Canroon

CR1000 Intelligent Digital Induction Heating Power Source

PRODUCT MANUAL

Shenzhen Canroon Electrical Appliances Co., ltd

Contents

1. Safety Precautions – Read Before Using

Protect yourself and others from injury – read and follow these precautions

1.1 Symbol Usage

DANGER! – Indicates a hazardous situation which, if not avoided, will result in death or serious injury.The possible hazards are shown in the adjoining symbols or explained in the text.

NOTICE – Indicates statements not related to personal injury.
Indicates special instructions

This group of symbols means Warning! Watch Out! ELECTRIC, SHOCK, MOVING PARTS, and HOT PARTS hazards. Consult symbols and related instructions below for necessary actions to avoid the hazards.

1.2 Induction Heating Hazards Symbols Instructions and Precautions

The symbols shown below are used throughout this manual to call attention to and identify possible hazards.When you see the symbol, watch out, and follow the related instructions to avoid the hazard. Please read and follow all Safety Standards.

Only qualified persons should install, operate, maintain and repair this unit.

During operation, keep everybody, especially children, away.

ELECTRIC SHOCK can kill.
Incorrectly installed or improperly grounded equipment is a hazard.

(1) Do not touch live electrical parts.
(2) Enclose any connecting bus bars and coolant fittings to prevent unintentional contact.
(3) Wear dry, hole free insulating gloves and body protection.
(4) Insulate yourself from work and ground using dry insulating mats or insulator big enough to prevent any physical contact with the work or ground.
(5) Additional safety precautions are required when any of the following electrically hazardous conditions are present: in damp locations or while wearing wet clothing; on metal structures such as floors, gratings, or scaffolds; when in cramped positions such as sitting, kneeling, or lying; or when there is a high risk of unavoidable or accidental contact with the workpiece or ground. For these conditions, see ANSI Z49.1 listed in Safety Standards. And, do not work alone!
(6) Disconnect input power before installing or servicing this equipment.
(7) Properly install and ground this equipment according to its Owner's manual and national, state, and local codes.
(8) Always verify the supply ground check and be sure that input power cord ground wire is properly connected to ground terminal in disconnect box or that cord plug is connected to a properly grounded receptacle outlet.
(9) When making input connections attach proper grounding conductor first double check connections.
(10) Keep cords dry, free of oil and grease, and protected from hot metal and sparks.
(11) Frequently inspect input power cord for damage or bare wiring replace cord immediately if damaged bare wiring can kill.
(12) Turn off all equipment when not in use.
(13) Do not use worn, damaged, undersized, or poorly spliced cables.
(14) Do not drape cables end your body.
(15) Do not touch power circuit if you are in contact with the work, ground, or another power circuit from a different machine.
(16) Use only well–maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
(17) Wear a safety harness if working above floor level.
(18) Keep all panels and outer cover securely in place.

Significant dc voltage exists in inverter–type power sources after removal of input power.Turn Off inverter, disconnect input power, and discharge input capacitors according to instructions in Maintenance Section before touching any internal parts.

FUMES AND GASES can be hazardous.

Induction Heating of certain materials, adhesives, and fluxes can produce fumes and gases. Breathing these fumes and gases can be hazardous to your health.

(1) Keep your head out of the fumes. Do not breathe the fumes.
(2) If inside, ventilate the area and/or use local forced ventilation to remove fumes and gases.
(3) If ventilation is poor, wear an approved air–supplied respirator.
(4) Read and understand the Material Safety Data Sheets (MSDS) and The manufacturer's instruction for adhesives, fluxes, metals, coatings, cleaners, and degreasers.
(5) Work in a confined space only if it is well ventilated, or while wearing anair–supplied respirator. Always have a trained watch person near–by. Fumes and gases from heating can displace air and lower the oxygen level causing injury or death. Be sure the breathing air is safe.
(6) Do not heat in locations near degreasing, cleaning, or spraying operations. The heat can react with vapors to form highly toxic and irritating gases.
(7) Do not end heat coated metals, such as galvanized, lead, or cadmium Plated steel, unless the coating is removed from the heated area, the area is well ventilated, and while wearing an air– supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if end heated.See coating MSDS for temperature information.

Fire or explosion hazard.

(1) Watch out overheat parts.
(2) Watch for fire; keep extinguisher nearby.
(3) Keep flammables away from work area.
(4) Do not locate unit on, end, or near combustible surfaces.
(5) Do not install unit near flammables.
(6) Do not operate where the atmosphere may contain flammable dust, gas, or liquid vapors (such as gasoline).
(7) After completion of work, inspect area to ensure it is free of sparks, glowing embers, and flames.
(8) Use only correct fuses or circuit breakers. Do not endsize or by– pass them.

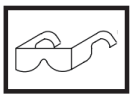
INDUCTION HEATING can cause burns.

(1) Hot parts and equipment can injure.
(2) Don't touch the hot parts with bare hands.
(3) Cooling for a period of time before handling parts or equipment.
(4) Keep metal jewelry and other personal metal items away from the induction coil during operation.

1.3 Additional Symbols for Installation, Operation, and Maintenance

FALLING UNIT can cause injury.

(1) Use handle and have person of adequate physical strength lift unit.
(2) Move unit with hand cart or similar device.
(3) For units without a handle, use equipment of adequate capacity to lift unit.
(4) When using lift forks to move unit, be sure forks are long enough to extend beyond opposite side of unit.



FLYING METAL OR DIRT can injure eyes.

(1) Wear approved safety glasses with side shields or wear face shield.

MOVING PARTS can cause injury.

(1) Keep away from moving parts such as fans.
(2) Keep all doors, panels, outer cover and guards closed and securely in place.

MAGNETIC FIELDS can affect Implanted medical devices.

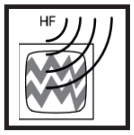
(1) Wearers of Pacemakers and other Implanted Medical Devices should keep away.
(2) Implanted Medical Device wearers should consult their doctor and thedevice manufacturer before going near arc welding, spot welding, gouging, plasma arc cutting, or induction heating operations.

ENDUSE can cause ENDHEATING.

(1) Allow cooling period.
(2) Reduce output or reduce duty cycle before starting to heat again.
(3) Follow rated duty cycle.

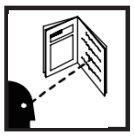
STATIC (ESD) can damage PC boards.

(1) Put on grounded wrist strap BEFORE handling boards or parts.
(2) Use proper static–proof bags and boxes to store, move, or ship PC boards.



H.F. RADIATION can cause interference.

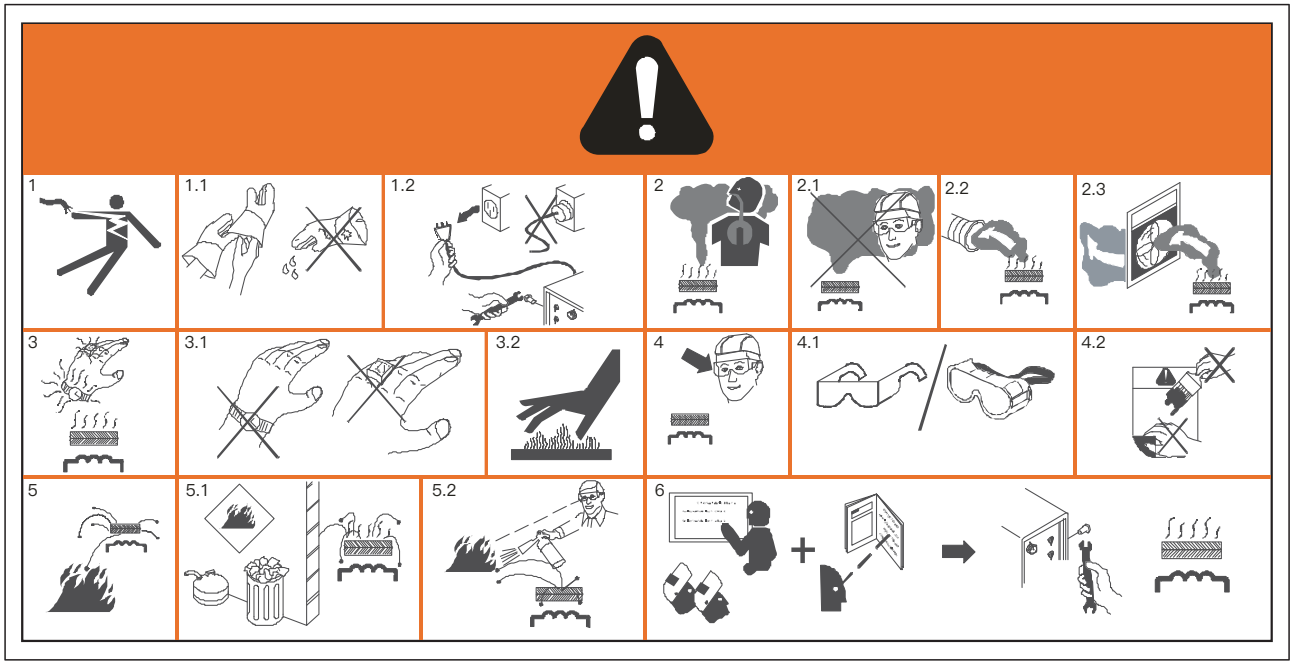
(1) High–frequency (H.F.) can interfere with radio navigation, safety services, computers, and communications equipment.
(2) Have only qualified person familiar with electronic equipment per–form this installation.
(3) The user is responsible for having a qualified electrician promptly correct anyinterference problem resulting from the installation.
(4) If notified by the FCC about interference, stop using the equip–ment at once.
(5) Have the installation regularly checked and maintained.
(6) Keep high–frequency source doors and panels tightly shut.



READ INSTRUCTIONS.

(1) Read Owner's Manual before using or servicing unit.
(2) Use only genuine replacement parts from the manufacturer.

1.4 Warning Label Definitions



Warning! Watch Out! There are possible hazards as shown by the symbols.

(1) Electric shock from wiring can kill.
  a. Wear dry insulating gloves. Do not wear wet or damaged gloves.
  b. Disconnect input plug or power before working on machine.

(2) Breathing heating fumes can be hazardous to your health. Read Material Safety Data Sheets (MSDS) and manu–facturer's instructions for material used.
  a. Keep your head out of the fumes.
  b. Use forced ventilation or local exhaust to remove the fumes.
  c. Use ventilating fan to remove fumes.

(3) Induction heating can cause injury or burns from hot items such as rings, watches, or parts.
  a. Do not wear metal jewelry and other metal personal items such as rings and watches during operation.
  b. Do not touch hot parts or hot head/coil.

(4) Always wear safety glass or goggles during and around heating operations to prevent possible injury.
  a. Wear either safety glasses or full goggles depending on type of operation and nearby processes.
  b. Do not remove or paint over (cover) the label.

(5) Induction heating sparks can cause fire.Do not overheat parts and adhesives.
  a. Keep flammables away from heating operation. Do not heat near flammables.
  b. Heating sparks can cause fires. Have a fire extinguisher nearby and have a watchperson ready to use it.

(6) Become trained and read the before working on the machine or heating.

2. Safety Instructions and Maintenance

2.1 Safety Instructions

As the equipment working with 380 – 480V three – phase alternating voltage, the line voltage inside and outside is very high, when the equipment is running, any part of your body can not be close to the input and output terminals of the device. Though the induction heating equipment is not under work, the input and output terminals are still with dangerous voltage. Disconnecting power supply is a must if you need to check inside or maintenance. For purposes of safety, you must ensure the equipment without voltage several minutes after power off before unpack–ing maintenance.

2.2 Routine Maintenance

Disconnect power before maintaining

In order to ensure the induction heating power normal running and extend its life,regular maintenance is a must.Content of the maintenance is in the following table.

Item	Content
Temperature/humidity	Ensure the ambient temperature –20˚C～+50˚C, relative humidity: 20%～90%
Oil mist and dust	Ensure no oil mist, dust and condensation in the equipment. no corrosive gas and liquid in the storage ambient
Induction heating equipment	Check it whether abnormal hot or vibrate
Cooling liquid	Check if cooling liquid is in accordance with requested (deionized purified water, PH 7.0～9.0).
Input power	Ensure the input power voltage and frequence within the permit scope
Coil	Check the coil whether normal, it will show no oil mist, dust and condensation if it is not yellow

In consideration of the running equipment easily to absorb dust, especial for the fan module, users should try to avoid the dust overstock which will affect the heat sink leading to any bad effects result from too high inside temperature. In order to extend the life of equipment, we suggest regular dedusting for the fan and radiator, at least one time within wo months; regular dedusting for the equipment inside, at least one time within a year.

Notice:

Ensure the power off before dedusting. Dedust with cloth and dry brush softly without water in case of damaging the components or even the complete set. While dedusting, ensuring the related plug–ins in good contact, avoid them loosing in case of affecting the equipment running.

3. Type and Specification

3.1 Unpacking Inspection

Unpack, take out the induction heating machine, please check the below items:
- ◆ Ensure no damage after transportation(Visual inspection whether there is damage or gap)
- ◆ Ensure package with manual
- ◆ Check the nameplate and confirm your order (the nameplate is on the right side of the equipment)
- ◆ Any damage, please contact with our local dealers or our company.

3.2 Specification

Model No.	Rated Input Power (kW)	Input Current (A)	Input Voltage And Frequency	Output Frequency Range (KHz)	Cooling Water Pressure/ Water Flow (Water Inlet Temperature<35°C)/ Water Quality	Size (mm)	IP Grade
CR1000–040A–14TW	40	48–72	3–Phase 400V (±20%) 50/60Hz	0.5–20KHz	Water pressure: ⩾0.4MPa, ⩽0.6MPa Flow rate: >16L/min Water quality: PH 7.0–9.0	L: 542 W: 525.7 H: 1250	IP23
CR1000–050A–14TW	50	60–90					
CR1000–060A–14TW	60	72–108					
CR1000–080A–14TW	80	96–144					
CR1000–100A–14TW	100	120–180					
CR1000–120A–14TW	120	144–216					
CR1000–160A–14TW	160	192–288	3–Phase 400V (±20%) 50/60Hz	0.5–20KHz	Water pressure: ⩾0.4MPa, ⩽0.6MPa Flow rate: >25L/min Water quality: PH 7.0–9.0	L: 737 W: 656 H: 1750.5	IP23
CR1000–200A–14TW	200	240–360					
CR1000–250A–14TW	250	300–451					
CR1000–300A–14TW	300	360–541					
CR1000–160A–24TW	160	192–288	3–Phase 400V (±20%) 50/60Hz	0.5–20KHz	Water pressure: ⩾0.4MPa, ⩽0.6MPa Flow rate: >40L/min Water quality: PH 7.0–9.0	L: 671.5 W: 780 H: 1986.5	IP23
CR1000–200A–24TW	200	240–360					
CR1000–250A–24TW	250	300–451					
CR1000–300A–24TW	300	360–541					
CR1000–400A–24TW	400	481–721		1–10KHz			
CR1000–060A–14TF	60	72–108	3–Phase 400V (±20%) 50/60Hz	0.5–20KHz	Air–cooled	L: 520 W: 500 H: 1050	IP20
CR1000–080A–14TF	80	96–144					
CR1000–100A–14TF	100	120–180	3–Phase 400V (±20%) 50/60Hz	0.5–20KHz	Air–cooled	L: 609 W: 425 H: 1176	IP20
CR1000–120A–14TF	120	144–216					

3.3 Commissioning before Starting

(1) Before power on, check whether the input terminal R, S, T and output terminal L1&L2 are connected correctly, and whether the connection screws are tightened.
(2) Ensure the equipment reliable grounding.
(3) After power on, the LCD will display the main menu interface.
(4) Check whether there is abnormal sound or other equipment failures, if so, immediately cut off the input power supply.
(5) After power on, first set the running command channel selection (P1.01) as the keyboard start command, then set the maximum output current setting (P1.06) to a small value (such as 20A, 30A), and run without load (press RUN key to run) to observe whether the device is normal.
(6) After the equipment runs normally without load, stop the operation and cut off the input power, then connect the load line to power on and restart the operation, observe whether the equipment is running normally, and finally check the total output current (D–02) and output frequency (D–05) through the keyboard display whether are normal, after confirming that the equipment is normal, set the parameter initialization (P0.08) to restore the factory value.

4. Installation and Wiring

4.1 Installation Condition and Dismantle Cautions

For fans effective operation and radiating, keep enough space near the wind inlet and outlet, locate the equipment where ventilate and waterproof.

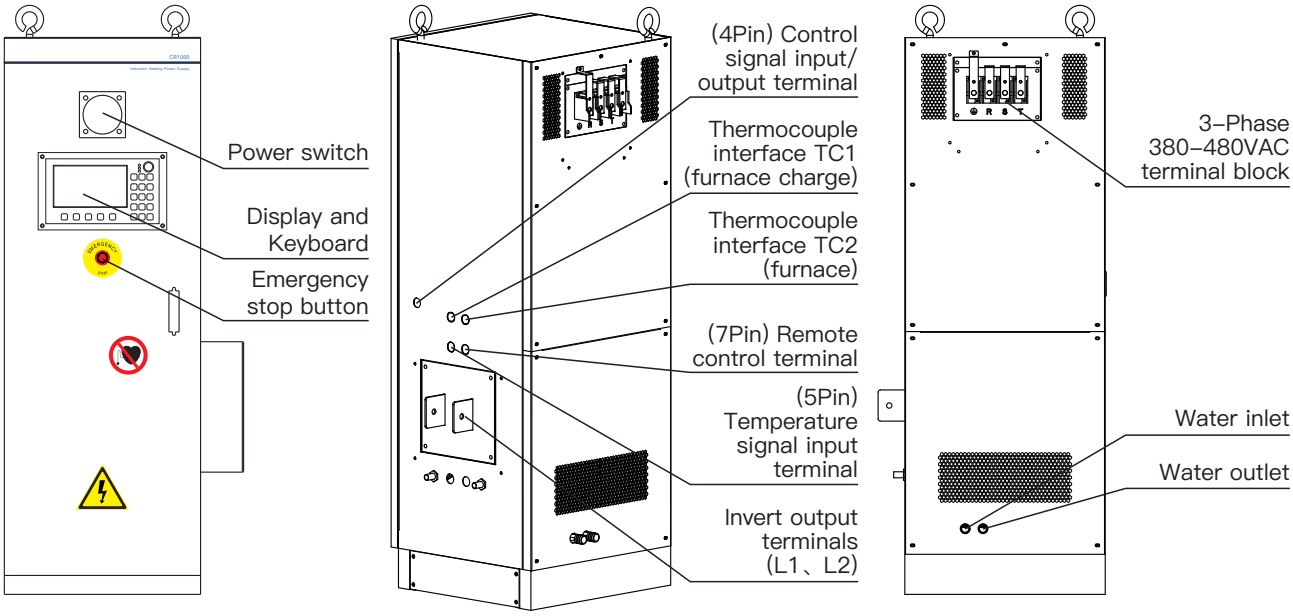
Induction heating machine should run with anti-flaming material, away from heat source and flammable objects in case of fire disaster.

4.2 Equipment Wiring Notices

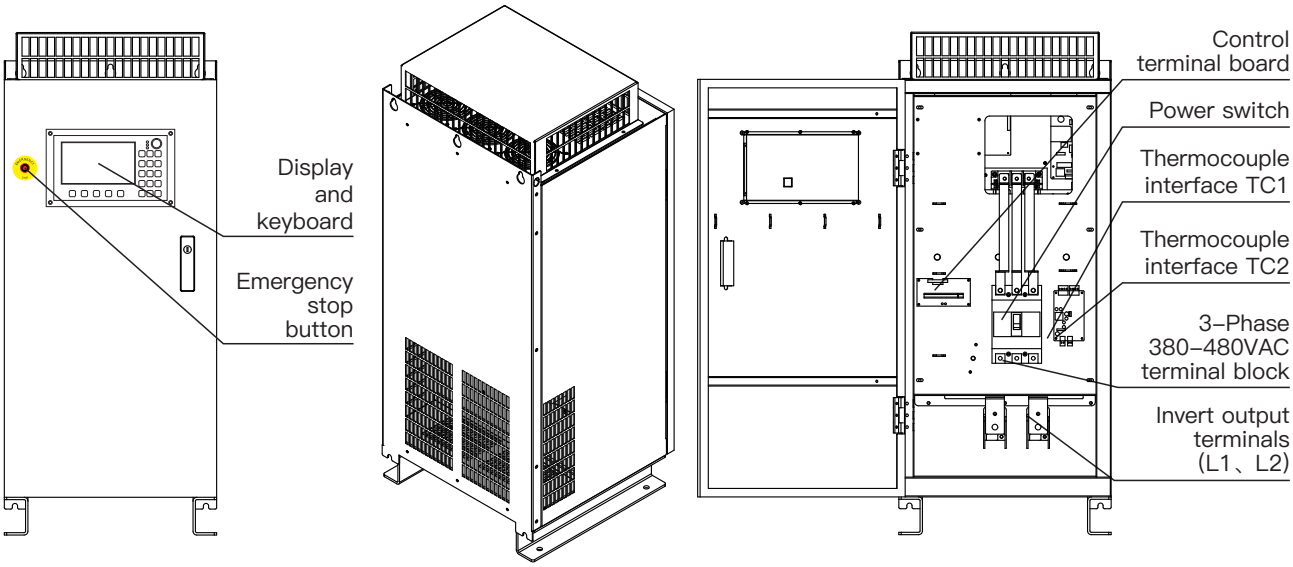
(1) Ensure input power switch off before wiring.
(2) Input power line must be permanently connected, equipment reliable grounding.
(3) The ground terminal of the equipment must be reliable grounding or it could cause a electric shock and fire hazard.
(4) Do not connect the input power line to the output terminals L1, L2 or it could damage the induction heating equipment.
(5) Do not touch the power input terminals R、S、T; output terminals L1, L2, meanwhile do not connect L1, L2 to the shell or short connect with line.

4.3 Equipment Layout and Wiring

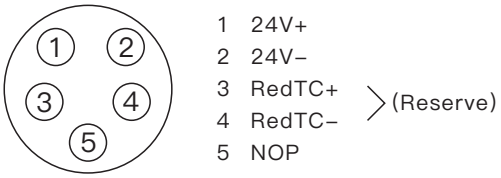
(1) CR1000-040A-14TW～CR1000-400A-24TW

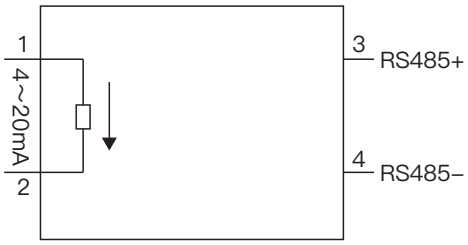


(2) CR1000-060A-14TF～CR1000-120A-14TF

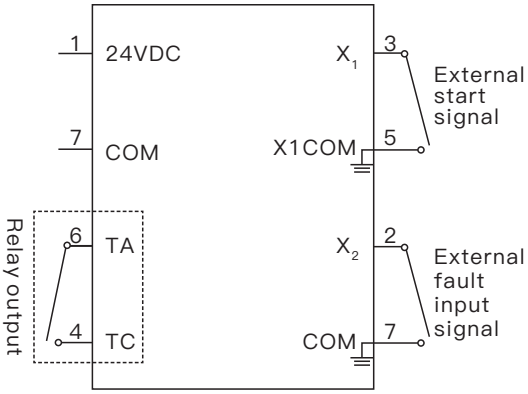


(3) 4Pin Remote control terminal pin definition





4Pin Remote control terminal pin definition



7Pin Remote control terminal pin definition

Wiring should conform with national and local regulation – only the qualified can conduct the wiring.

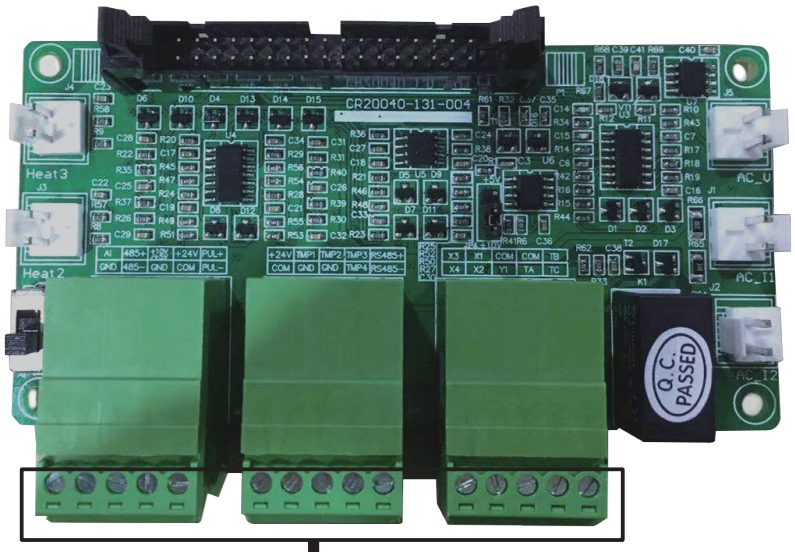
Disconnect or turn off the power before connecting the input wire.

Check input voltage. This unit supports 380VAC, 3–phase, 50/60Hz input power.

Check nameplate on the unit for rated value, see if the input voltage adapts:
Marks for input power connection part: Connect input wire to terminal R, S, T, and tighten the screw.
Marks for cutting off input power: OFF––disconnect equipment ON––connect equipment

4.4 Control Signal Wiring Terminal Instruction

The top view is as shown below:



AI	485+	+10V /+5V	+24V	PUL+
GND	485–	GND	COM	PUL–

+24V	TMP1	TMP2	TMP3	RS485+
COM	GND	GND	TMP4	RS485–

X3	X1	X1COM	COM	TB
X4	X2	Y1	TA	TC

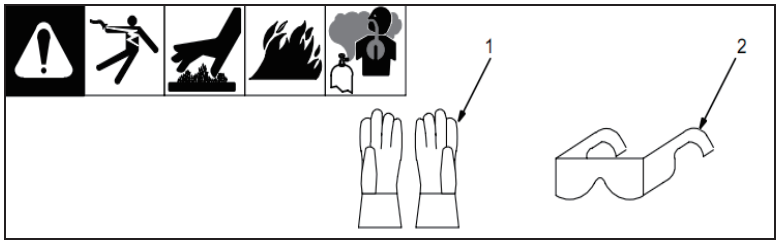
Category	Terminal No.	Name	Terminal Description
Input terminal	X1	Remote start terminal	(Common port: X1COM)
	X2	Input terminal 2～4	For details, see basic parameters P2.05～P2.07 Common port: COM
	X3		
	X4		
Power	+24V	+24V power	(Negative terminal: COM)
	+5V / +10V	+5V or +10V power	(Negative terminal: GND) Default 5V
	COM	24V ground	24V ground and common port
	GND	10V ground	10V ground and analog signal reference ground
Analog quantity input	AI	Analog quantity current/voltage signal input	When it is controlled by voltage 0～10V, set P2.00 parameter to 0～10V. When the current is 0～20mA/4～20mA control, set the P2.00 parameter to 0～20mA/4～20mA. The switching of the current/voltage signal is switched by the toggle switch mA<—>V on the left side of the terminal. Negative terminal: GND
	TMP1	Reserve	
	TMP2		
	TMP3		
	TMP4		
	RS485+	Communication interface, positive terminal	When using as 485 upper computer communication (slave): Connect 485+ to external MODBUS communication equipment D+ or A. Connect 485– to D– or B
	RS485–	Communication interface, negative terminal	
Pulse input	PUL+	24V pulse positive	24V pulse voltage control for running
	PUL–	24V pulse negative	
Output terminal	Y1	Output terminal 1	See basic parameters P2.08 for details. Negative terminal: COM
Relay output terminal	TA	Fault output relay	For details, see basic parameters P2.09 Normal: TA–TB closed, TA–TC disconnected In case of failure: TA–TB is disconnected, TA–TC is closed
	TB		
	TC		
External communication terminal	485+	Communication interface, positive terminal	When used as a 485 host computer communication (slave): 485+ is connected to D+ or A of external MODBUS communication equipment, 485– then D– or B. When used as transmitter communication (master): Connect to the corresponding 485+ and 485– of the transmitter.
	485–	Communication interface, negative terminal	

4.5 User Communication Interface Instruction

The control terminal of the equipment provides MODBUS communication ports 485+ and 485–. The upper computer and other equipment can be connected to the RS232~RS485 transmitter by connecting the serial port cable. The transmitter is a 9–core D–type socket, and the signal “A” is connected to the 485+ terminal control terminal , signal “B” is connected to the 485– terminal of the control terminal.

5. Display and Operation Control

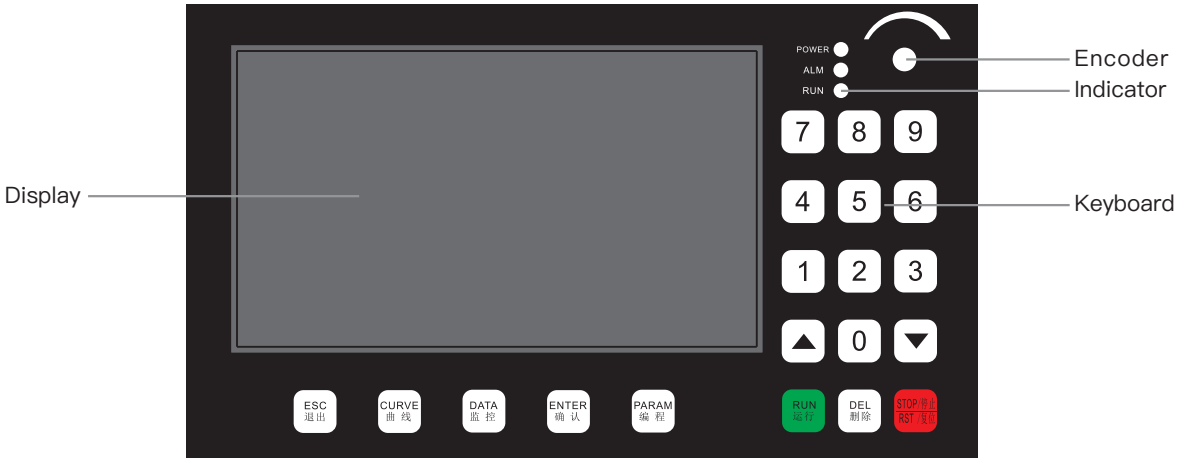
5.1 Safety Equipment



Wearing the following during operation:
1. Dry, insulating gloves;
2. Safety glasses with side shields;
Do not wear rings or watches during operations.

5.2 LCD Keyboard Instructions

Equipment display and operation mainly on the LCD and keyboard.
Following is the diagram and equipment display screen.



Button function instructions:

Sign	Button Name	Function Description
ESC 退出	Return button	Menu return
ENTER 确 认	Confirm button	Menu entry, parameter setting entry, setting parameter confirmation
RUN 运行	Run	In keyboard operation mode, press this key to start running
STOP 停止 RST 复位	Stop/reset button	In the keyboard operation mode, press this key to stop running; after stop, it can be reset in case of failure
▲	Increase/Up button	Data or parameter code add 1
▼	Decrease/Down button	Data or parameter code reduce 1
	Encoder	Power value addition or reduce adjustment during operation
PARAM 编 程	Basic parameter index button	Basic parameter quick index button
DATA 监 控	Monitor parameter index button	Monitoring parameter quick index button
CURVE 曲 线	Curve parameter index button	Programmable parameter quick index button
0	Digit 0	Digit code input
1	Digit 1	Digit code input

Sign	Button Name	Function Description
2	Digit 2	Digit code input
3	Digit 3	Digit code input
4	Digit 4	Digit code input
5	Digit 5	Digit code input
6	Digit 6	Digit code input
7	Digit 7	Digit code input
8	Digit 8	Digit code input
9	Digit 8	Digit code input
DEL 删除	Delete button	When entering a number, delete the value

5.3 Indicator and Display Mode

(1) Indicator Instructions:

Type		Function Instruction
Status indicator	POWER	Power indicator, light red when power on.
	RUN	Run indicator, light green when running.
	ALM	Alarm indicator, light yellow when equipment with fault or alarm.

(2) Display mode:

Basic parameter	Basic parameter code display format: PX.XX
Monitoring parameter	Monitoring parameter code display format: D–XX
Fault display	Fault code display format: E–XX
Alarm display	Alarm code display format: A–XX

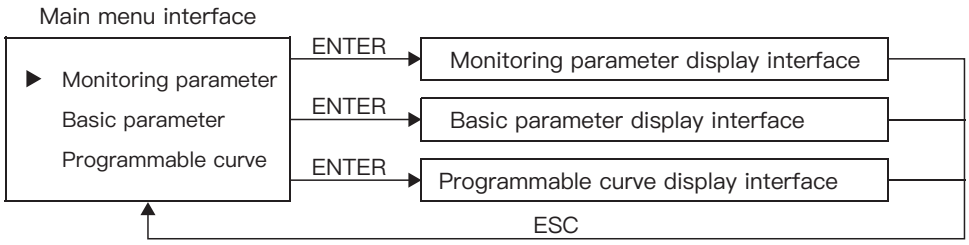
The latest fault code and the power, current and other values when the fault occurred are stored in the monitoring parameter D–30. Check the fault code record in D–30 of the monitoring parameter to obtain the latest first time, the latest second time, and the latest third time. ...fault code and fault information when a fault occurs.
Check the specific meaning of the basic parameters in PX.XX, please refer to 7.1 Basic Parameter Table;
Check the specific meaning of the monitoring parameter D–XX, please refer to 7.2 Monitoring Parameter Table;
Check the fault code E–XX and alarm code A–XX, please refer to 8.1 Fault and Alarm Parameter Table.

5.4 Parameter Screen Display and Setting

5.4.1 Main Menu, Main Interface Display

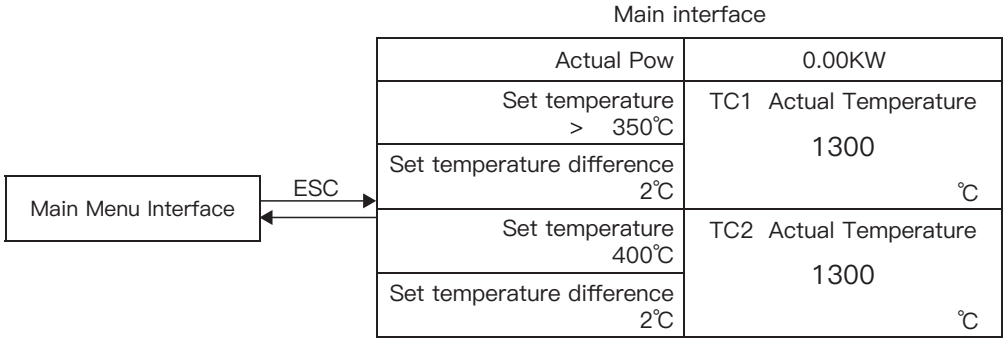
(1) Main Menu interface:

After power–on, the LCD screen displays the main menu interface, the main menu interface can be used to move the ▶ cursor up and down with the up and down keys, and enter the corresponding parameter interface with the ENTER key. As shown below:



(2) Main Interface:

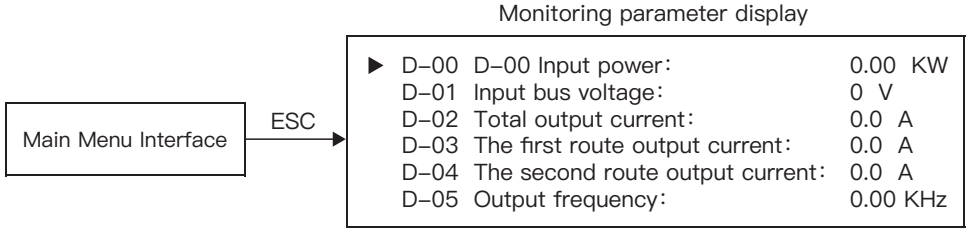
In the basic parameter and setting interface, if there is no button operation within half a minute, it will automatically jump to the main interface and display the parameters of the main interface. Press the ESC key on the main interface to return to the main menu interface. As shown below:



5.4.2 Monitoring Parameters, Fault Code Record Display

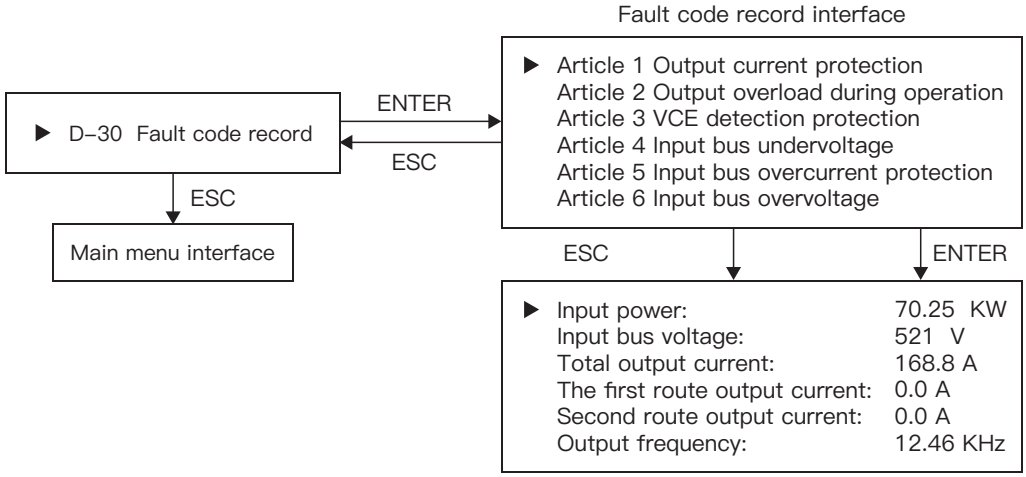
(1) Monitoring parameter display interface:

On the monitoring parameter interface, use the up and down keys to move the cursor ▶ up and down, and use the ESC key to return to the main menu interface. There are 33 monitoring parameters in total. If you need to view more monitoring parameters, please refer to 7.3 Monitoring parameter table. The specific value of the monitoring parameter can only be viewed but not modified. As shown below:



(2) Fault Code Recording Interface:

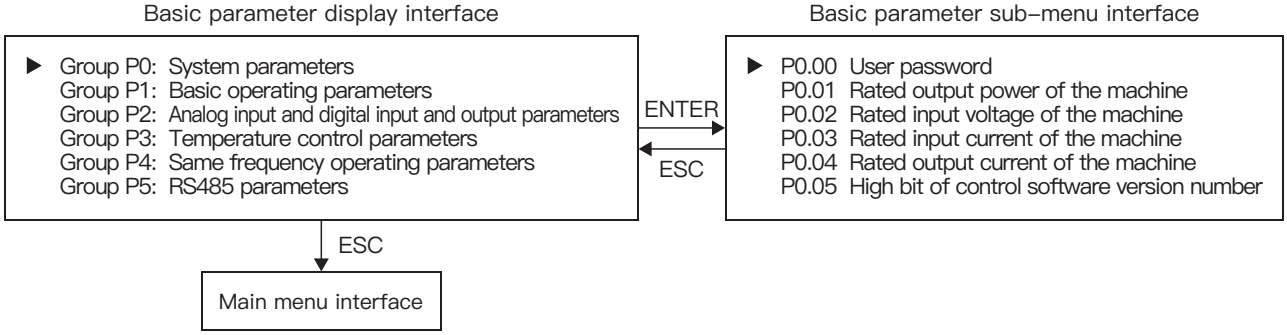
When the cursor ▶ locates on D-30 (fault code record), press ENTER to enter the fault code library interface, where you can view the fault codes that have occurred recently on the equipment, and the fault information when a fault occurs, such as: output current, output frequency , radiator temperature, etc. As shown below:



5.4.3 Basic Parameter Series Display

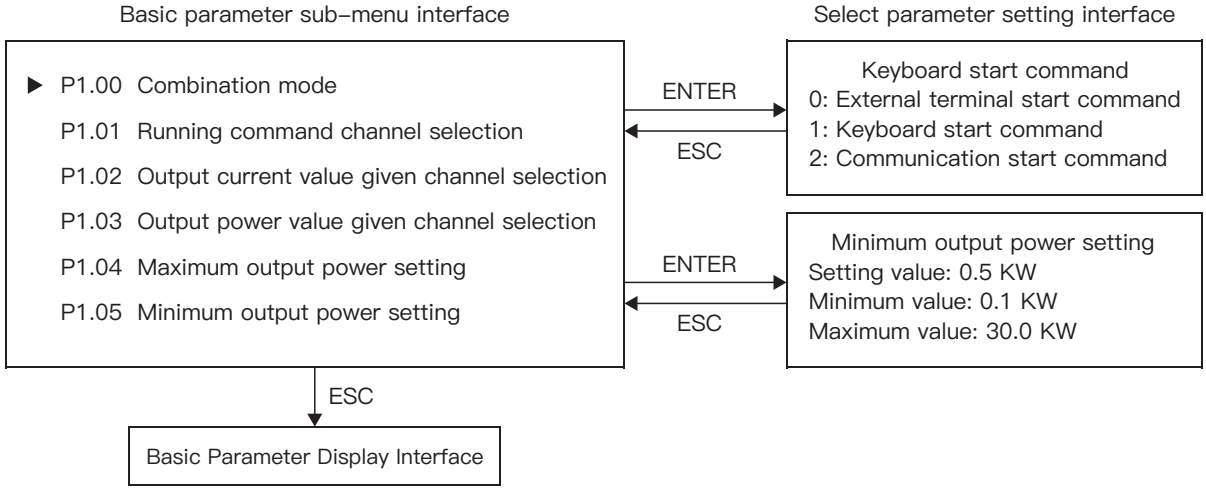
(1) Basic Parameter Display Interface

In the basic parameter interface, you can use the up and down keys to move the curso ▶ up and down, and use the ESC key to return to the main menu interface. There are 7 groups of basic parameters in total. If you need to view more basic parameters, please view the 7.1 basic parameter table. As shown below:



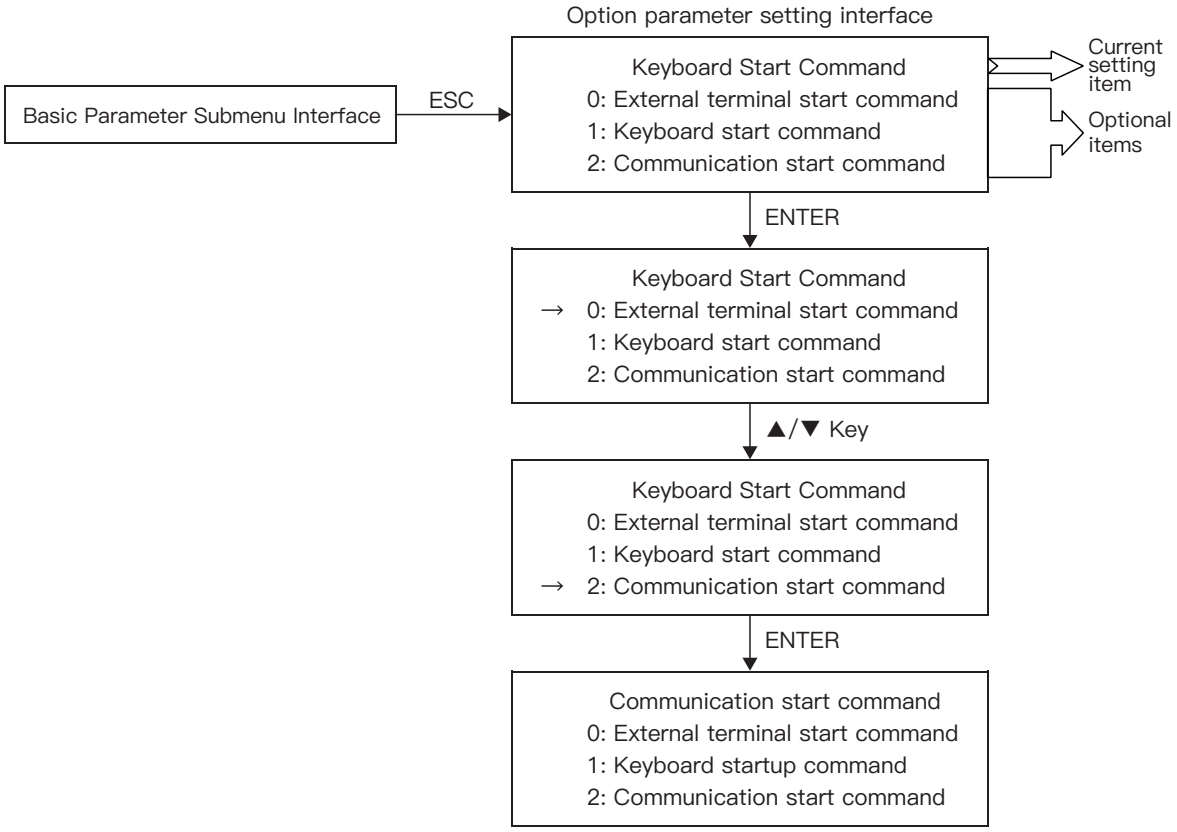
(2) Basic Parameter Sub-menu Interface:

In the basic parameter sub-menu interface, you can use the up and down keys to move the cursor ▶ up and down, and use the ESC key to return to the basic parameter menu interface. If you want to view more basic parameter sub-menus, please view 7.1 Basic Parameter Table. As shown below:

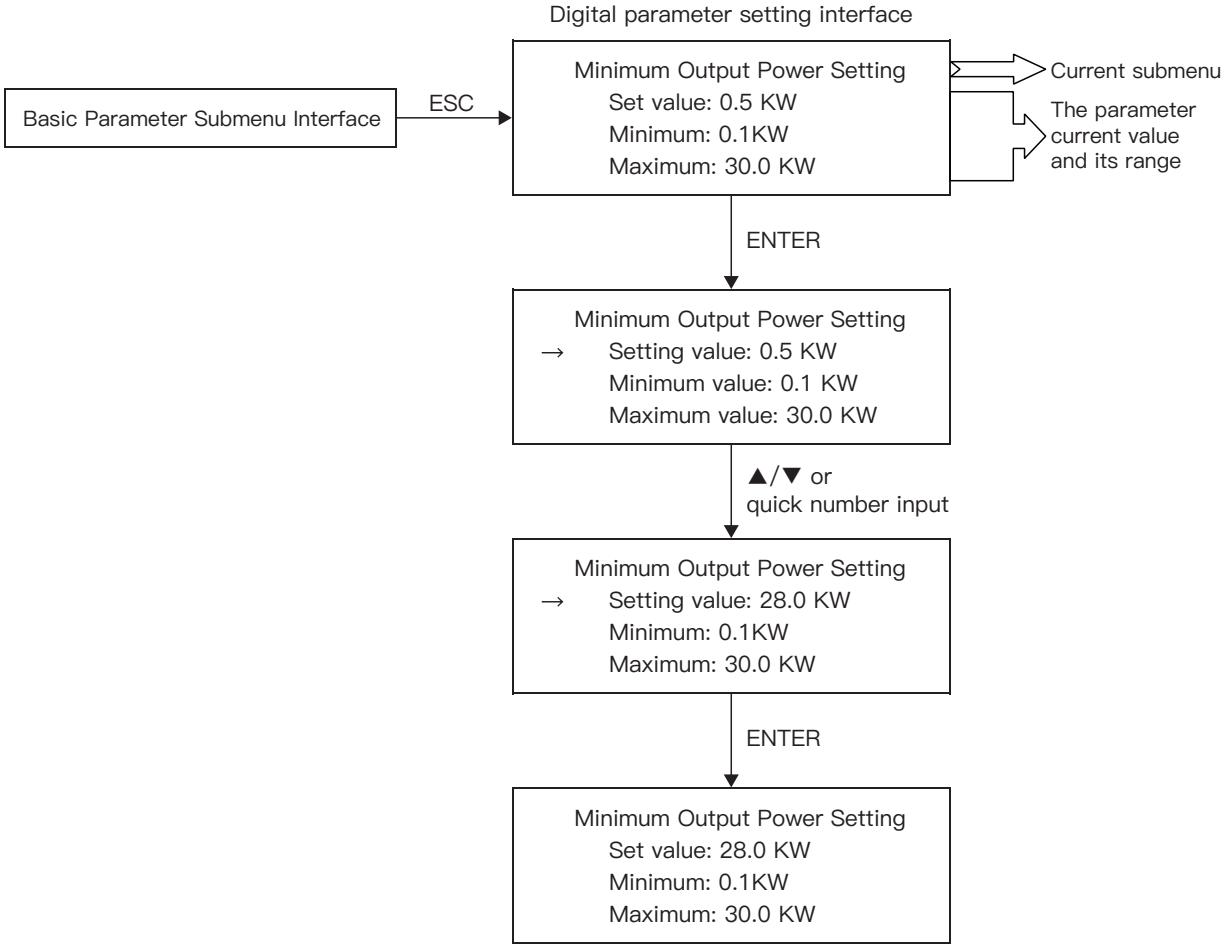


(3) Basic Parameter Setting Interface:

① Option parameter setting interface:
After entering the option parameter setting interface, press the ENTER key, and the selection cursor → appears on the lower selection item, indicating that the cursor can be moved with the up and down keys at this time. After selecting the desired item (as shown in the figure below: communication start command), press the ENTER key to confirm , select the cursor → disappear, and the position of the current setting item at the top of the screen is displayed as the latest setting item (as shown in the figure below: communication start command), which means that the parameter setting is completed. Use the ESC key to return to the basic parameter sub-menu interface. As shown below:



② Digital parameter setting interface:
After entering the digital parameter setting interface, press the ENTER key,the selection cursor → appears in the lower selection item, indicating that the up and down keys or fast numbers can be used to enter the required value (as shown below: 28.0). After the setting is completed, press the ENTER key to confirm. Select the cursor → disappear, and the set value position is displayed as the latest set value (as shown below: 28.0), which indicates that the parameter value setting is completed. The above minimum value and maximum value represent the input range of the set value. The minimum value and maximum value are fixed values and cannot be modified. Use the ESC key to return to the basic parameter sub-menu interface. As shown below:

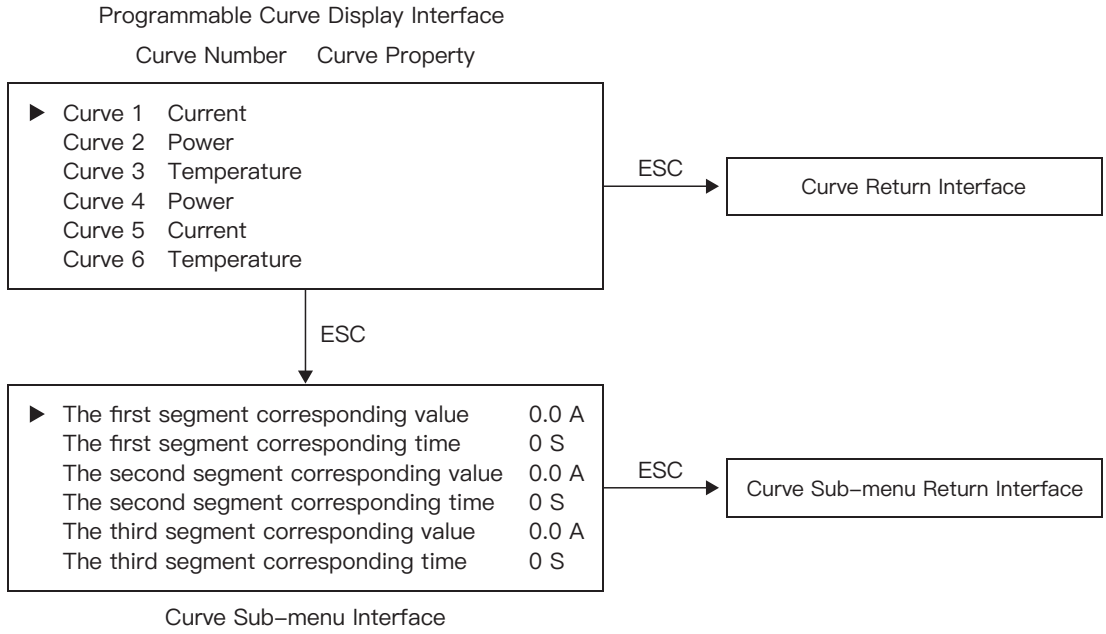


Note: There are limited conditions for changing some parameters, such as curve heating power and time, etc., and cannot be changed when the system is running. It can only be modified after the equipment is stop. For details, please refer to the symbol description at the end of the basic parameter table.

5.4.4 Curve Series Display

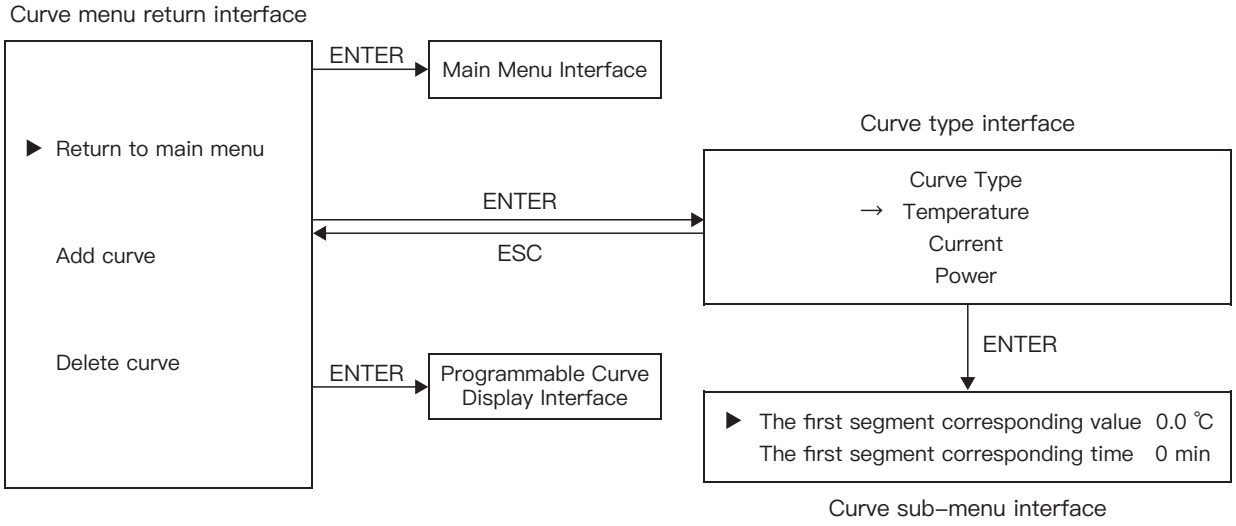
(1) Programmable Curve Display Interface:

After entering the programmable curve interface, press the ENTER key to enter the curve sub–menu interface. In this interface, you can view the number and segment values of the current curve. Press the ESC key to enter the curve return interface. As shown below:



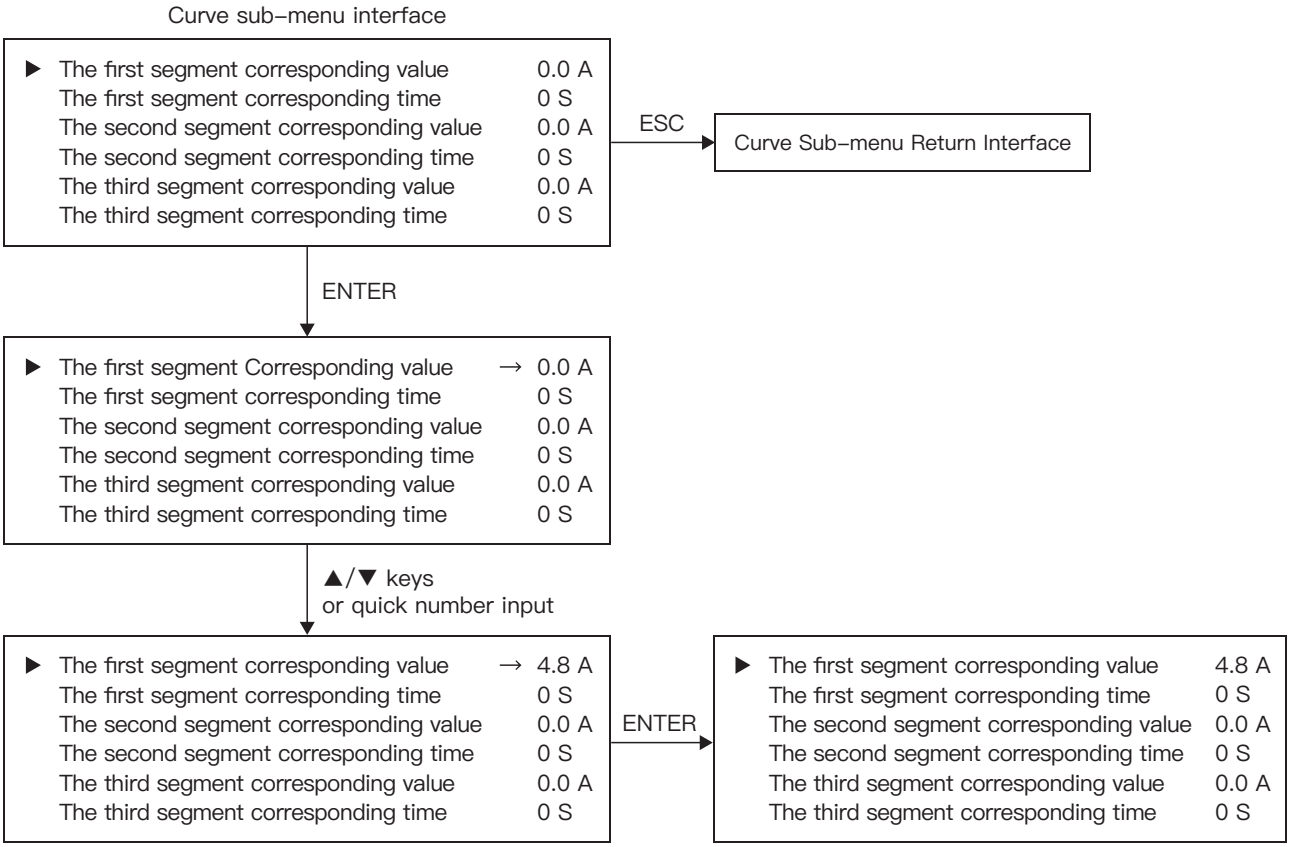
(2) Curve Return Interface:

After entering the curve menu return interface, when returning to the main menu position press the ENTER key to return to the main menu interface; When adding a curve, press ENTER to add a curve under the current position of the programmable curve, Enter the curve property type interface to select the attribute type of the new curve, and press Enter to select the end of the selection interface to enter the sub-menu interface of the new curve, where you can add the number of segments of the new curve and the corresponding value of the input segment. Press ENTER at the Delete curve position to delete the curve where the current cursor is located and return to the programmable curve display interface. As shown in the picture below:



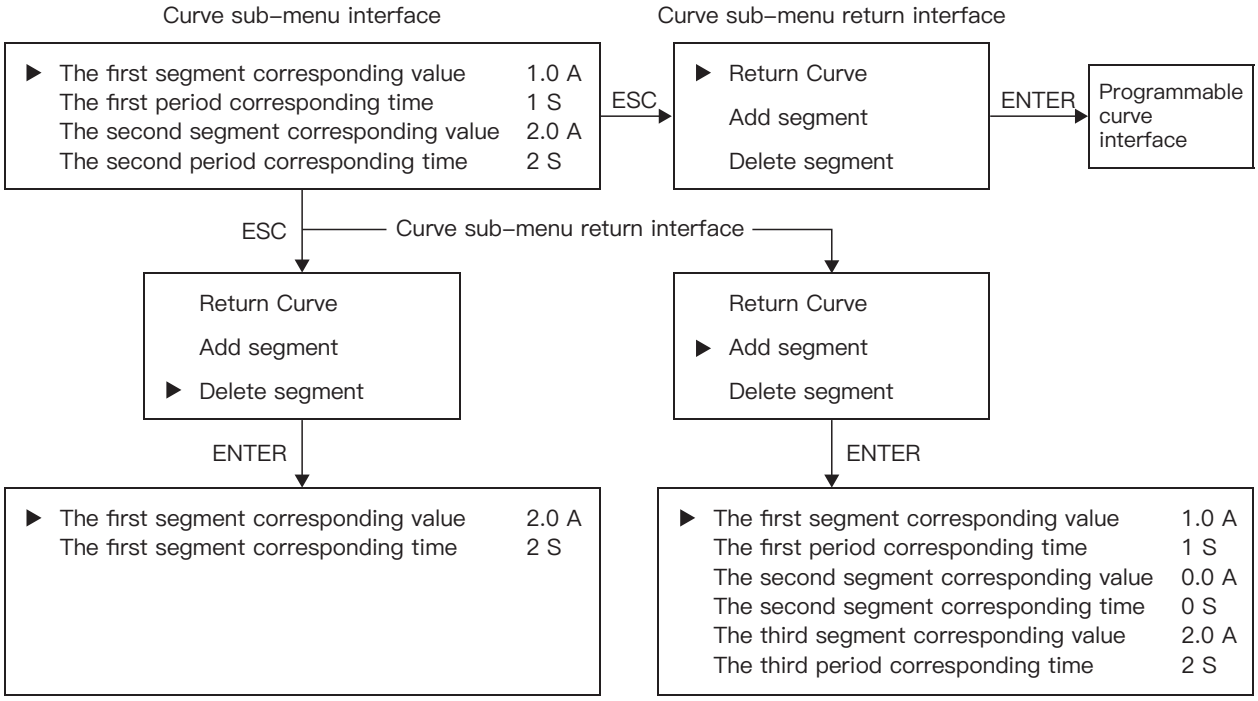
(3) Curve Sub-menu Interface:

After entering the curve sub-menu interface, press the ENTER key, and the selection cursor → will appear before the value of the segment address where the displacement cursor ▶ is located, indicating that the up and down keys or fast numbers can be used to input the required value (as shown below: 4.8). After the setting is completed, press the ENTER key to confirm, the selection cursor → disappear, and the setting position is displayed as the latest setting value (as shown in the figure below: 4.8), which indicates that the parameter value setting is completed. The above-mentioned set values have a maximum and a minimum range. If the value exceeds, the value setting will be unsuccessful, and the value before setting will be restored. Use the ESC key to enter the curve sub-menu return interface. As shown below:



(4) Curve sub–menu return interface:

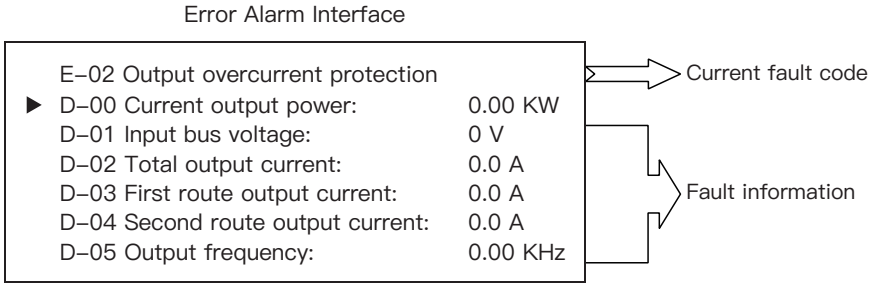
After entering the curve sub–menu return interface, press the ENTER key at the return position to return to the programmable curve interface; press the ENTER key at the adding segment position to add a segment (two) curves below the current segment position in the curve sub–menu segment interface , and return to the curve sub–menu segment interface. At this time, the cursor ▶ is positioned at the position of the newly added segment; press the ENTER key at the position of the deleted segment to delete the programmable curve where the current cursor is located, and return to the programmable curve display interface. As shown below:



5.4.5 Error Alarm Screen Display

Error Alarm Interface:

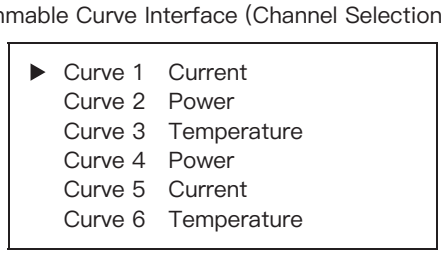
The error alarm interface displays the current fault code and the fault information when the error code has occurred. As shown below:



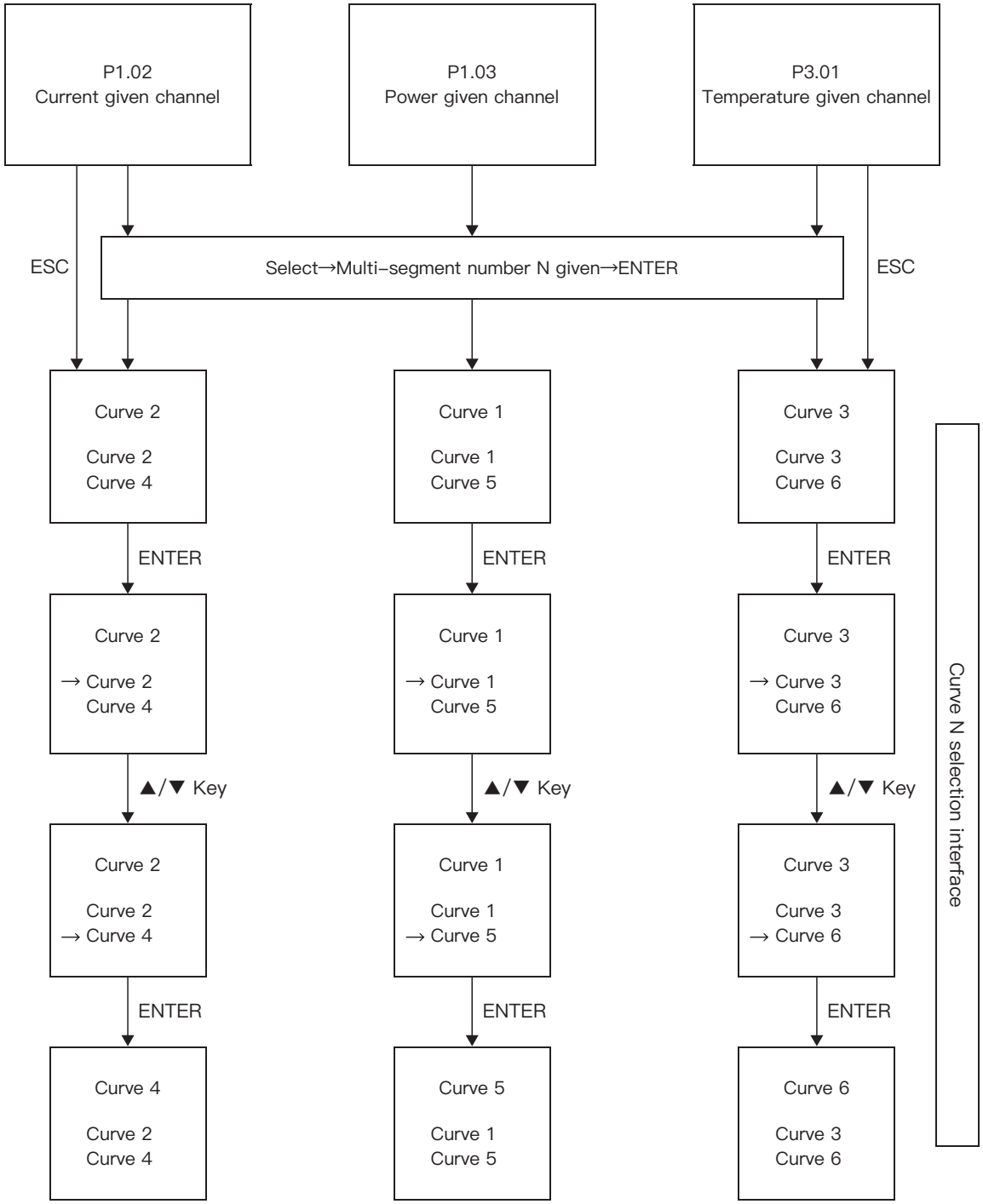
5.5 Multi–Segment Curve N Selection

Select the multi–segment number N given in the output current given value channel selection (P1.02), output power given value channel selection (P1.03) and temperature given channel (P3.01), press ENTER to enter the multi–segment curve N selection interface allows you to select the corresponding curve for the corresponding adjustment object. The selection channels for objects such as power, current and temperature are extracted from the programmable curve interface (channel selection library), as shown in the following figure:

(1) Channel Selection Library:



(2) Channel selection for each object of power, current and temperature:

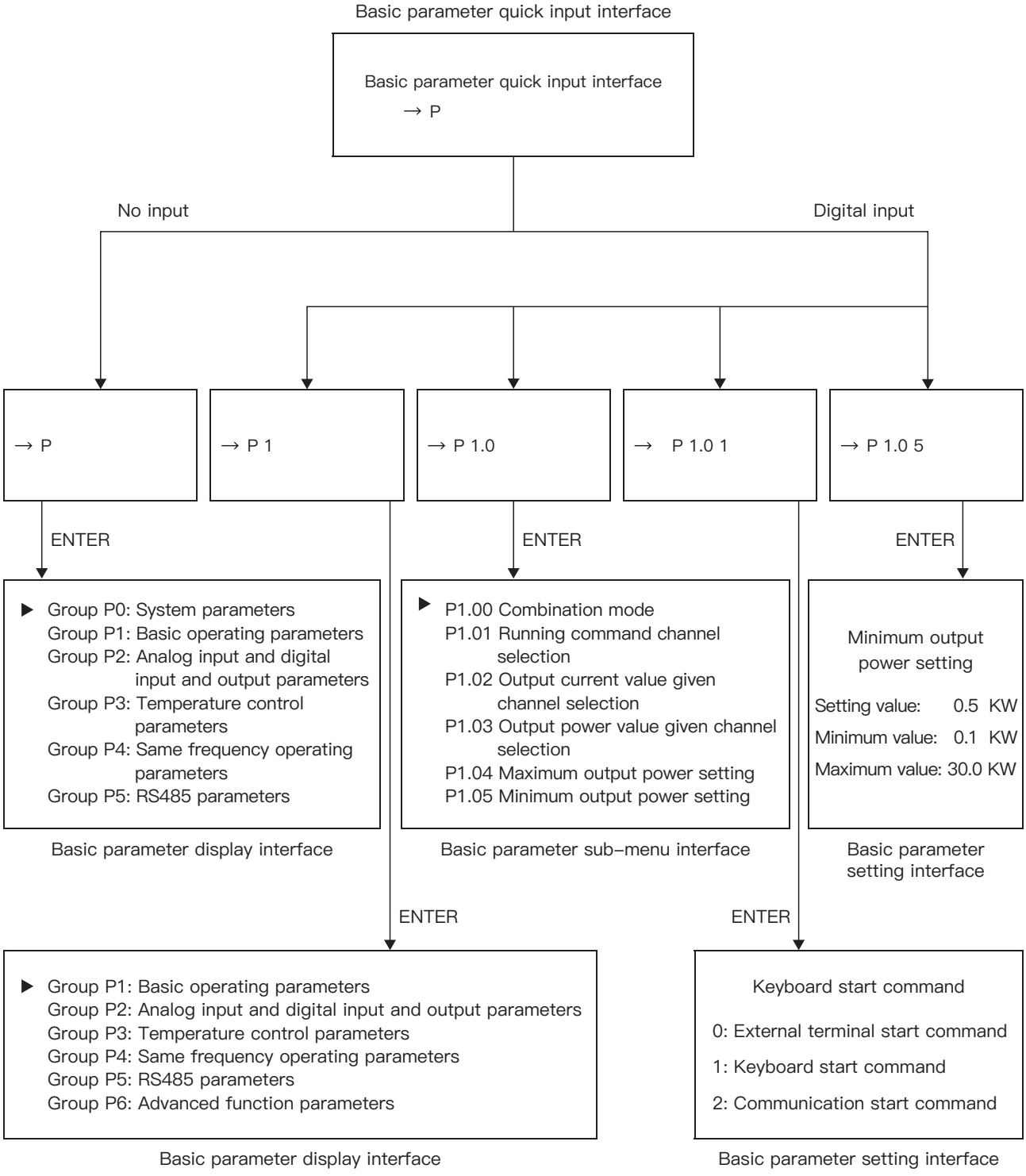


5.6 Quick Index (PARAM, DATA, CURVE) Interface

In other interfaces except the error alarm interface, press the PARAM, DATA, and CURVE shortcut keys to quickly enter the basic parameter index input interface, monitoring parameter index input interface, and programmable curve interface respectively.

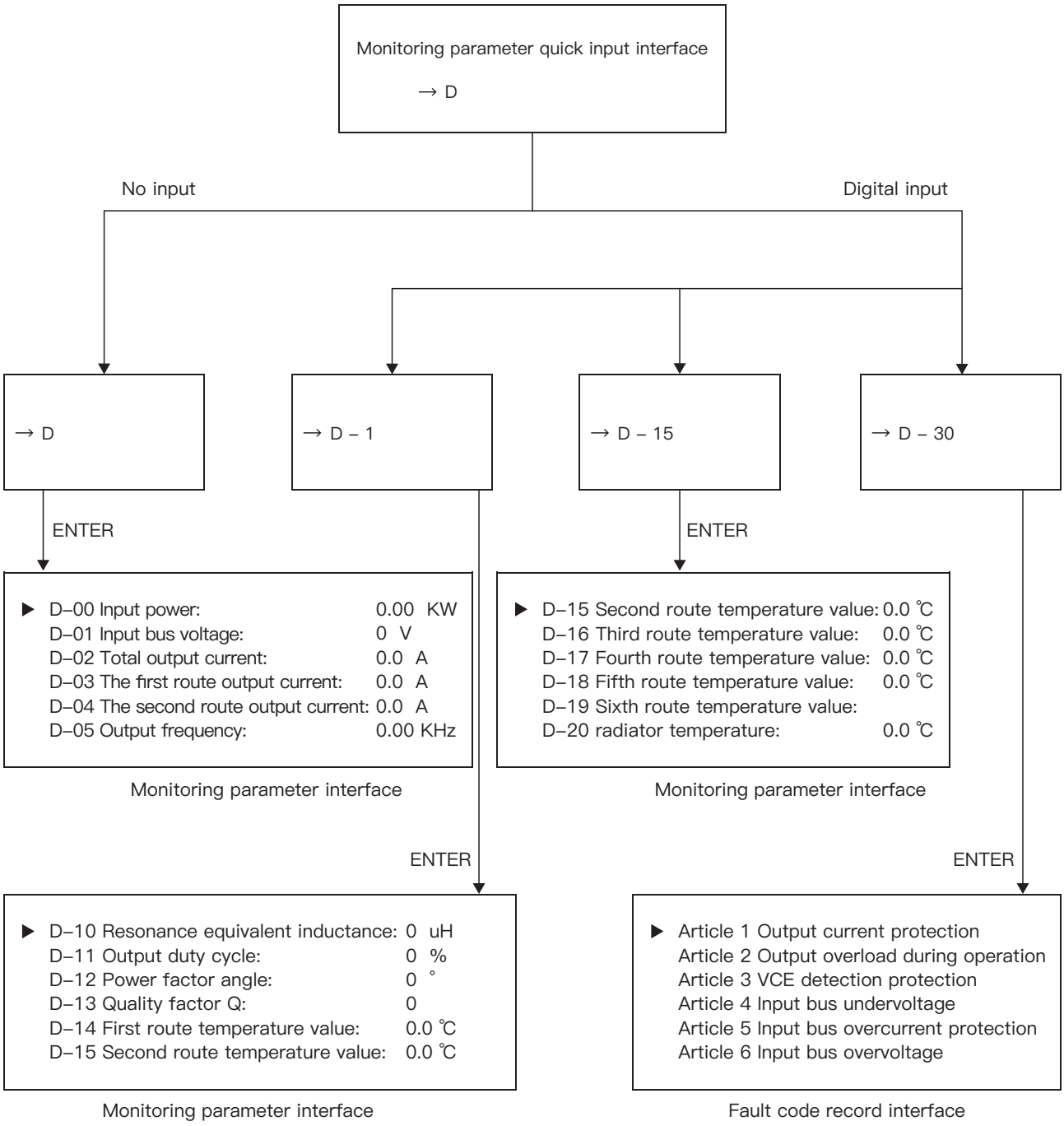
(1) Basic parameter quick input interface (quick index PARAM interface):

Press the PARAM key to enter the basic parameter quick input interface, enter the numeric key of the basic parameter number to be viewed or modified, and press the ENTER key to enter the corresponding basic parameter series interface (including basic parameter interface/basic parameter sub-menu interface/basic parameter Setting interface), if there is no key operation within 8 seconds of this interface, it will automatically jump to the parameter interface where the current parameter number is located. If there is no parameter number input, the default basic parameter number is 0 and it will automatically jump to the basic parameter interface. As shown below:



(2) Monitoring parameter quick input interface (quick index DATA interface):

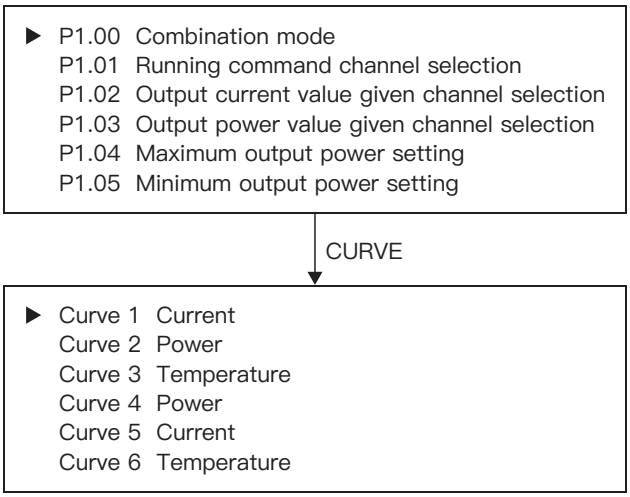
Press the DATA key to enter the monitoring parameter quick input interface, enter the number key of the monitoring number you want to view, and press the ENTER key to enter the corresponding monitoring parameter series interface (the monitoring parameter number is D–30 to enter the fault code recording interface, other monitoring parameters number to enter the monitoring parameter interface), if there is no key operation within 8S of this interface, it will automatically jump to the parameter interface where the current parameter number is located. If there is no parameter number input, the default monitoring parameter number is 0 and it will automatically jump to the monitoring parameter interface. As shown below:



(3) Curve parameter quick input interface (quick index CURVE interface):

In other interfaces except the error alarm interface, press the CURVE key to directly enter the programmable curve interface, as shown in the figure below:

Basic parameter sub-menu interface
(This can be any interface except the error alarm interface)



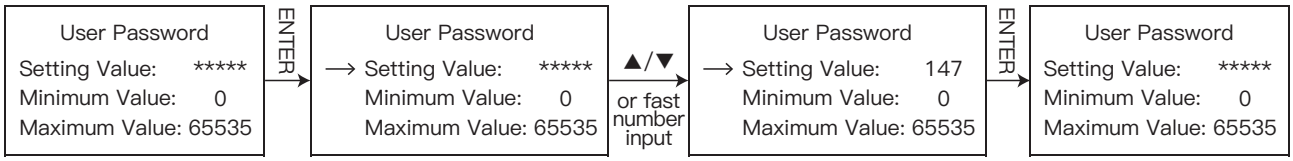
Programmable curve display interface

5.7 Password Setting And Verification

(1) Password Setting

From the password parameters (P0.00, P6.19, P7.00) to enter the parameter setting interface,can press ▲ ▼ key or fast number enter the password, after press ENTER key, the password has been set and saved. As shown below:

Password setting interface

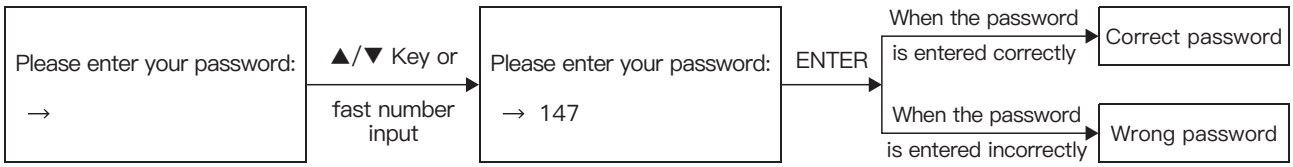


① User password (P0.00) function
After the user password is set, all adjustable parameters after the user password cannot be viewed and modified.
② Operation limit password (P6.19)
After the operation limit password is set, the two parameters of limit operation setting (P6.20) and limit operation time setting (P6.21) cannot be modified.

(2) Password Verification

When entering the basic parameter series interface from other interfaces, if there is a user password, the verification password parameter interface will pop up, can press the ▲ ▼ key or number keys to enter the known password value, press ENTER key to confirm the password input verification. If the password is entered correctly, it will display "Correct Password", if the password is wrong, it will display "Wrong Password", and then return to the verification password parameter interface. As shown below:

Enter the verification interface that pops up before the password parameter



Note: If forget the password, please contact the manufacturer.

6. Function Instruction

6.1 Three Run Command Start Modes

The machine has three command start modes that control the start/stop operation of the device:

External terminal start:

Set the running command channel selection (P1.01) to the external terminal start command. Select this option when you need to use a remote control switch (inserted into the ON/OFF wiring port) to control the start/stop of the device.

Keyboard start:

Set the running command channel (P1.01) as the keyboard start command.Select this item when you need to use the keys  on the keyboard to control the start/stop of the device.

Communication start:

Set the running command channel (P1.01) as the communication start command. Select this item when it is necessary to control the start/stop of the device through 485 communication.

6.2 Output Power Value Given Channel Selection

Digital given (P1.04) :

Set the output power value given channel (P1.03) to the digital given heating mode. At this time, the output power is given by the maximum output power given value (P1.04) for heating. You can adjust the maximum output power (P1.04) and minimum output power (P1.05) to set the maximum power output value and minimum output power value.

Temperature control given heating mode:

Set the output power value given channel (P1.03) to the temperature control given heating mode, at this time the output power is controlled by the temperature, and the control performance can be adjusted by adjusting the parameters of group P3.

AI1 given heating mode:

Set the output power value given channel (P1.03) to AI1 given heating mode. At this time, the heating power can be given by the analog quantity AI1, and the AI1 given can be set by adjusting (P2.00) ～ (P2.03) for the power output value. AI1 group parameter details, please refer to (P2.00) ～ (P2.03) in 7.2 Basic Parameter Description.

Curve given heating mode:

Set the output power value given channel (P1.03) to the curve given heating mode, the heating power is given by the curve, and the curve start power (P6.22) and heating time (P6.23) can be set to make it Heating according to the predetermined curve.

Multi-segment number N given heating mode:

Set the output power value given channel (P1.03) as the multi-segment number N given heating mode, the heating power is given by the multi-segment number N, you can choose to set the heating curve number, set the number of segments in the heating curve, and each segment the heating power and heating time length, make it run according to the predeter-mined heating curve mode.

6.3 Output Current Value Given Channel Selection

Digital given (P1.06):

Set the output current value given channel selection (P1.02) to digital given (P1.06), at this time the output current is given by the maximum output current setting (P1.06), which can be adjusted by (P1.06) to set the maximum output current.

AI1 given heating mode:

Set the output current value given channel selection(P1.02) as AI1 given heating mode. At this time, the output current can be given by analog quantity AI1, AI1 given current output value can be set by adjusting (P2.00) ～ (P2.03), the detailed explanation of AI1 group parameters can refer to (P2.00) ～ (P2.03) in 7.2 Basic parameter detailed explanation.

Multi-segment number N given heating mode:

Set the output current value given channel selection (P1.02) as the multi-segment number N given heating mode, the output current is given by the multi-segment number N, you can choose to set the heating curve number, set the middle segment number of the heating curve, and each the segment heating current and heating time length, make it operate according to the predetermined heating curve mode, and skip the segment whose current is set to zero during operation.

6.4 Power-on Start Function Selection

Do not run when the power-on terminal is short connected:

Set the power-on start-up mode selection (P1.09) to not run when the power-on terminal is short-connected. At this time, when the device is powered on and the running terminal is in a valid state when it is powered on, the device will not start to run. It can only run when the running terminal is released first and then the running terminal is enabled again.

Run when the power-on terminal is short connected:

Set the power-on start-up mode selection (P1.09) to run when the power-on terminal is short-connected. At this time, when the device is powered on and the running terminal is in a valid state when it is powered on, the device starts to run. Using this mode can automatically detect the status of the device when the power is cut off in an unexpected situation, and automatically run to ensure automatic recovery after an unexpected power off.

Note: This function is only valid when the running command channel is selected as external terminal command start.

6.5 Parameter Initialization Function

Set the parameter initialization (P0.08) to no action, and the parameters will not be initialized at this time.

Set the parameter initialization (P0.08) as parameter initialization. At this time, the parameters are initialized and the parameters are restored to the factory value. When the parameter setting is wrong or other states are abnormal, this func-tion can be enabled as appropriate.

6.6 Control Input Terminal Xn Function (n=2,3,4)

Idle control terminal:
Set the input terminal Xn function (P2.05) ~ (P2.07) as the control terminal idle, when Xn and COM are short-connect, the terminal function does not action.
Emergency stop control:
Set the input terminal Xn function (P2.05) ~ (P2.07) to emergency stop control, when Xn and COM are short-connect, the device immediately blocks the output and stops.
External reset signal input (RST):
Set the input terminal Xn function (P2.05) ~ (P2.07) as external reset signal input, and clear the error code that can be cleared by reset when Xn and COM are short-connect.
External device fault input:
Set the input terminal Xn function (P2.05) ~ (P2.07) as the external device fault input. At this time, the external input device can be connected. If the external input device is faulty, the error code indicating the external device fault (E-15) is reported.
Heat preservation signal input:
Set the input terminal Xn function (P2.05) to (P2.07) as the heat preservation signal input. When the load heating temperature has reached and the heating process has been completed, the load generates a heat preservation signal. When the device receives the heat preservation signal, it immediately enters the heat preservation state from the heating state, so that the load enters the constant temperature state.

6.7 Control Output Terminal Ym And Rm Function (m=1)

No output:
Set the output terminal Ym and Rm functions (P2.08) ~ (P2.09) to no output, at this time the terminal function does not action.
Run:
Set the output terminal Ym and Rm function (P2.08) ~ (P2.09) to run, when the induction heating power supply is in the running state, this terminal is valid.
Fault output:
Set the output terminal Ym and Rm function (P2.08) ~ (P2.09) as fault output, when the induction heating power supply is in a fault state, this terminal is valid.
Load temperature alarm indication 1:
When the furnace charge temperature is greater than the furnace charge set temperature minus the furnace charge set temperature difference and less than the furnace charge set temperature plus the furnace charge set temperature difference, this terminal is in the valid state.
Load temperature alarm indication 2:
When the furnace charge temperature is less than the furnace charge set temperature minus the furnace charge set temperature difference or greater than the furnace charge set temperature plus the furnace charge set temperature difference, this terminal is in a valid state.
Load temperature rise indication:
Set the output terminal Ym and Rm function (P2.08) ~ (P2.09) as load temperature rise indication, when the load temperature is in the state of heating up, this terminal is valid.
Load temperature drop indication:
Set the output terminal Ym and Rm function (P2.08) ~ (P2.09) as load temperature drop indication, when the load temperature is in the temperature drop state, this terminal is valid.
TC1 alarm indication:
Set the output terminal Ym and Rm function (P2.08) ~ (P2.09) as TC1 alarm indication, when the TC1 temperature reaches the target temperature, this terminal is in a valid state.

6.8 Load Temperature, Transformer Temperature Measurement, Coil Temperature Measurement Feedback Disconnection Processing

Not processing:
Set load temperature (P6.08)/transformer temperature (P6.11)/coil temperature (P6.14) feedback disconnection processing to no processing, and feedback disconnection will not be processed at this time.
Protect action and block output immediately:
Set the load temperature (P6.08)/transformer temperature (P6.11)/coil temperature (P6.14) feedback disconnection processing as protect action and block output immediately. When the feedback disconnection is detected, the protection action is executed and blocked power output.
Alarm and maintain operation with the power at the moment of disconnection:
Set the load temperature (P6.08)/transformer temperature (P6.11)/coil temperature (P6.14) feedback disconnection processing as alarm and maintain operation with the power at the moment of disconnection. When the feedback disconnection is detected, the feedback disconnection alarm is displayed and the operation continues with the power at the moment of disconnection.

6.9 Combination Mode Selection

Standalone mode:
Set the combination mode (P1.00) to standalone mode, at this time, the device loads one-to-one output.
Multi-drag-one mode:
Set the combination mode (P1.00) to multi-drag-one mode, and at this time two or more devices carry one load for many-to-one output. Synchronization factors are involved in the two devices in the multi-drag-one mode and between the two devices. For details on the synchronization parameter settings, see 6.11 Synchronization Parameter Selection.

Note: Multiple devices in multi-drag-one mode must be of the same type, and the loads must also be of the same nature.

6.10 Synchronization Parameter Selection

(1) Set sync output
That is, set the combination mode to multi-drag-one mode, see 6.10 combination mode selection for details;
(2) Master-slave machine selection
Master machine:
Set the master-slave machine selection (P4.00) as master machine. At this time, the device acts as the master during synchronous communication and can send data to other synchronous devices.
Slave machine:
Set the combination mode (P4.00) as slave machine, at this time, the device acts as a slave during synchronous communication, and can receive the data sent by the master machine during synchronous communication.
(3) ID setting
Each device in the same-frequency communication has its own ID address, which can be known through the ID address, so that the device can know which device to send data to, or which device the received data is sent from. Set the ID setting (P4.01) to the corresponding ID address.

6.11 Temperature Control Selection Parameter (P1.03 Is Temperature Control Given)

(1) System parameter self-detection selection (parameter P3.08)
No action:
Set the system parameter self-detection selection (P3.08) to no action, at this time the system parameter will not be automatically detection.
System parameter detection:
Set the system parameter self-detection selection (P3.08) to system parameter detection. At this time, the device will automatically detect the system parameters according to the load status, so that the temperature control can reach the optimal state.
(2) Temperature adjustment mode selection (parameter P3.07)
Manual setting of PID control:
Set the temperature adjustment mode selection (P3.07) to manual setting of PID control. At this time you can set the PID parameters (proportional gain high and low bits (P3.11~P3.12), integral time (P3.13), Derivative time (P3.14)) value according to the actual situation.
Self-tuning PID control:
Set the temperature adjustment mode selection (P3.07) to self-tuning PID control. At this time, the device automatically adjusts the PID parameter value according to the load condition. The premise is that the actual PID parameter value must be set to the system parameter detection through the system parameter self-detection selection (P3.08).
Fuzzy control:
Set the temperature adjustment mode selection (P3.07) as fuzzy control, at this time, the device controls and adjusts the load temperature according to the internally set rules.
When the temperature overshoot does not meet the requirements, the value of parameter P3.09 can be increased appropriately, but it may affect the temperature rising speed.
When the stable deviation temperature does not meet the requirements, the value of P3.10 can be appropriately reduced.
(3) Control the number of thermocouples (parameter P3.22)
Select the number of thermocouples to measure the load temperature.
(4) Multi-point sampling main control temperature selection (parameter P3.23)
The first route～the sixth route:
Set the multi-point sampling main control temperature as the Nth route. At this time, the device uses the temperature of the Nth (TCN) thermocouple as the main control temperature. The number of route selected must not be greater than the value set by the parameter P3.22.
Highest temperature:
At this time, the highest temperature value detected by the device from the range of the control thermocouples number is used as the main control temperature.
Lowest temperature:
At this time, the lowest temperature value detected by the device from the range of the control thermocouples number is used as the main control temperature.
(5) Multi-point temperature deviation maximum control (parameter P3.24)
When the value of parameter P3.24 is greater than zero, the deviation between the maximum and minimum value of the multi-route (P3.22 value) temperature sampling point is controlled within the range set by P3.24.

6.12 RS485 Comunication Control

Through the RS485 interface of the device, according to the relevant protocol, the remote communication function can be realized:
- Control the start and stop of device
- Set basic parameters of device (including operation mode, etc.)
- Check the equipment parameter values (including maximum and minimum values of basic parameters, etc.)
- Read fault code
- Monitor device status

Communication settings instructions:
(1) If you need to use RS485 to communicate with the device, you must set the RS485 communication selection (P5.00) as 1, that is to open the communication function.
(2) When it is necessary to control the start and stop of the device through RS485, it is necessary to set the running command selection (P1.01) as 2, that is, choose RS485 communication mode to control start and stop.

Note: For the specific communication protocol, please refer to Appendix 1: RS485 Communication Protocol

7. Parameter Table

7.1 Basic Parameter Table

CR1000 Basic Parameter Table

Label instructions:
"×" indicate the parameter can not be modified under running.
"◆" indicate the parameter value is actual value, can not be modified.
"○" indicate the parameter set value can be modified under running.
"–" indicate the parameter can not be modified as a reservation.
"◇" manufacturer parameter, only manufacturers modify, users are not permitted.

P0 Group: System Parameter					
Function	Instruction	Set Scope	Unit	Factory Set Value	Modify
P0.00	User password	0～65535	1	****	×
P0.01	Machine rated output power	0.0KW～6553.5KW	0.1KW	Model setting	◆
P0.02	Machine rated input voltage	220V～380V	1V	Model setting	◆
P0.03	Machine rated input current	0.0A～6553.5A	0.1A	Model setting	◆
P0.04	Machine rated output current	0.0A～6553.5A	0.1A	Model setting	◆
P0.05	Control software version (high)	0000～FFFF	1	Model setting	◆
P0.06	Control software version (low)	0000～FFFF	1	Model setting	◆
P0.07	Keyboard board software version	1.00～655.35	0.01	1.00	◆
P0.03	Parameter Initialization	0: No Action 1: User parameter restore factory value	1	0	×
P1 Group: Basic Running Parameter					
P1.00	Combination mode	0: Standalone mode 1: Multi–drag–one mode	1	0	×
P1.01	Running command channel selection	0: External terminal start command 1: Keyboard start command 2: Communication start command	1	1	×
P1.02	Output current value given channel selection	0: Digital given (P1.06) 1: AI1 given 2: Multi–segment number N given	1	0	×
P1.03	Output power value given channel selection	0: Digital given (P1.04) 1: Temperature control given 2: AI1 given 3: Curve given 4: The multi–segment number N given	1	1	×
P1.04	Maximum output power setting	5～15KW：0.1KW～Pe*1.2KW 20～300KW：0.1KW～Pe*1.05KW	0.1KW	Model setting	○
P1.05	Minimum output power setting	0.5～【P1.04】	0.1KW	0.5KW	◆
P1.06	Maximum output current setting	1.0A～Ie*1.2A	0.1A	Model setting	◆
P1.07	Output frequency lower limit setting	3.00KHz～【P1.08】	0.01KHz	Model setting	×
P1.08	Output frequency upper limit setting	【P1.07】～35.00KHz	0.01KHz	Model setting	×
P1.09	Power–on start mode selection	0: Do not run when the start terminal is valid after power–on 1: Run when the start terminal is valid after power on	1	0	×
P1.10	Encoder power regulation rate	1～300	1	30	○
P1.11	Reserved	——	——	——	–
P1.12	Reserved	——	——	——	–

P2 Group: Analog Input And Output And Digital Input And Output Parameters					
Function	Instruction	Set Scope	Unit	Factory Set Value	Modify
P2.00	AI1 input characteristics	0: 0V～10V input 1: 4mA～20mA input 2: 0mA～20mA input	1	0	○
P2.01	AI1 input filter time	0.00s～10.00s	0.01s	0.10s	○
P2.02	AI1 lower limit corresponding value	0～100%	1	0%	○
P2.03	AI1 upper limit corresponding value	0～100%	1	100%	○
P2.04	Input terminal X1 function	Run/stop	1	/	×
P2.05	Input terminal X2 function	0: The control terminal is idle 1: Emergency stop control 2: External reset signal input 3: External device fault input 4: Cooling system fault	1	3	×
P2.06	Input terminal X3 function		1	3	×
P2.07	Input terminal X4 function		1	4	×
P2.08	Open collector output terminal Y1 setting	0: No output 1: Run 2: Fault output 3: Load temperature alarm indication 1 4: Load temperature alarm indication 2 5: Load temperature rise indication 6: Load temperature drop indication 7: TC1 alarm indication	1	1	×
P2.09	Programmable relay R1 output		1	2	×
P2.10	Reserved	——	——	——	–
P2.11	Reserved	——	——	——	–
P2.12	Reserved	——	——	——	–
P3 Group: Temperature Control Parameters					
P3.00	Maximum temperature (transmitter range)	0～2000℃	1℃	2000℃	×
P3.01	Temperature given channel	0: Digital constant temperature given 1: Multi-segment number N given	1	0	×
P3.02	Temperature digital given amount	0～P3.00℃	1℃	150℃	○
P3.03	Feedback channel HEAT characteristics	0: 0V～10V input 1: 4mA～20mA input 2: 0mA～20mA input 3: Communication input	1	3	×
P3.04	Feedback channel HEAT filter time	0.00s～10.00s	0.01s	1.00s	○
P3.05	Feedback channel corresponding lower limit value	0～2000℃	1℃	0℃	○
P3.06	Feedback channel corresponding upper limit value	0～2000℃	1℃	1300℃	○
P3.07	Temperature adjustment mode selection	0: Manually set PID control 1: Self-tuning PID control 2: Fuzzy control 3: Switch type control	1	2	×
P3.08	System parameter self-detection selection	0: No action 1: System parameter detection	1	0	×
P3.09	Input quantization factor coefficient	1.0～10.0	0.1	5.0	×
P3.10	Output scale factor coefficient	0.0～6553.5	0.1	6.0	○
P3.11	Proportional gain high bit	0～65535	1	1	○
P3.12	Proportional gain	0～655.35	0.01	60.00	○
P3.13	Integration time	0.00s～655.35s	0.01s	0.20s	○
P3.14	Differential time	0.00s～655.35s	0.01s	0.00s	○
P3.15	Sampling period	0.01s～655.35s	0.01s	2.00s	×
P3.16	Reserved	——	——	——	–

Function	Instruction	Set Scope	Unit	Factory Set Value	Modify
P3.17	Maximum allowable temperature	0.0～2000.0℃	0.1℃	15.0℃	×
P3.18	Integral mode	0: Normal mode 1: Integral separation mode	1	0	×
P3.19	I separation minimum value	0.1℃～【P3.20】	0.1℃	5.0℃	×
P3.20	I separation maximum value	【P3.19】～2000.0℃	0.1℃	5.0℃	×
P3.21	Temperature correction factor	0.8～1.2	0.1	1.0	○
P3.22	Control the number of thermocouples	0：1 route 1：1、2 route 2：1、2、3 route 3：1、2、3、4 route 4：1、2、3、4、5 route 5：1、2、3、4、5、6 route	1	1	×
P3.23	TC1 alarm lower limit value	0～1300℃	1℃	0℃	○
P3.24	TC1 alarm upper limit value	0～1300℃	1℃	0℃	○
P3.25	TC2 setting temperature	0～1300℃	1℃	400℃	○
P3.26	TC2 setting temperature difference	0～【P3.25】℃	1℃	2℃	○
P4 Group: Synchronous Running Parameters					
P4.00	Master-slave selection	0: Master machine 1: Slave machine	1	1	×
P4.01	ID setting	1～16	1	0	×
P4.02	Reserved	——	——	——	—
P4.03	Reserved	——	——	——	—
P4.04	Reserved	——	——	——	—
P5 Group: RS485 Parameters					
P5.00	RS485 communication selection	0: Invalid 1: Valid	1	1	○
P5.01	Local address	0～247 0: Transmitter communication (master) 1～247: 485 upper computer communication (slave)	1	0	○
P5.02	Baud rate	0：38400BPS 1：19200BPS 2：9600BPS 3：4800BPS	1	2	○
P5.03	Data format	0: 1 stop bit, no parity bit 1: 1 stop bit, 1 even parity bit 2: 1 stop bit, 1 odd parity bit 3: 2 stop bits, no parity bit 4: 2 stop bits, 1 even parity bit 5: 2 stop bits, 1 odd parity bit	1	0	○
P5.04	Communication disconnection detection	0～500ms 0：No detection	1ms	0ms	○
P5.05	Reserved	——	——	——	—
P6 Group: Advanced Function Parameters					
P6.00	Input phase loss protection selection	0: Forbid 1: Valid	1	1	×
P6.01	Radiator overheat protection threshold	60.0～85.0℃	0.1℃	70.0℃	×
P6.02	Transformer overheat protection threshold	0～165.0℃	0.1℃	120.0℃	×
P6.03	Load overheat protection threshold	0～6553.5℃	0.1℃	120.0℃	×
P6.04	Capacitor overheat protection threshold	0～160.0℃	0.1℃	120.0℃	×
P6.05	No-load operation overtime protection selection	0: Forbid 1: Valid	1	1	×

Function	Instruction	Set Scope	Unit	Factory Set Value	Modify
P6.06	E–24 shielding selection	0: Forbid 1: Valid	1	1	×
P6.07	E–03 fault selection	0: Forbid 1: Valid	1	1	×
P6.08	PID feedback disconnection processing	0: No processing 1: Protection action and block output immediately 2: Alarm and maintain operation with the power at the moment of disconnection	1	0	×
P6.09	Feedback disconnection detection value	0～2000	1	1℃	○
P6.10	Feedback disconnection detection time	0～3600s	1s	10s	○
P6.11	Transformer temperature measurement disconnection treatment	0: No processing 1: Protection action and block output immediately 2: Alarm and maintain operation with the power at the moment of disconnection	1	0	×
P6.12	Transformer temperature measurement disconnection detection value	0～165.0℃	0.1℃	1.0℃	○
P6.13	Transformer temperature measurement disconnection detection time	0～3600s	1s	10s	○
P6.14	Coil temperature measurement disconnection processing	0: No processing 1: Protection action and block output immediately 2: Alarm and maintain operation with the power at the moment of disconnection	1	0	×
P6.15	Coil temperature measurement disconnection detection value	0～165.0℃	0.1℃	1.0℃	○
P6.16	Coil temperature measurement disconnection detection time	0～3600s	1s	10s	○
P6.17	Power rise time	0.1～60.0s	0.1s	1.0s	×
P6.18	Current regulation P	0.01～655.35	0.01	Model Setting	×
P6.19	Run restriction password	0～65535	1	0	×
P6.20	Limit running setting	0: Invalid 1: Valid	1	0	×
P6.21	Limit running time setting	0～65535h (小时)	1h	0h	×
P6.22	Curve heating time	0.1～6553.5min	0.1min	8.0min	×
P6.23	Curve heating initial power	【P1.05】～100%*【P1.04】	1%	60%	×
P6.24	Frequency phase lock P	0.01～655.35	0.1	Model Setting	×
P6.25	Frequency phase lock I	0.001～65.535	0.01	Model Setting	×
P6.26	Power regulation P	0.01～655.35	0.1	Model Setting	×
P6.27	Power regulation I	0.001～65.535	0.01	Model Setting	×

7.2 Monitoring Parameter Table

Users can observe the induction heating equipment actual operating parameters through the keyboard.

Monitoring Parameter		
Monitoring Code	Instructions	Range
D–00	Input power	0.00～655.35KW
D–01	Input bus voltage	0～1000V

Monitoring Code	Instructions	Range
D–02	Total output current	0.1～999.9A
D–03	The first route output current	0.1～999.9A
D–04	The second route output current	0.1～999.9A
D–05	Output frequency	3.00～35.00KHz
D–06	Reserved	——
D–07	Input bus current	0.1～999.9A
D–08	Resonance capacitor voltage	0～6000V
D–09	Series equivalent resistance	0.0～100.0Ω
D–10	Resonant equivalent inductance	10～400uH
D–11	Output duty cycle	0.01%～100.00%
D–12	Power factor angle	0.0～180.0°
D–13	Quality factor Q	0.1～10.000
D–14	The first route temperature value	0.0℃～2000.0℃
D–15	The second route temperature value	0.0℃～2000.0℃
D–16	The third route temperature value	0.0℃～2000.0℃
D–17	The fourth route temperature value	0.0℃～2000.0℃
D–18	The fifth route temperature value	0.0℃～2000.0℃
D–19	The sixth route temperature value	0.0℃～2000.0℃
D–20	Radiator temperature	0.0～165.0℃
D–21	AI state	0～4096
D–22	Transformer temperature	0.0～165.0℃
D–23	X terminal state	0～65535
D–24	Cumulative electricity consumption (low order)	0～9999KWH
D–25	Cumulative electricity consumption (high order)	0～9999*10000KWH
D–26	Reserved	——
D–27	Total run time (low order)	0～9999h
D–28	Total run time (high order)	0～9999*10000h
D–29	Limit the accumulated running time	0～9999h
D–30	Fault code record	0～10条
D–31	Reserved	——
D–32	Special product number	1～65535

7.3 Curve Parameter Table

Curve Parameter

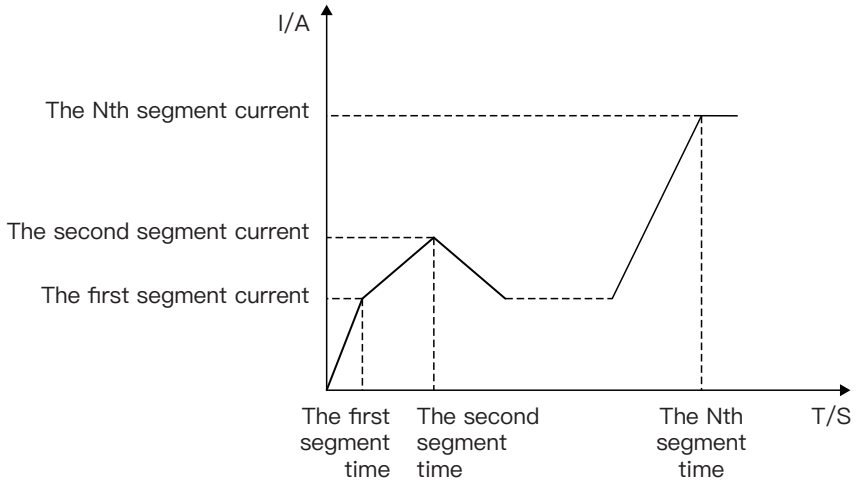
Instruction:
“×” means this parameter setting value cannot be modified when the system is running.

Curve No.	Segment No.	Property	Set Scope	Unit	Factory Set Value	Modify
Curve 1	The first segment corresponding value	Current	0.0A～6553.5A	0.1A	Model Setting	×
	The first segment corresponding time		0s～65535s	1s	Model Setting	×
Curve 2	The first segment corresponding value	Power	0.0KW～6553.5KW	0.01KW	Model Setting	×
	The first segment corresponding time		0s～65535s	1s	Model Setting	×
Curve 3	The first segment corresponding value	Temperature	0.0℃～6553.5℃	0.1℃	Model Setting	×
	The first segment corresponding time		0min～65535min	1min	Model Setting	×

7.4 Curve Parameters Detailed Instruction

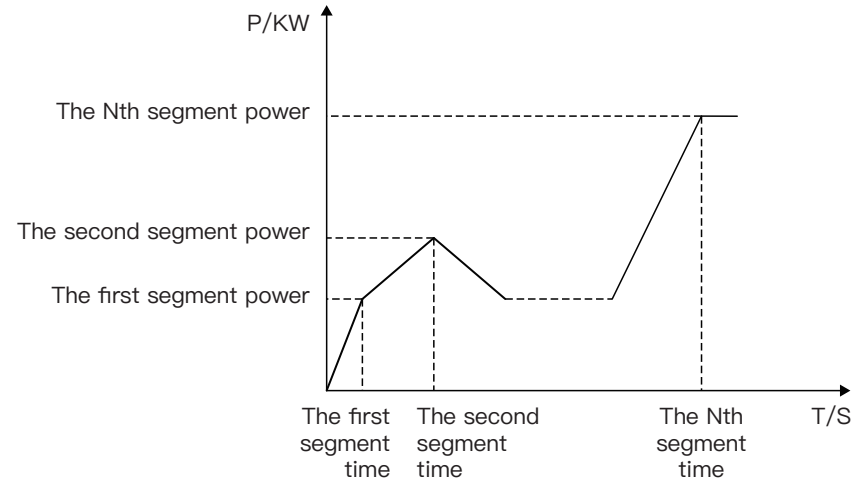
Curve No.	Content		Property
Curve 1	Curve 1 the first segment corresponding value		Current
	0.0A～6553.5A	Model Setting	
	Curve 1 the first segment corresponding time		
	0s～65535s	Model Setting	

When P1.02=2, enter the output current curve selection, the output current curve is composed of the number of segments of the selected current curve, the schematic diagram of the output current curve is as follows:
For details on curve value parameter setting, see 5.4.4 Curve series display. For details on multi–segment curve N selection, see 5.5 Multi–segment N curve setting.



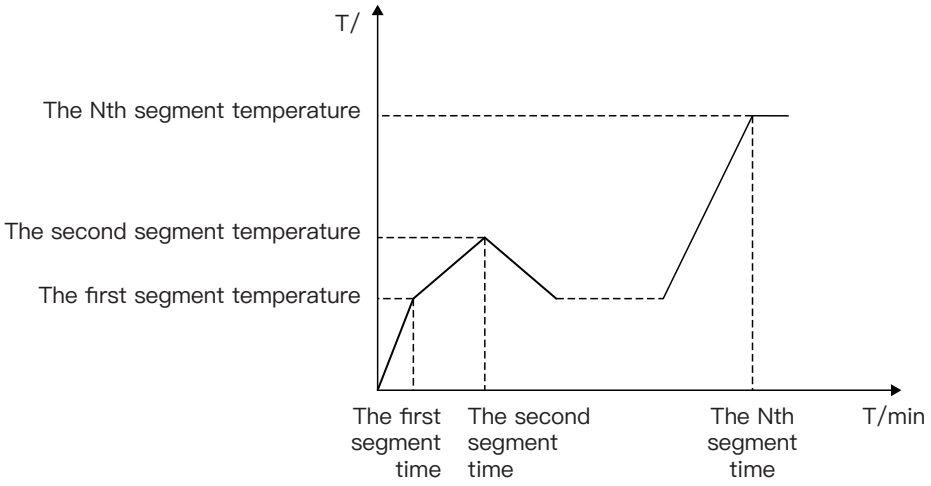
Curve No.	Content		Property
Curve 2	Curve 1 the first segment corresponding value		Power
	0.0KW～6553.5KW	Model Setting	
	Curve 1 the first segment corresponding time		
	0s～65535s	Model Setting	

When P1.03=4,enter the output power curve selection. The output power curve is composed of the number of segments of the selected power curve. The number of curves, the number of curve segments, and the curve value can be increased or decreased by itself.For details on curve value parameter setting, see 5.4.4 Curve series display. For details on multi–segment curve N selection, see 5.5 Multi–segment N curve setting.
The schematic diagram of the output power curve is as follows:



Curve No.	Content		Property
Curve 3	Curve 1 the first segment corresponding value		Temperature
	0.0℃～6553.5℃	Model Setting	
	Curve 1 the first segment corresponding time		
	0s～65535s	Model Setting	

When P1.03=1, P3.01=1, enter the temperature control curve selection, the output temperature curve is composed of the number of segments of the selected temperature curve, the number of curves, the number of curve segments, and the value of the curve can be increased or decreased by itself. For details on curve value parameter setting, see 5.4.4 Curve series display. For details on multi-segment curve N selection, see 5.5 Multi-segment N curve setting.
The output temperature curve diagram is as follows:



8. Protection、Alarm Code And Fault Check

8.1 Protection And Alarm Code Table

Fault Code			
Fault Code	Fault Instruction	Reason	Fault Inspection
E–00	No protection action		
E–01	Busbar overcurrent protection	Busbar current overcurrent protection circuit action	1. Stop or single machine running with error code E–01,try to replace control board. 2. Multi heating machine with one load, try to increase the distance between coils.
E–02	Output overcurrent protection	Output current overcurrent protection circuit action	1. Inspect the output terminal and coil whether short circuit or not. 2. Inspect output terminal, coil and machine inwall whether there are signs of ignition, or should strengthen the insulativity between output coil and connection point. 3. Multi heating machine with one load, try to increase the distance between coils.
E–03	VCE inspection protection	Drive circuit protection action	1. Inspect the output terminal and coil whether short circuit or not. 2. Inspect output terminal, coil and machine inwall whether there are signs of ignition, or should strengthen the insulativity between output coil and connection point. 3. Multi heating machine with one load, try to increase the distance between coils. 4. Power on with error code E–03, contact with the manufacturer.
E–04	Output current overload (software protection point) protection during operation	Output current overcurrent protection software action	1. Inspect the output terminal and coil whether short circuit or not. 2. Inspect output terminal, coil and machine inwall whether there are signs of ignition, or should strengthen the insulativity between output coil and connection point.
E–05	Input busbar overvoltage protection	Output overvoltage protection software action	1. Use a multimeter to measure the three–phase input line voltage when stop. If the multimeter displays a value higher than 510V, should wait until the line voltage is lower than 510V before running; 2. Use a multimeter to measure the three–phase input line voltage when the machine is stop. If the value displayed by the multimeter is below 510V, adjust the voltage adjust–ment potentiometer on the control board to make the value of D–01 correspond to the measured value. (D–01 value = measured value * 1.43) 3. When the E–05 error is reported when multiple heating power supplies drag the same load, the distance between the coil groups should be increased.
E–06	Input busbar undervoltage protection	Output undervoltage protection software action	1. Use a multimeter to measure the three–phase input line voltage when stop. If the multimeter displays a value lower than 300V, you should wait until the line voltage is higher than 300V before running; 2. Use a multimeter to measure the three–phase input line voltage when the machine is stop. If the multimeter shows a value above 300V, check the power board, control board and wiring.
E–07	Reserved		
E–08	Reserved		
E–09	Phase loss protection	Three–phase AC phase loss protection action	1. Tighten the screws on the input terminals of the heating power supply so that the input wires are in good contact with the input terminals; 2. Check whether the three–phase input power cord is disconnected, and if so, replace the three–phase input power cord. Check whether the equipment is leaking electricity.

Fault Code	Fault Instruction	Reason	Fault Inspection
E–10	Radiator over temperature protection	① The air duct is blocked ② Invert fan failure ③ Ambient temperature is too high	1. Clean cooling fan. 2. Improve radiating ambient. 3. Check fan power line whether contact well. 4. Replace fans if broken
E–11	Coil over temperature protection	Coil fan fault or coil specifications do not match the heating equipment	1. Improve the heating coil. 2. Enhance coil heat dissipation.
E–12	Load over temperature protection	Temperature adjustment is unstable or the temperature sensor is broken	Check load temperature sampling path
E–13	Reserved		
E–14	Busbar current overload during running (software protection point) protection	Busbar overcurrent protection software action	Check if the input voltage is normal
E–15	External device fault protection	External fault signal input	Troubleshoot external device
E–16	No–load running protection	No–load running	1. No–connect with heating coil. 2. Output coil and output terminal with poor contact.
E–17	Reserved		
E–18	Reserved		
E–19	Reserved		
E–20	Reserved		
E–21	Running time limitation protection	Limit running function in effect and set time up	Input running limit code (P6.19) to check and set P6.20 to 0.
E–22	Display panel communication fault	Display board connection cable not connected properly, the host control board broken.	1. Reinsert keyboard board and control board communica–tion line. 2. Take keyboard board out from the slot and reinstall it. 3. Replace keyboard board and control board communica–tion line. 4. Try to replace a new control board.
E–23	Load inductance excessive protection	Load inductance is too large	Reduce output coil inductance.
E–24	Low load inductance protection	Load inductance is too small	Increase output coil inductance.
E–25	Leakage protection	Induction heating power source leakage	1. Check whether the coil leakage. 2. Check whether the coil is in direct contact with iron material. 3. Check the machine for signs of ignition.
E–26	Transformer over temperature protection	Heat dissipation problem	1. Check whether the transformer cooling fan is broken. 2. Clean the transformer cooling fan.
E–27	Cooling system fault	Cooling pipe not connected properly or too much dirt or the water pressure switch fault	1. Check water quality and clean dirt. 2. Check water pressure switch.
E–28	Resonant capacitor over temperature protection	Heat dissipation problem	1. Check whether the cooling fan is broken. 2. Clean the cooling fan.
E–29	Resonant capacitor temperature measurement disconnection protection	Resonant capacitor temperature measurement circuit not connected properly	1. Check the resonant capacitor temperature measurement circuit; 2. Check the temperature sensor of the resonant capacitance temperature measurement.
E–30	Load coil temperature measurement disconnection protection	Load coil temperature measurement circuit not connected properly	1. Check the load coil temperature measurement circuit; 2. Check the load temperature measurement temperature sensor.

Fault Code	Fault Instruction	Reason	Fault Inspection
E–31	Transformer temperature measurement disconnection protection	Transformer temperature measurement circuit not connected properly.	1. Check the transformer temperature measurement circuit. 2.Check the transformer temperature measurement temperature sensor.
E–32	Temperature PID feedback disconnection fault	Temperature PID feedback line not connected properly or broken	1. Reconnect the temperature signal line. 2. Check whether the transmitter is working normally. 3. Check whether the thermocouple is damaged.
E–33	Slave machine fault protection during synchronous operation	The slave is in protection or the slave has not selected synchronous operation mode	
P.oFF	Low voltage	Busbar voltage too low, increase the power supply circuit voltage	1. Use a multimeter to measure the three–phase input line voltage when stop. If the multimeter displays a value lower than 270V, check the power distribution; 2. Use a multimeter to measure the three–phase input line voltage when the machine is stop. If the multimeter shows a value above 300V, check the power board, control board and wiring.

NOTE: Ve as rated input voltage.

Alarm Code			
Alarm Code	Instruction	Reason	Fault Inspection
A1	No load or can not detect load	① No load ② Load position incorrect or the distance from the coil is too large	
A2	Current limit running	① Running frequency too high ② Running frequency too low	Check D–05, if D–05 is greater than 25KHz, increase the output coil inductance
A3	Derating power running	① Voltage low, in the scope of ± (20～30%) ② Radiator over temperature lead to forced derating power running	If machine over temperature, increase the machine ambient ventilation and clean radiating fan.
A4	High voltage alarm		1. Use a multimeter to measure the three–phase input line voltage when stop. If the multimeter displays a value higher than 480V, check the power distribution. 2. Use a multimeter to measure the three–phase input line voltage when the machine is stop. If the value displayed by the multimeter is below 480V, adjust the voltage adjustment potentiom–eter on the control board so that the value of D–01 corresponds to the measured value. (D–01 value = measured value * 1.43)
A5	Low voltage alarm		1. Use a multimeter to measure the three–phase input line voltage when stop. If the multimeter displays a value lower than 300V, check the power distribution; 2. Use a multimeter to measure the three–phase input line voltage when the machine is stop. If the multimeter displays a value above 300V, adjust the voltage adjustment potentiometer on the control board so that the D–01 value corresponds to the measured value. (D–01 value = measured value * 1.43).
A6	MODBUS communication disconnection	MODBUS communication line not connected properly or the communication disconnect	1. Reconnect the communication signal line 2. Check whether the 485 converter is working normally
A7	Temperature PID feedback disconnection	Temperature PID feedback disconnection	1. Reconnect the temperature signal line 2. Check whether the transmitter is working normally 3. Check whether the thermocouple is damaged

Alarm Code	Instruction	Reason	Fault Inspection
A8	Load coil temperature measurement line disconnection	Load coil temperature measurement line not connected properly	Check the load temperature feedback circuit
A9	Transformer temperature measurement disconnection	Transformer temperature measurement line not connected properly	Check the transformer temperature measurement circuit
A10	Resonant capacitor temperature measurement disconnection	Resonant capacitor temperature measurement circuit not connected properly	Check the resonant capacitor temperature measurement circuit
A11	Communication disconnection in synchronous operation mode	Communication line not connected properly during synchronous operation	Check the synchronous communication line

Appendix 1: RS485 MODBUS Communication Protoco

(1) Overview

The CR1000 series intelligent digital induction heating power supply provide users a universal RS485 communication interface. This interface can communicate with a PC with a corresponding interface,to realize the monitoring of the equipment.

(2) Communication Settings

This device can be used as a slave, and the master is completed by a PC or other equipment to achieve point-to-point communication between the master and the slave. The relevant communication methods using RS485 include the following:

① If need to use RS485 communication, must open the RS485 communication selection(F5.00) and set its value to 1;

② To start the device operation through communication, set the startup command selection (F1.00) and set its value to 2. As shown in the table below:

P1.01	Running command channel selection	0: External terminal start command 1: Keyboard start command 2: Communication start command	1	0	×

③ The PC or other equipment is the master, the device is the slave, and the master and slave realize point-to-point communication;

④ When the local address (F5.01) is set to 0, it communicates with the transmitter as the master; when it is set as 1 to 247, it communicates with the upper computer as the slave;

⑤ The same baud rate, data format and stop position as the host computer must be set before communication can be carried out;

⑥ The default baud rate is 9600bps, the data format is 1 stop bit, and no parity bit;

The specific parameter settings are shown in the table below:

F5 Group: RS485 Parameters					
P5.00	RS485 communication selection	0: Invalid 1: Valid	1	0	○
P5.01	Local address	0～247 0: Transmitter communication (master) 1～247; 485 upper computer communication (slave)	1	0	○
P5.02	Baud rate	0：38400BPS 1：19200BPS 2：9600BPS 3：4800BPS	1	2	○
P5.03	Data format	0: 1 stop bit, no parity bit 1: 1 stop bit, 1 even parity bit 2: 1 stop bit, 1 odd parity bit 3: 2 stop bits, no parity bit 4: 2 stop bits, 1 even parity bit 5: 2 stop bits, 1 odd parity bit	1	0	○
P5.04	Communication disconnection detection	0～500ms 0: No detection	1ms	0ms	○

(3) Communication Format

① Instruction description and sending and receiving data format

a. 03: Read multiple registers

Send data format:

Machine address 03 Starting address Number of registers CRC check code

Receive data format:

Machine address 03 Data length Data CRC check code

b. 13: Read a single register with attributes

Send data format:

Machine address 13 Register address Number of data CRC check code

Receive data format:

Machine address 13 Data length Main parameter Readable attribute Minimum value Maximum value CRC check code

c. 06：Write a menu register

Send data format:

Machine address 06 Register address Data CRC check code

Receive data format:

Machine address 06 Register address Data CRC check code

d. 10：Write multiple menu registers

Send data format:

Machine address 10 Starting address Number of registers Data CRC check code

Receive data format:

Machine address 10 Start address Number of registers CRC check code

② Register address description:
P parameter address: 41100～41299
D monitoring parameter address: 41000～41099
Error alarm address: 41300～41301
Run command address: 41400
Furnace feedback temperature address: 41401
Furnace charge feedback temperature address: 41402
Furnace setting temperature address: 41410
Furnace charge setting temperature address: 41411
③ Error operation format and code description:
a. Error operation format:

Format:
Machine address 80+ function code Error code CRC check code

b. Error code description:

Error Code		
Code No.	**Description**	**Reason**
01	Illegal function	Wrong command number
02	Illegal address	Register address is incorrect
03	Illegal data	Data exceeds parameter data range
04	Illegal register length	The number of read and write registers is incorrect
05	CRC Error	Sending and receiving data error
06	Parameters cannot be modified during running	
07	Parameters cannot be modified	
08	The upper computer control command is invalid	
09	Parameters are password protected	
0A	Wrong password	

④ 1.Attribute Table:

Bit	Meaning
Bit	00: Reserve parameters or monitor parameters 01: Read only 10: Only read during operation 11: Can read and write in any state 101: Password parameter
Bit4～Bit2 (Read-write attribute)	000: None 001: HZ 010: A 011: % 100: V 101: ℃ 110: TIME 111: KW
Bit1～Bit0 (Unit)	00: None 01: One decimal place 10: Two decimal places 11: Three decimal places

(4) Operation example (the following data are all displayed in hexadecimal):
① Read parameters
a. Read one parameter (with attributes):
Example: read only P0.01 parameter value
[Send] 01 13 04 4C 00 01 85 2E
01: machine address
13: read a single register command
044C: read P0.01 parameter
0001: read-only main parameter
852E: CRC code

[Receive] 01 13 02 04 B0 BF F0
01: machine address
13: read command
02: number of data*2
04B0: P0.01 parameter value is 1200 (the machine rated power is 120.0kw)
BFF0: CRC code

Example: read P0.01 parameter value and attribute value
[Send] 01 13 04 4C 00 02 C5 2F
01: machine address
13: read a single register command
044C: read P0.01 parameter
C52F: read main parameters and attribute values
6708: CRC code
[Receive] 01 13 04 04 B0 00 3E 79 A4
01: machine address
13: read command
04: number of data*2
04B0: P0.01 parameter value is 1200
003E: The attribute value of P0.01. It can be known from the attribute table that P0.01 is read–only, and the unit is KW, 1 decimal place
79A4: CRC code

Example: read the parameter value of P0.01, and attach the attribute value and minimum value of P0.01
[Send] 01 13 04 4C 00 03 04 EF
01: machine address
13: read a single register command
044C: read P0.01 parameter
0003: read the main parameter value, parameter attribute and parameter minimum value
04EF: CRC code
[Receive] 01 13 06 04 B0 00 3E 00 00 01 EB
01: machine address
13: Read command
06: Number of data*2
04B0: P0.01 parameter value is 1200
003E: The attribute value of P0.01. It can be known from the attribute table that P0.01 is read–only, and the unit is KW, 1 decimal place
0000: The minimum value of P0.01 parameter is 0
01EB: CRC code

Example: read the parameter value of P0.01, and attach the attribute, minimum value and maximum value of P0.01
[Send] 01 13 04 4C 00 04 45 2DA
01: machine address
13: read single register command
044C: read P0.01 parameter
0004: read main parameter value, parameter attribute, parameter minimum value and parameter maximum value
452D: CRC code
[Receive] 01 13 08 04 B0 00 3E 00 00 27 0F 56 4B
01: machine address
13: read command
08: number of data*2
04B0: P0.01 parameter value is 1200
003E: the attribute value of P0.01. It can be known from the attribute table that P0.01 is read–only, and the unit is KW, 1 decimal place
0000: the minimum value of P0.01 parameter is 0
270F: the maximum value of F0.01 parameter is 9999
564B: CRC code

b. Read multiple parameters (only parameter values can be read, attributes and minimum and maximum values cannot be read. Up to 5 groups can be read):

Example: Read P0.01, P0.02, P0.03 parameter values
[Send] 01 03 04 4C1 00 03 C5 2C
01: Machine address
03: Read multiple register command
044C: Starting address
0003: Read the number of parameters
C52C: CRC code

[Receive] 01 03 06 04 B0 01 7C 00 EB E1 40
01: machine address
03: read multiple parameter command
06: rumber of data = number of read parameters * 2
04B0, 017C, and 00EB are the values of parameters P0.01, P0.02, and P0.03 respectively.
E140: CRC code

② Write parameters:

a. Write a parameter:

Example: Assign a value to P0.05
[Send] 01 06 04 50 00 10 89 27
01: machine address
06: write a parameter command
0450: parameter address
0010: the value assigned to the parameter
8927: CRC code
[Receive] 01 06 04 50 00 10 89B 27
01: machine address
06: write parameter command
0450: parameter address
0010: assigned parameter value
8927: CRC code

b. Write multiple parameter values:

Example: Assign values to P1.00 and P1.01
[Send] 01 10 04 54 00 02 00 01 00 01 11 F4
01: machine address
10: write multiple parameter command
0454: start parameter
0002: number of write parameters
0001, 0001: the values assigned to P1.00 and P1.01 respectively
11F4: CRC code
[Receive] 01 10 04 54 00 02 01 28
01: machine address
10: write multiple parameter command
0454: starting parameter address
0002: number of write parameters
0128: CRC code

③ Read monitoring value:

a. Read a monitoring parameter value (with attributes):

Example: read the value of monitoring parameter D004, and attach the unit, decimal places and other values
[Send] 01 13 03 EB 00 02 75 B8
01: machine address
13: read a single register command
03EB: register address
0002: monitor parameters and attributes
75B8: CRC code
[Receive] 01 13 04 01 2C 00 05 F8 95
01: machine address
13: read a single register command
04: number of data*2
012C: monitor the value of parameter D004
0005: the attribute of D004, which can be checked from the attribute table. The unit of D004 is Hz, and the decimal place is 1 digit
F895: CRC code

b. Read the values of multiple monitoring parameters:

Example: read the D000, D001, D002 value
[Send] 01 03 03 E7 00 03 B5 B8
01: machine address
03: read register command
03E7: register start address
0003: number of registers
B5B8: CRC code

[Receive] 01 03 06 1F 5B 03 EE 03 1E A6 5E
01: machine address
03: read multiple register command
06: number of data = Number of registers * 2
1F5B, 03EE, 031E: the values of D000, D001, and D002 respectively
A65E: CRC code

④ Run operation

a. Run:

Example:

[Send] 01 06 05 77 00 01 F8 DCA
01: machine address
06: write command
0577: running operation address
0001: run
F8DC: CRC code

[Receive] 01 06 05 77 00 01 F8 DC
01: machine address
06: write command
0577: running operation address
0001: run
F8DC: CRC code

b. Stop

Example:

[Send] 01 06 05 77 00 02 B8 DD
01: machine address
06: write command
0577: run operation address
0002: stop
B8DD: CRC code

[Receive] 01 06 05 77 00 02 B8 DD
01: machine address
06: write command
0577: run operation address
0002: stop
B8DD: CRC code

c. Read running status:

Example:

[Send] 01 13 05 77 00 01 F5 1F
When running: [Receive] 01 13 02 00 01 7D 44
When stopped: [Receive] 01 13 02 00 02 3D 45

⑤ Fault alarm operation

a. Read error:

Example:

[Send] 01 03 05 13 00 01 75 03
01: machine address
03: read command
0513: reading error address
0001: read error
7503: CRC code

[Receive] 01 03 02 00 03 18 72
01: machine address
03: read command
02: number of registers*2
0003: error code
1872: CRC code

b. Read alarm:

Example:

[Send] 01 03 05 14 00 01 C4 C2
01: machine address
03: read command
0514: read alarm address

0001: read alarm
C4C2: CRC code
[Receive] 01 03 02 00 03 19 E2
01: machine address
03: read command
02: number of registers*2
0003: alarm code
19E2: CRC code

c. Read errors and alarms:
Example:
[Send] 01 03 05 13 00 02 35 02
01: machine address
03: read command
0513: reading error address
0002: read error codes and alarm codes
3502: CRC code
[Receive] 01 03 04 00 03 00 03 CB 00
01: machine address
03: read command
04: number of registers*2
0003: error code
0003: alarm code
CB00: CRC code

⑥ Temperature operation

a. Read the furnace temperature and furnace charge temperature
[Send] 01 03 05 78 00 02 44 DE
01: Machine address
03: Read command
0578: Register starting address
0002: Number of read registers
44DE: CRC code
[Receive] 01 03 04 00 01 00 02 2A 32
01: machine address
03: Read command
04: Number of registers*2
0001: Furnace temperature is 0.1℃
0002: Furnace charge temperature is 0.2℃
2A32: CRC code

b. Set furnace protection temperature and furnace charge temperature
[Send] 01 10 05 78 00 02 01 F4 01 2C ED B9
01: machine address
10: write command
0578: register start address
0002: number of write registers
01F4: set the furnace protection temperature to 500°C
012C: set the furnace charge temperature to 300°C
EDB9: CRC code
[Receive] 01 10 05 78 00 02 C1 1D
01: Machine address
10: Write command
0578: Write register start address
0002: Number of write registers
C11D: CRC code

(5) Implementation of checksum

CRC generation function:

```
typedef unsigned char   int8u;
typedef unsigned char   u8;
typedef unsigned short  int16u;
typedef unsigned short  u16;
int16u CRC_16BIT_ChkSum( u8 *chkbuf, u8 len )
```

```
{
      int8u           uIndex;
      int8u           uchCRCHi = 0xff;
      int8u           uchCRCLo = 0xff;
      int16u          chk_sum;
      while (len--)
     {
        uIndex =  ((~uchCRCHi)&(*chkbuf)) |((uchCRCHi)&(~(*chkbuf))) ;        uchCRCHi = ((~uchCRCLo)&(AuchCRCHi_exp[uIndex]))  |((uchCRCLo)&(~AuchCRCHi_exp[uIndex])) ;
         uchCRCLo = AuchCRCLo_exp[uIndex];
              chkbuf++;
     }
    chk_sum = uchCRCHi;
    chk_sum = ((int16u)chk_sum<<8) | (uchCRCLo & 0xff);
    return chk_sum;
 }
/* Table of CRC values for high_order byte */
static const u8 AuchCRCHi_exp[] = {
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};

/* Table of CRC values for low_order byte */
static const u8 AuchCRCLo_exp[] = {
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};
```

Warranty Card

Product Information:

Product Name:_____ Customer Name:_____

Model Type:_____ Customer Address:_____

Purchase Date:_____ Contact Number:_____

Warranty Terms:

1. From the date of original shipment, we guarantee warranty of 12 months for free, and paid service for a lifetime;
2. Product failure caused by the following reasons are not included in 12 months warranty guarantee:
   (1) Users didn't conduct right operation according to user's manual;
   (2) Eguipment has been repaired or modified by user's without consent of manufacturer;
   (3) Fault caused by operation outside standard scope of application;
   (4) Abnormal aging or fault result from bad operating environment;
   (5) Damage caused by force majeure lie earthquke, fire, flood, thunderstrike, abnormal voltage, or other naturtal disasters;
   (6) Damage caused by improper delivery or extermal force.
3. Manufacturer preserves the right to refuse warranty service for the following conditon:
   (1) Damage of beyond recognition of brand, trade mark, serial number, nameplate, and other manufacturer marks;
   (2) Payment is not finished according to contrace;
   (3) Intenional concealment to our after-sale service provider of wrong operation during setting, wirting, operation, maintenance or other process.
4. For failing products, our preserve the right to entrust others for warranty issues.

Certificate

Inspector: QC 001

The product is inspected according to the standard.

Canroon

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