follows:

- (1) Number: the order of the events in memory, the latest in the front and the serial number minimum.
- (2) Time: The records of time event occurs.
- (3) Next page (Left 1): check 8 events log in next page, total 256.
- (4) Turn previous page (left 2): check 8 events log in the previous page.
- (5) Back icon (left 3): Press the icon to back to the previous degree catalogue
- (6) Exit key (left 4): Press the icon to exit all the catalogue and back to the standby screen.

INV MANAGEMENT SYSTEM--EVENT		
NUM	EVENT	TIME
001	INV OUTPUT	12.02.18 11:30:54
002	INV OPEN	12.02.18 11:30:49
003	BAT RECOVERY	12.02.18 11:30:48
004	BAT LOW	12.02.18 11:30:46
005	NO EVENT	00.00.00 00:00:00
006	NO EVENT	00.00.00 00:00:00
007	NO EVENT	00.00.00 00:00:00
008	NO EVENT	00.00.00 00:00:00

### 8.7 ATTENTIONS

1. Please use your finger face to touch the screen, avoid using fingertip and other picker in order to prevent to scratch the touch screen surface, affects the display effect.

2. System will immediately store the amendment parameter in machine forever after setting the parameter and will not affected by the system power on or not.

3. The recorded event will be stored in the machine forever and not affected by the system power on or not. But the event log exceeds the max. Number of storage then the latest log will instead of the oldest one. User also can delete the entire event log in the system setting interface.

4. The system time use 24 hours system per day, and use the solar calendar date

5. Please correct the system time and clear the system log when first using.

**If can't understand the instructions or want to get more detailed help during operation, please**

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contact with the agent or contact with us, we will sincerely for your service.

Attended list:

Packing list

NO.	NAME	QTY	REMARK
1	INVERTER HOST	1	
2	INSTRUCTIONS	1	
3	WARRANTY CARD	1	
4	KEY	2	