SEC-SH

Energy-saving Intelligent Drying Control System

Date: Dec., 2023

Version: Ver. A

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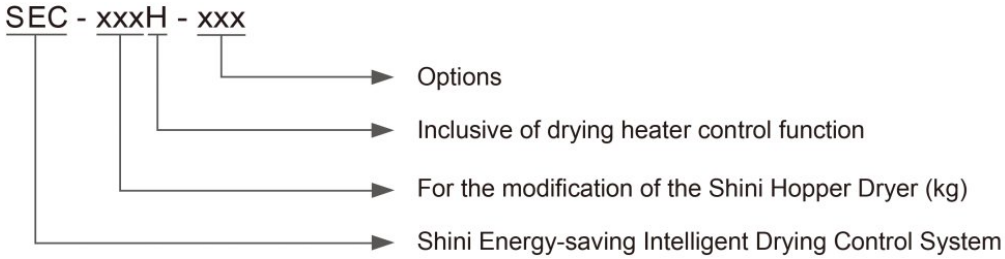
1. General Description

Please read through this operation manual before using the machine to prevent damages of the machine or personal injuries.

The energy-saving intelligent drying control system SEC-SH can be implemented and modified on most hopper dryers. Remove the original control system of the hopper dryer and replace it with the Shini energy-saving intelligent drying control system, which can save 30%~80% energy consumption according to different blower airflows and environments.

Picture 1-1: Energy-saving Intelligent Drying Control SystemSEC-150SH

1.1 Coding Principle



1.2 Feature

1) Features microcomputer PID controller, LCD screen.
2) 28 default preprograms material receipt, and simply select materials as required. The system can automatically set the drying and exhaust air temperatures for easy operation.
3) It has a self-adaption function and simply sets the drying temperature; the control system will match the exhaust air temperature. It is widely applicable.
4) One-week timer and intermittent running function
5) With heat insulation and anti-over-drying function, the control system can automatically reduce the drying temperature and airflow when it stops material throughput to prevent material from excessive drying;
6) Overheat, low-temperature alarm, RS485 interface functions
7) ***This machine can adjust the drying airflow and temperature automatically based on actual material consumption to achieve energy-saving and excessive drying prevention purpose. According to different material types and outputs, it can save up to 30％~80％ energy consumption.***

All service work should be carried out by a person with technical training or corresponding professional experience. The manual contains instructions for both handling and servicing. Chapter 5, which contains service instructions intended for service engineers. Other chapters contain instructions for the daily operator.

Any modifications of the machine must be approved by SHINI in order to avoid personal injury and damage to machine. We shall not be liable for any damage caused by unauthorized change of the machine.

Our company provides excellent after-sales service. Should you have any problem during using the machine, please contact the company or the local vendor.

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1.3 Safety Regulations

Note:

Electrical installation should be done by qualified electrician only.

Before connecting to the power supply, make sure whether the power switch specifications and the rated current for load protection are appropriate and safe, and please be noted to set the main power switch to the "OFF" state before power connection. Before machine repairing and maintaining, turn off the power switch and automatic switch first.

1.3.1 Safety Signs and Labels

Danger!

High pressure!

It is attached to the control box.

Attention!

This mark reminds you to be more careful!

1.4 Exemption Clause

The following statements clarify the responsibilities and regulations born by any buyer or user who purchases products and accessories from Shini (including employees and agents).

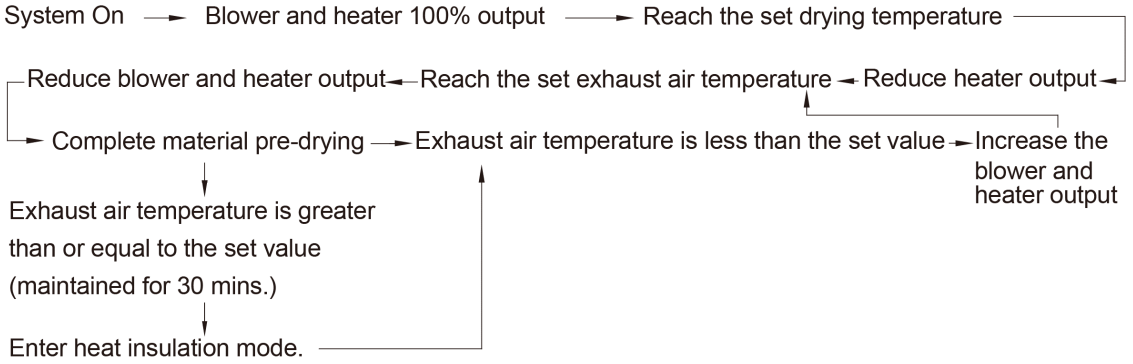
Shini is exempted from liability for any costs, fees, claims and losses caused by reasons below:

1) Any careless or man-made installations, operation and maintenances upon machines without referring to the Manual prior to machine using.
2) Any incidents beyond human reasonable controls, which include man-made vicious or deliberate damages or abnormal power, and machine faults caused by irresistible natural disasters including fire, flood, storm and earthquake.

3) Any operational actions that are not authorized by Shini upon machine, including adding or replacing accessories, dismantling, delivering or repairing.
4) Employing consumables or oil media that are not appointed by Shini.

2. Structure Characteristics and Working Principle

2.1 Working Principle



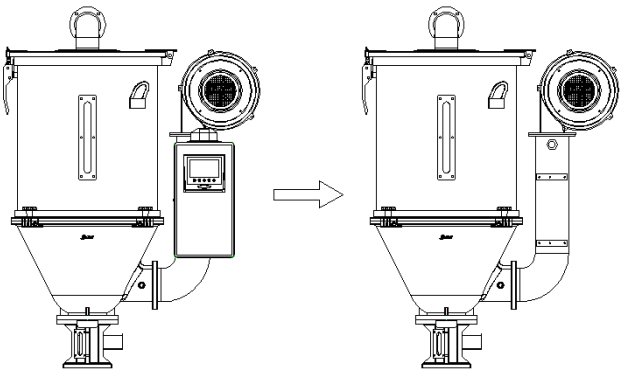
Note: The drying temperature will be decreased in the heat insulation mode.

Picture 2-1 Working principle

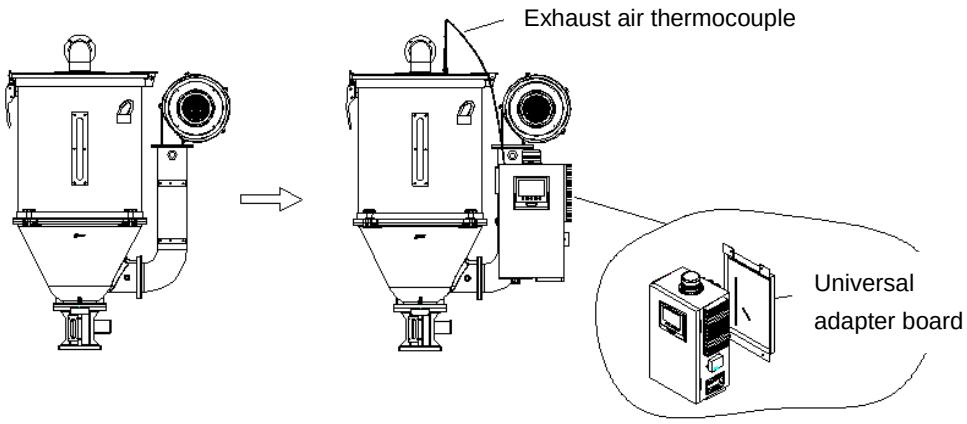
3. Installation and Debugging

3.1 Installation Steps

1) Step 1, remove the control box of the original dryer, as shown in Picture 3-1.
2) Step 2, fix the universal adapter board that is compatible with any installation hole onto the dryer, and then fix Shini energy-saving drying intelligent control system SEC-SH onto the universal adapter plate, as shown in Picture 3-2.
3) Step 3, connect to the pipe heater, blower and thermocouple, etc. of the original dryer to the SEC-SH according to the circuit diagram of the manual.
4) Step 4, fix the exhaust air thermocouple on one of the hopper mounting holes of the dryer, as shown in Picture 3-2.



Picture 3-1: Installation Steps



Picture 3-2: Installation Steps

3.2 Power Connection

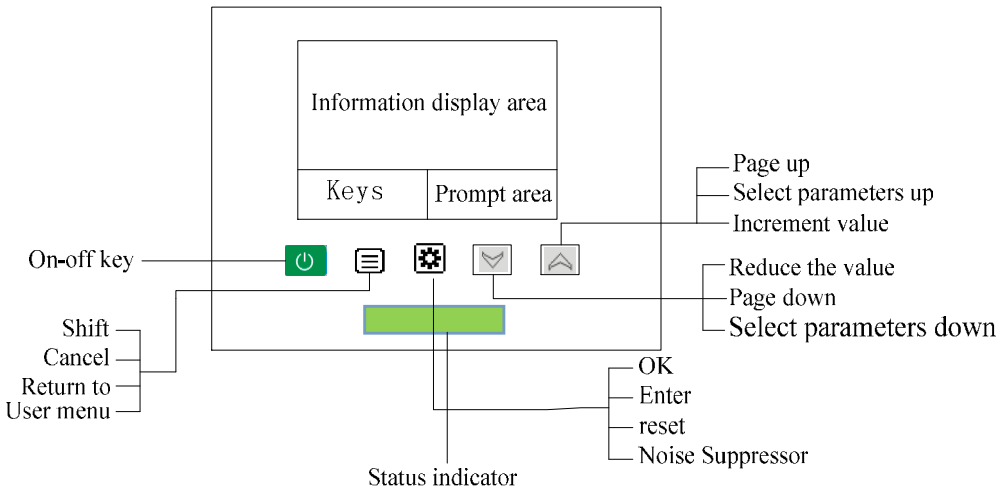
1) Make sure the voltage and frequency of the power source comply with those indicated on the manufacturer nameplate that attached to the machine.
2) Power cable and earth connection should conform to your local regulations.
3) Use independent electrical wires and power switch. Diameter of electrical wire should not be less than those used in the control box.
4) The power cable connection terminals should be tightened securely.
5) The machine requires 3-phase 4-wire power source, connect the power lead (L1, L2, L3) to the live wires, and the earth (PE) to the ground.
6) Power supply requirements:
   Main power voltage: +/- 5%
   Main power frequency: +/- 2%
7) ***Please refer to the circuit diagram of each model for specific power access specifications.***

   Note: Keep 2m distance between the machine and flammable materials.

   Note: Before connecting the power, turn the main power switch to "OFF" state, and the heater switch on dryer's control box to "OFF" state.

4. Operation Guide

4.1 Control Panel



Picture 4-1: Control Panel

Table4-1: Control Panel

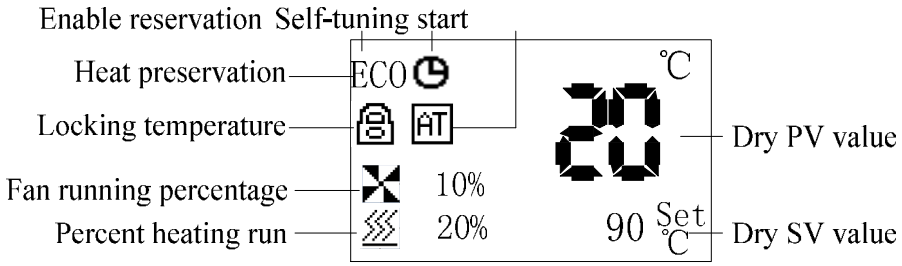
ICONS	Name	Use
20%	Heating ICONS	Represents the percentage of the current electric heating operating power, with a maximum value of "100" and a minimum value of "0". The current value is 20%, indicating that the power of the electric heating operation is 20% of the maximum power
10%	Fan Running icon	Represents the percentage of the current fan operating power. The maximum value is "100" and the minimum value is "0". If the current value is 10%, it indicates that the fan is running at 10% of the maximum power
	Lock icon	Lit: Set temperature lock, cannot be modified under the main screen Off: Set temperature lock, can be quickly modified in the main screen
	Appointment timing icon	On: The reservation timing function is enabled Off: The reservation timing function is disabled

ECO	Heat Preservation Mode icon	Lit: The unit is in Heat preservation mode Off: The unit is not in Heat preservation mode
AT	Self-setting icon	Lit: PID parameter self-tuning is on Off: PID parameter self-tuning is off
	Status indicator	Steady yellow: Stop/In stopping Steady green: In operation Flickering red: Fault alarm
	On/Off button	On/off button
	Menu button	Enter the user menu
	Set button	Set key
	Up button	Add value, select parameter up
	Down button	Reduce the value and select the parameter down

4.2 Common Interface

4.2.1 Home screen

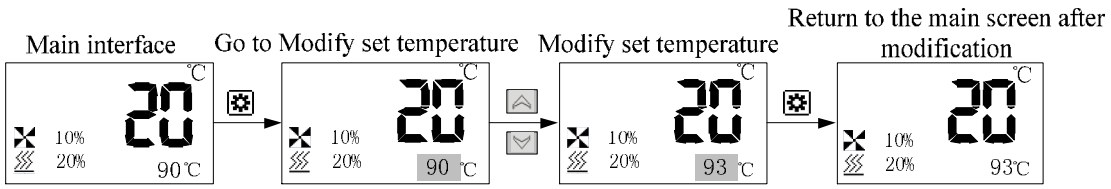
All startups are performed on the "Main operation interface". The corresponding icon indicates the relevant status. If the drying temperature now is 20 ℃ and the drying temperature is set to 90 ℃ (During operation, the blower and heating are on, the timing function is enabled, and the temperature lock is enabled), the "main operation interface" will be displayed as follows:



Picture 4-2: Home screen

4.2.1.1 Quickly modify the set temperature under the main interface

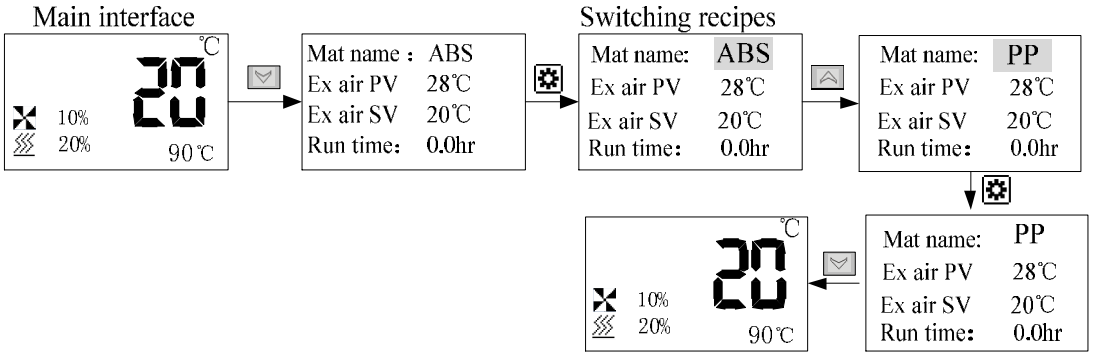
If the user parameter [lock temperature] is set to "no", the set temperature can be directly modified under the main interface, the operation is as follows:



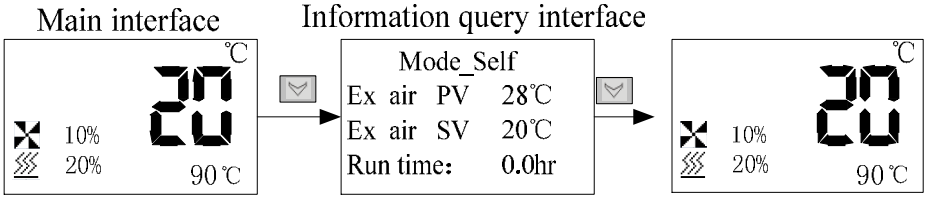
Note: You can also modify the set temperature in the user parameter.

4.2.1.2 Check related information on the main screen

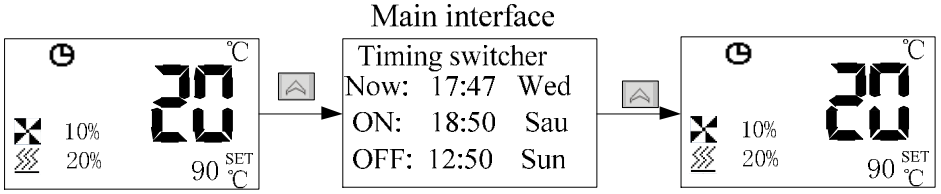
1) The control mode is: Recipe mode:



2) The control mode is: Self-adaption mode:



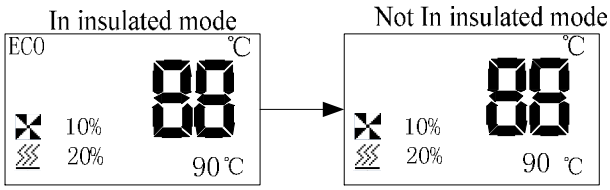
4.2.1.3 The timing time is displayed on the main screen



Note: If there is no timed startup, the time is displayed 00:00.

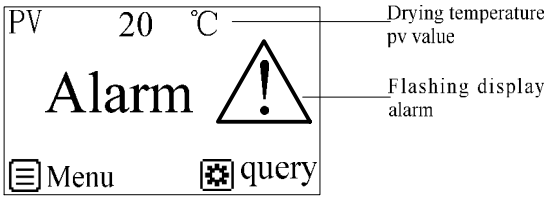
4.2.1.4 ECO Mode

After the first start-up and the drying time, when the air exhaust set temperature ＞ the actual temperature, and the anti-excessive drying time (default 30 minutes) is over, the unit will enter the ECO mode. The actual drying temperature decreases and the temperature is determined by the cooling deviation (default 20 ℃); When the actual air exhaust temperature＜the set temperature, the unit exits the ECO mode. To enter the ECO mode again, it only needs the actual air exhaust temperature＞the set temperature and it lasts the anti-excessive drying time.



4.2.2 Fault screen

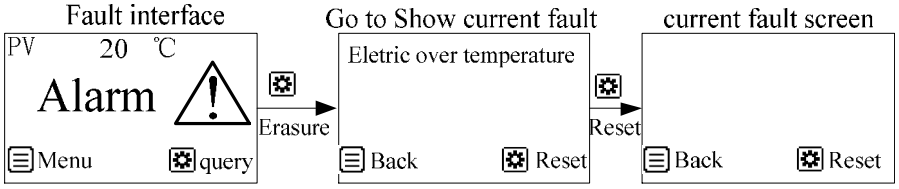
When the unit fails, it will automatically enter the fault interface, and the corresponding fault icon will be displayed. If the current drying temperature PV value is 20.0℃, the fault interface will be displayed as follows:



Picture 4-3: Fault screen

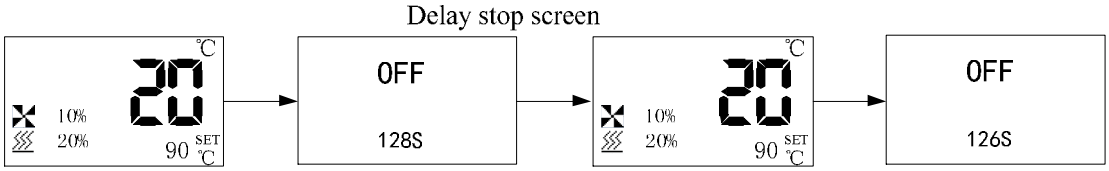
4.2.2.1 Fault query/reset interface

When the fault occurs, the alarm interface will automatically pop up. The fault query and reset operation are as follows:



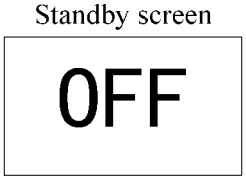
4.2.3 Delayed shutdown and standby interface

4.2.3.1 Delay stop interface



Note: In the case of delayed shutdown, the main interface and the delayed shutdown interface are alternately displayed every 2 seconds until the shutdown countdown is over.

4.2.3.2 Standby interface



Picture 4-4: Standby interface

Note: Enter the standby interface after the delayed shutdown ends.

4.3 User Menu

Press <Menu> key in the main interface to enter the user menu, the user menu parameters are as follows:

Table4-2: User Menu Parameter Table

Serial No.	Parameter Items	Parameter Function	Remarks
1	User settings	Set the exhaust temp. Set the drying temp. Enable timing function. Open locking temp. Set the language. Check the version.	Relevant parameter settings of user settings please refer to the User Menu Parameter Table.
2	Time settings	Set the current time to include year/month/day/hour/minute/second/week	
3	Start time	Mon.~ Sun. time setting hr./min./sec.	

4	Start time	Mon.~ Sun. time setting hr./min./sec.	
5	Historical fault	You can query all faults that have occurred in the last 10 times	Press the <Set> key for 2s to clear the history of failures.
6	Comm. setting	Comm. address Baud rate Check bit Data length Stop bit	During external comm., it must set the parameters correctly for communication.

4.4 Parameter Table

4.4.1 User Parameter Setting Table

Table4-3: User Parameter Setting Table

Serial No.	Items	Initial Value	Set Range	Units	Remarks
On the home screen, press the "Menu" key to enter the menu. Select User Settings in the menu bar and press the "Set" key to access. Select User parameters and press the "Set" key to enter. Press the "Up" or "Down" button to pollor modify the parameters, and press the "Set" button to modify or confirm, and press the "Menu" button to exit.					
1	Drying time	120	1-999	Mins.	
2	Set drying temperature	90	0~200	℃	
3	Set exhaust air temperature	60	0~200	℃	
4	Timing function	Disable	Disable/use		Disable: The reservation timing function is disabled. Enable: The reservation timing function is enabled.
5	Lock the temperature	no	Yes/No		No: The setting temperature can be quickly modified from the home screen. Yes: The set temperature can’t be quickly modified

					on the home screen.
6	Self-tuning	Disabled	Disable/use		This parameter is displayed only when the machine is running
7	Multiple languages	Chinese	Chinese /English		
8	Control mode	Recipe Mode	Recipe mode/Adaptive mode		
9	Version				Check the version of current controller.
On the home screen, press the "Menu" key to enter the menu. Select User Settings in the menu bar and press the "Set" key to access. Select the shutdown time and press the "Set" key to enter. Press the "Up" or "Down" to poll or modify parameters, press the "Set" button to modify or confirm the setting, and press the "Menu" button to exit.					
1	MM/DD/YY	Set according to actual time			
2	Hour/Min../Secs.	Set according to actual time			
3	Week	Set according to actual time			
On the home screen, press the "Menu" key to enter the menu. Select User Settings in the menu bar and press the "Set" key to access. Select the shutdown time and press the "Set" key to enter. Press the "Up" or "Down" to poll or modify parameters, press the "Set" button to modify or confirm the setting, and press the "Menu" button to exit.					
1	Monday shutdown time:	00:00	00:00-23:59		(1) The time is set to 00:00, and the timed shutdown function is disabled.
2	Tuesday shutdown time:	00:00	00:00-23:59		
3	Wednesday	00:00	00:00-23:59		

	shutdown time:				
4	Thursday shutdown time:	00:00	00:00-23:59		
5	Friday shutdown time:	00:00	00:00-23:59		
6	Saturday shutdown time:	00:00	00:00-23:59		
7	Sunday shutdown time:	00:00	00:00-23:59		
Press the "Menu" key from the home screen to enter the menu. Select User Settings in the menu bar and press the "Set" key to access. Select the boot time and press the "Set" key to enter. Press the "Up" or "Down" button to poll or modify parameters, press the "Set" button to modify or confirm, and press the "Menu" button to exit.					
1	Monday start time:	00:00	00:00-23:59		(1) The time is set to 00:00, and the timed power-on function is disabled.
2	Tuesday boot time:	00:00	00:00-23:59		
3	Wednesday boot time:	00:00	00:00-23:59		
4	Thursday boot time:	00:00	00:00-23:59		
5	Friday boot time:	00:00	00:00-23:59		
6	Saturday boot time:	00:00	00:00-23:59		
7	Sunday boot time:	00:00	00:00-23:59		
Press the "Menu" key from the main interface to enter the menu. Select User Settings in the menu bar and press the "Set" key to access. Select Communication Settings and press "Set" to enter. Press the "Up" or "Down" button to poll or modify parameters, press the "Set" button to modify or confirm, and press the "Menu" button to exit.					
1	Communication protocol	1	1~99		
2	Baud rate	19.2K	4.8K/9.6K/19.2K		
3	Check bit	No parity	No parity / Odd parity / Even		

			parity		
4	Data length	8	8		
5	Stop bit	1	1~2		

4.4.2 Recipe list

Table4-4: Recipe List

Groups	Ingredients	Drying time (min)	Drying temperature (℃)	Exhaust air temperature (° C)
1	ABS	180	80	50
2	PP	120	90	45
3	PE	120	90	45
4	PS	120	80	45
5	PPS	240	140	65
6	PVC	120	70	40
7	PBT	240	120	60
8	PC	180	120	60
9	CAB	180	75	45
10	SAN	180	80	50
11	PEI	240	150	70
12	PEN	300	170	85
13	SB	120	80	50
14	PET	360	160	80
15	PETG	360	60	45
16	PI	180	120	60
17	PMMA	180	70	45
18	POM	180	95	50
19	CA	180	75	45
20	PPO	120	110	45
21	LCP	240	150	70
22	CP	180	75	45
23	PSU	240	120	60
24	PUR	180	90	50
25	TPE	180	105	55
26	PEEK	240	150	70

27	PES	240	160	80
28	PA	360	70	45

Note: Under the condition that the moisture content of materials meets the standard, decrease the exhaust air temperature appropriately can improve the energy-saving effect.

4.4.3 Trouble Table

This controller has various alarm functions. When a failure occurs, the alarm interface displays the current fault. The specific fault code meaning is shown in the following Table.

Table 4-5: Trouble Table

Faults	Action
Probe failure	1. Stop heating, delay stop blower, trip output for 5 secs. After troubleshooting, automatic reset. 2. The test starts as soon as it is powered on.
Probe reverse connection	1. Stop heating, delay stop the blower. After troubleshooting, automatically reset it. 2. The test starts after power-on.
Overheat	1.Stop heating, delay stop blower, trip output for 5 secs. After troubleshooting, automatic reset. 2. Start detection as soon as it is powered on
Overload	1.Stop heating and stop the blower. After troubleshooting, manually reset. 2.Start detection as soon as it is powered on
EGO	1. Stop heating, delay stop blower, trip output for 5 secs. After troubleshooting, automatic reset. 2. Start detection as soon as it is powered on
No battery.	1. The machine continues to run when the alarm is given. After the fault is removed, the machine automatically resets. 2. Start detection as soon as it is powered on

Low temperature	1. The machine continues to run when the alarm is given. After troubleshooting, the machine automatically resets. 2. Detection after power on (1) [SV] - [PV] > [low temperature alarm] and delay [low temperature reaction time] alarm. When the temperature rises, automatic reset. If you want to prohibit, set [low temperature reaction time] = 0. (2) Wait until the current temperature passes through the set temperature once before starting to detect.
Heating failure	When it alarms, the machine continues to run and automatically resets after the fault is removed. Detection after starting up (1) After starting up, the temperature within the [heating alarm] time, can't reach the [SV] -5℃ range, and it alarms. If you want to prohibit, set [heating alarm] = 0. (2) After the current temperature passes through the set temperature, the alarm is no longer detected.
Return air probe fault	1. Stop heating and delay stop blower. After troubleshooting, automatically reset. 2. The test starts after power-on.
Return air probe reversely connected.	1. Stop heating and delay stop blower. After troubleshooting, automatically reset. 2. The test starts after power-on.

5. Troubleshooting

Table 5-1: Common Faults and Troubleshooting

Fault	Possible Reasons	Solution
Probe failure	1. Thermocouple poor contact. 2. Thermocouple wire broken.	1. Check and connect it closely. 2. Check and replace.
Overheat	1. Temp. control large error or fault of the controller. 2. Blower air inlet blocked. 3. Solid state contactor bonded.	1. Check and replace. 2. Check and clean. 3. Check and replace.
Blower overload	1. Blower fault. 2. Too high ambient temp.	1. Check, clean or replace. 2.Reduce the ambient temp.
EGO	1. Temp. control large error or fault of the controller. 2. Blower air inlet blocked. 3. Solid state contactor bonded.	1. Check and replace. 2. Check and clean. 3. Check, clean or replace.
Low temperature	1. Solid-state contactor short circuit or phase shortage. 2. Temp. control large error or fault of the controller. 3.Electromagnetic contactor short circuit or phase shortage. 4. Pipe heater fault. 5.Lead fuse.	1. Check, reset or replace. 2. Check and replace. 3. Check, reset or replace. 4. Check and replace. 5. Check and replace.
Heating failure	1. Solid-state contactor short circuit or phase shortage. 2. Temp. control large error or fault of the controller. 3.Electromagnetic contactor short circuit or phase shortage. 4. Pipe heater fault. 5.Lead fuse.	1. Check, reset or replace. 2. Check and replace. 3. Check, reset or replace. 4. Check and replace. 5. Check and replace.
Return air probe failure	1. Thermocouple poor contact. 2. Thermocouple wire broken.	1. Check and connect it closely. 2. Check and replace.

Notes: Before inspecting or changing spare parts, make sure the main switch should be off.

6. Maintenance and Repair

 Attention!

All screws of electrical components inside the control box must be fastened tightly, without regular inspections!

6.1 Maintenance Schedule

6.1.1 General Machine Information

Model _____ SN _____ Manufacture date _____

Voltage _____ Φ _____V Frequency_____ Hz Power_____ kW

6.1.2 Installation & Inspection

☐Check if the pipe joint is tightly locked by clips or not.

☐Check that the material clearance door is firmly closed.

☐Check that the pipeline is correctly connected.

Electrical Installation

☐Voltage _____ V _____Hz

☐Fuse melt current: 1 Phase _____ A 3 Phase _____ A

☐Check phase sequence of power supply

☐Check the rotating direction of the blower

6.1.3 Daily Checking

☐Check the alarm light is normal.

☐Check the timer startup function of the machine.

☐Check the machine On/Off function

6.1.4 Weekly Checking

☐Check all the electrical cables of the machine.

☐Check if there are loose electrical connections.

6.1.5 Monthly Checking

☐Check that the pipe heater is working properly.

☐Check the blower performance.

☐Check the electrical part's working state.

- [ ] Check exhaust fan’s working state.
- [ ] Check whether the exhaust fan and dust-proof screen are blocked.

6.1.6 Half-yearly Checking

- [ ] Check whether the heat-resistant air pipe is damaged.
- [ ] Check the drying heater.
- [ ] Check the blower.