SJZ65/132 Conical Twin-screw Extruder

BEIER MACHINERY
Preface

Thank you for using product of our company, before starting the machine formally, be sure to read this specification, especially the operator, should strictly observe the relevant regulations and explanation in this specification in the course of operating, Use incorrectly, will cause abnormal running or cause the trouble and reducing the life span.

This specification excludes any information about spare electric elements and mechanic elements, and un-forecast situation during installation and operation. Some more information for you, please contact with us.
Safety consideration

**Danger**

- Wrong operation will lead to die, people serious damage or great property loss.
- When open electric cabinet, please make sure power is turn off, and any operation with power will lead to people serious damage.
- Cannot stand at the front of the machine, when machine run with material;
- When heating, prohibit touch heater with hand, otherwise will cause scald.

**Cautious**

- Wrong operation will lead to people damage or machine damage.
- Main machine’s rotary direction must be right, and screw rotate outside, otherwise lead to machine damage.
- Avoid machine run in no load, otherwise lead to damage to machine.
- Prevent hard material fall into feeding stand, otherwise lead to damage machine.
- Connection between barrel, connector and mould, the fixed system must accord to the standard, strength \( \geq 12.9 \)
- Installation should according to the operation manual.
- Electric connection must be followed the electric drawing.
- Repair the electric system done by the qualified and professional trained people.
- When conveying machine, please use suitable tools and consult suspend plan to avoid damage.
- When maintaining, please adopt preventive measure, hang warning signal, to avoid damage.
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1. **Purpose**
SJZ65 conical twin-screw plastic extruder can process the PVC powder material directly to large pipe, Panel, large different type material and so on, after matching the suitable machine nose and auxiliary equipment, it also can use for palletizing PVC powder material.

2. **Main technical parameter**
   **Screw**
   a) screw diameter 65/132mm
   b) screw thread length 1441mm
   c) screw number 2 piece
   d) meshing form of screw conical mesh
   e) rotating way of screw Difference to revolve outwardly
   f) rotating speed of screw 4—39r/min

   **Barrel**
   a) barrel form whole
   b) heating method resistance heater
   c) heating power 29KW
   d) zones number 4 zones
   e) joint part of machine nose 1.5KW

   **Drive motor**
   a) power 37KW
   b) type Y2-225S-4
   c) rotate speed 1500r/min
   d) the grade of motor outer shell protection IP41

   **Ration feeding device**
   a) feeding way screw ration feeding
   b) screw rotate speed 5—60r/min
   c) AC motor power 0.75KW
   d) motor rotate speed 1400rpm

   **Exhaust system**
   a) vacuum pump model SZ-0.5
   b) vacuum pump form water ring vacuum pump
   c) limit vacuum degree 4000Pa
   d) air bleed speed 40m³/h
   e) vacuum pump’s motor power 1.5KW
f) motor rotate speed 2840rpm

**Oil box system (constant temperature)**

a) Model SJLC-2  
b) Oil pump power 0.55KW  
c) Oil pump flux 10L/min  
d) Voltage 0.05-0.4MPa  
e) Oil box heating power 6KW  
f) Cooling medium water  

Equipment’s center height 1000mm  
Overall dimension (L×W×H) 3130×1340×2382mm  
(Exclude die-head and auto feed device)  
Main machine’s weight about 4000kg

3. **Structure**

(1) This machine has the features as following:
   a) The screw of this machine is conical, so it has bigger diameter at the segment of entering material, enlarged the cutting speed and transmit heat area to the material, it advantageous to the plasticity of the material; at the segment of come out, the diameter of screw reduces, lowers the cutting speed, makes the melt can extruder in the lower temperature, it advantageous to improve the product quality.

   The thread structure of the screw is twin-conical (the outside path awl degree is bigger than the awl degree of the bottom path), so it can increase the trough’s depth, raise the extruder’s product ability, and became reasonable naturally of even compression ratio, adjust the material’s extrusion principle.

   b) The core of screw establishes the auto temperature control system for the outside circulation type that use the bearing hot temperature as heat exchange, it can control the temperature of the inner screw part available, raise the quality and the yield of the product.

   c) The heating cooling system of the barrel. It adopt founding aluminum resistance heater. It has the advantage of greatly power of heating, the long service life; the barrel cooling adopt breeze cold, cool off quick and even.

   d) Distribute wheel gear box and push bearings. Distribute wheel gear box adopts high hardness conical tilted gear, constitute the person tooth alignment binate to the ground, the box adopts the high strength ball ink iron, the system can bear bigger carry dint, spread to move even and steady.

   Because the screw is conical, the horizontal piece area at extruding sect of screw reduces, so the screw bears physically of the stalk is smaller toward the dint; but the center of two screws at the part of installing push bearings will enlarge, there is bigger space to install greatly of push bearings, so this machine can bear bigger stalk toward burden dint.

   The bearing of the key adopts import bearing, makes the credibility and
service life of the whole machine have an obvious exaltation.

e) Adjust equipment adopts frequency adjust system. It control AC motor to adjust the speed without step, the range of adjust is wide, the efficiency is high, the rotate speed is stable, the operation is easy.

f) This machine equips the vacuum exhaust system, it can take off the water, air and the low molecule in the PVC powder material, improve the product’s quality.

g) This machine fits the ration feeding device, makes the anticipate quantity and extruding quantity can reasonable match, promising the material can import stability, and can adjust the moment of the screw, extend the orientation ability of different material.

h) This machine fits excessive electricity protection device, avoids driving super burden of the dint to circulate to reduce the damage of the spare part.

i) This machine has some advantages, for example, the slice velocity is small, the material is not easy to resolve, the neurochemistry mixing is equality, the output is high, quality is good, apply scope is wide.

j) The machine’s design is tightly packed, the machine frame and the drive module to constitute a whole, the machine frame is a fastness weld piece, being easy to install each parts.

Attention: Material inside will never can sneak into any metals object, otherwise will damage the screw and barrel!

(2) The structure constitute

The main machine is consist of screw, barrel, drive system, heater and cooling system, vacuum exhaust system, ration feeding device, electric cabinet, machine nose joint part and machine nose’s spare parts and so on.

a) Screw

This is the key part of conveying and plasticization the material, because of its rotating, push through plastic forward, to realize the good result of compressing, melting and compounding. There is constant temperature system of outer circulation type, adopt high-temperature resistant medium (normally can be above 200°C, the liquid which cannot gasify, such as heat-conduction oil JD-300), heat to the required temperature (normally should lower than extruder’s control temperature), then send to inside hole of screw with oil pump, make the extruding zone of extruder cool, not exceed temperature because of shearing
heat, and then extrude steadily with a required temperature; at the feeding zone, because of sucking mass of cold powder, screw’s temperature reduce, high-temperature medium can heat the feeding zone of extruder, make the material plastisize, improve the extruder output. The high-temperature in oil box should inspect often (especial after first trial run), heat-conduction oil should keep half of the oil box height. Screw material is made of high strength nitride steel, reaches high rigidity and good hardwearing, and has the ability of anticorrosion.

b) Barrel

The barrel is partnership part with screw and barrel. Its two holes are conical and the shape is “∞”, it needs high precision, good hardwearing. so barrel is also made of nitrite steel, inside hole has nitride, so as to reach highly hardness, anticorrosion, hardwearing, The outside of barrel is equipped with 4 sets of electric heater and 3 sets of cooling fan blower, and heat is transferred to the plastic through barrel, make plastic fusion plasticization. There are 4 temperature points on barrel; they can auto-control and set process temperature according to the requirement.

c) drive system

Drive system is a whole system that: motor’s rotating drives two screws rotate evenly with a necessary torque. To meet the requirement of different specs plastic product, screw should have different rotating speed. This machine adopts frequency speed control system, and control AC motor’s speed. Motor speed in 150-1500rpm is step less speed control, and can set at random. Gearbox and distribute box, make two screws in the range of speed control, to realize step less speed control, and screw rotating speed can show on the speed gauge on the control cabinet.

d) Cooling and heating system

Cooling and heating system’s main function is to keep the every barrel extruding at a required temperature. At the front zone of the barrel, equip a set of big power cast Al resistant heater. Because of mass cold material, so need fast heat to make material plasticized. Because of the heating power too big, front material is mainly to absorb heat, normally not over heat, so no need to install cooling fan blower.

The back three zones adopt cast Al resistance heater, because of it calorific conduction even, cost low, and life also very long, at this time, the material has plasticized, heating power decrease. For improving the screw speed, avoid
material over temperature, so the back three zones all equip cooling fan blowers. At the middle of ever heater, equip temperature point, and show and auto-control temperature with K type thermocouple and PID temperature adjusting gauge. When temperature is lower than set temperature, heater can turn on power and heat automatically; when temperature is round the set temperature, can turn off power and keep barrel temperature automatically. If affected by the shear heat and friction heat, when temperature exceed set temperature, can turn on fan blower automatically, to cool barrel until no exceed temperature.

**e) Vacuum exhaust system**

So as to improve quality of plastic, in the middle of barrel, there has vent, vacuum pump exhaust the low numerator volatile, air and moisture mixed in plastic out. Water and windpipe of vacuum pump install well, enter water is control by solenoid valve, solenoid valve of open pump put through, water supply for water-ring vacuum pump; solenoid valve of stop pump cut down, stop to supply water. When stop the pump, another solenoid valve install beside suction pipe put through, air enter into vacuum pipe and vacuum degree disappear, in case water regorge.

**f) Ration feeding equipment**

Ration feeding equipment mainly function is make feeding quantity matching with extrusion quantity, reach optimal and steady extrusion process. Due to plastic in twin-screw extruder is coercive transmission, so feeding quantity of feeder should suit for extrusion capacity of screw, when feeding quantity shortage, material in screw cannot compaction, not only lower quality and lower output, but also at the vent powder is suction directly influence exhaust system working. If feeding too much, it will augment machine charge (commonly cannot over motor rating charge 85%), also at the vent it will appear the material overflow, therefore need special point, customer should according to condition of produce characteristic and process, first time for test running must strict adjust well feeding quantity and screw extruder quantity.

**g) die-head connector**

This part connects barrel and die-head, make 2 holes on barrel exit become 1 hole, and then extrude the material to die-head, dimension for connect part of connector and die-head, please see this manual attached picture. Outside surface of connector install electric heater, in case melting plastic cooling, in the middle of heater has temperature point, it cans enactment temperature according to process, there are thermometer display and self-control
temperature.

h) die-head

This part is used for material extrude moldings, due to the produce of each customer is difference, so if customer has no requirement, this machine leave factory without die-head. If customer need, please tell us before order, to order kinds of die-head.

4. Installation

1) Installment

According to “technical criterion” list for machine height, choose sling equipment space.

   a) Prepare work before installation.
      • Check machines all attachment and installation tool.
      • According to local soil condition, choose basic, installation place must have machine teardown, examine and repair convenience.

   b) Installation
      • Pour concrete as basic, and leave machine feet hole for bolt.
      • After basic dryness well, put the machine on basic, and then put the bolt into hole, pours concrete, after concrete hard, screw down screw cap of bolt, and fix well machine.
      • Install electrical wire and water pipe.
      • Add lubricant on where need lubricate. And consult item 4” machine maintains”.
      • Comprehensive check once, if no any mistake can test running.

2) Test running and operation

Test running machine need person whom kwon well process, so as to if any suddenness occur, can take action, avoid accident occur.

   a) Prepare working before test running
      • Check oil whether reach sign space in gearbox and distribute wheel box, if not, please add to sign space.
      • Start-up mainly motor to check turning whether right, screw must turning forth, notice that if turning wrong must stop running at once.

In addition notice: machine should avoid running with no load, in case screw and barrel scratch or screw snap, if need running with no load, please add oil into barrel, and running under low speed.
• Check feeder motor, vacuum pump and all fan blowers turning whether right.
• Open cooling equipment, put through cooling water, check pipeline whether expedite, and is there leak.
• Upon test running all after nature, it can put through heater switch, check heating and cooling whether in nature, and check screw core adjust temperature equipment and inside box high temperature resistant medium of barrel cooling equipment, whether enough to stated high, if natural can pre-heating.
• Enact each part temperature, when each heating zone temperature reach needed valve, heat preservation 30 minutes.

b) testing running and operation
• start-up main motor and twin screw running at a low speed, at the same time start-up ration feeder, feed slowly, and then slightly speedup, but notice motor current, cannot over rating 85%, until discharge from die-head, hereafter gradually speedup to process speed, strictly adjust feeding quantity and extrusion quantity whether balance (usually feeding quantity should slightly less than extrusion quantity, check method is observe height and main motor’s load), hereafter start-up vacuum pump and exhaust, check whether quality of extrusion product(include plasticizing) is reach the requirement.
• Adjust the screw speed and temperature of every heating zone until get the best quality product and best process condition.
• Vacuum pump should start when the screw full of material, and must turn off vacuum pump before stopping machine, to avoid powder suck into exhausting device.
• Make a note of test running and for reference in the future.
• After testing, clear the remained plastic in barrel and screw (except special process), to make next production successful.

c) discharge and adjustment
• Installment and discharge of screw
   When install screw, move extruder barrel to side, put screw 1 (right rotate) and screw 2 (left rotate) push to barrel at the same time (notice: 2 screw cannot in reverse), and then use metal soft pipe put screw gland cover connect with adjust temperature equipment of screw core, add high temperature resistant medium, cannot leak out, and then move the barrel to
working location and locking, slightly rotate screw make screw spline location consistent with transmission shaft spline, put in connect cover, fixed well orientation bolt.

When discharge screw, after removing material from barrel, turn off power, and discharge die-head and die-head connector, take fixed bolt out, first loose and take out the round nut connecting barrel, and then take out the connecting cover and make it separate from spline, open lock device, rotate hand roller and make barrel move to a position, then move the barrel to an end, discharge screw out with copper stick knocking the screw. If possible, discharge metal soft pipe, but must pay attention, prevent the liquid of high temperature in barrel out, but also care for personal safety.

- Adjustment of the interval between screws

Push two screws into barrel, move barrel to the working position, lock the round nut with random spanner. Push two screws reach the end, select with one screw as benchmark, whose interval with barrel is zero( if two screws all zero, so can select any one as benchmark), and then back the benchmark screw, make its interval with barrel is 0.2mm, then interval between screw ands drive shaft is the cushion thickness, which need to adjust.

Make the screw (already adjusted) as benchmark, then back to the end, move another screw in shaft direction, measure the shaft direction interval between the two screws, adjust the second screw to middle position, measure the interval between the two screws and drive shaft, then the interval is the cushion thickness, which need to adjust.

Install adjusting cushion, back the second screw, measure and make sure the interval with barrel in the range 0.2-0.4mm, otherwise must adjust the interval between first screw and barrel. In general, must make sure the interval between the middle interval position of both two screws and barrel is in 0.2-0.4mm.

Adjust everything, then install adjusting cushion, and make connecting cover at its position.

Note: when leave our factory, the interval between screw has been adjusted, so no need customer to adjust, if after maintenance, so customer must adjust it as above.

- Material filter

A filter is installed on the extruder, which consists of top and bottom filter hopper and two manual valves. It can prevent raw material and impurity
taken from degassing outlet from going into vacuum pump. When the bottom hopper is filled with raw materials, you only need to switch valve direction rather than stopping machine so that the air directly flows into degassing outlet not to filter. Then you can unload bottom filter and remove impurity remaining inside. After that switch the valve direction again to make gas flow into filter and vacuum pump and then go out.

Note: When installing the bottom filter hopper, ensure the seal between top hopper and bottom hopper.
5. outside drawing
6. Slinging drawing
Note:

a) Unload feeding hopper and electric cabinet
b) Keep machine body in balance

7. connection drawing of interflow core
8. Groundwork drawing

9. maintenance
   a) Be charged by the experienced staff.
   b) The machine is not permitted to run high speed without load to avoid the friction and screws dead point.
   c) Reverse rotation is not allowed. In 1st wire connection, separate the motor from gearbox and inspect rotation direction of motor to ensure correct screw rotation direction.
   d) The gearbox and distribution box filled in N220-320 gear oil to spare amount while in operation up to making position. Replace oil in gearbox and distribution box after 500 working hours for the 1st operation while 4000 hours later. Use No. 320 gear oil from BP Company. Replace oil in measurable feeder after 20000 working hours. Use MoS2-2 lubricating fat.
   e) Must clean the die head, cylinder and the screws (except special processing) after each production. Anti-erosion oil must spread on screws, cylinder and internal of the die head if the machine stay idle for some longer time.
   f) Not let any foreign material drops into the cylinder to cause any damage.
   g) All bearing must be checked once a year, and replace them when first found worn.
   h) If any malfunction found during production, stop the machine
immediately for inspection and reparation.

10. **bearing and oil sealer specification of gearbox and distribution box**

<table>
<thead>
<tr>
<th>Name</th>
<th>Qty</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearing of high-speed shaft</td>
<td>2</td>
<td>7513E/65×120×32.75</td>
</tr>
<tr>
<td>Oil sealer of high-speed shaft</td>
<td>2</td>
<td>SD65×90×12</td>
</tr>
<tr>
<td>Bearing of gear shaft</td>
<td>2</td>
<td>7513E/65×120×32.75</td>
</tr>
<tr>
<td>Bearing of gear shaft</td>
<td>2</td>
<td>7516E/80×170×42.5</td>
</tr>
<tr>
<td>Bearing od output shaft</td>
<td>2</td>
<td>7224E/120×215×43.5</td>
</tr>
<tr>
<td>Oil sealer of output shaft</td>
<td>2</td>
<td>SD120×150×12</td>
</tr>
<tr>
<td>Bearing</td>
<td>2</td>
<td>3513/65×120×31</td>
</tr>
<tr>
<td>Bearing</td>
<td>2</td>
<td>3514/70×125×31</td>
</tr>
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<td>Bearing</td>
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<td>29418E/90×190×60</td>
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<tr>
<td>Bearing</td>
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<td>29420E/100×210×67</td>
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<td>Oil sealer</td>
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<td>PD65×90×12</td>
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<tr>
<td>Oil sealer</td>
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<td>SD90×110×12</td>
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<tr>
<td>O type ring</td>
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<td>160×5.7</td>
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<tr>
<td>O type ring</td>
<td>2</td>
<td>120×3.1</td>
</tr>
</tbody>
</table>

11. **Attention**
   
a) It’s forbidden to poke raw material using a metal bar at the degassing outlet of barrel to prevent from damaging barrel and screw. The correct method is to use soft plastic pipe.

b) The raw material put into hopper must be pure plastic powder. Metal impurity is not allowed to put into hopper. To keep machine from damage, inspect and get rid of absorbent materials on the magnetic frame regularly in hopper.

c) During operation, method of raising temperature of high temperature oil in constant temperature box: first adjust it to 80°C and keep it for 20 minutes at least. Second raise it 10°C by every 10 minutes till to set value.
d) Inspect oil level in constant temperature box and cooling oil box regularly and complement high temperature oil.

e) According to working situation in a service cycle, clean screw and plastic absorbent material in barrel in time and regularly to guarantee quality of plastic product.

f) It’s only allowed to unload pressure sensor when the plastic in confluence core melts, otherwise it may be damaged.

g) Inspect regularly related illustration instruments, especially torque meter of main extruder and pressure meter of the melt in confluence core. If beyond range, inspect at once and resolve it.

h) Equipments must be connected to earth according to instructions.

12. **Wearing part**

<table>
<thead>
<tr>
<th>Name</th>
<th>Specification</th>
<th>Qty</th>
<th>Remark</th>
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<tbody>
<tr>
<td>Oil sealer of high-speed shaft in gearbox</td>
<td>SD65×90×12</td>
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<td></td>
</tr>
<tr>
<td>Oil sealer of output shaft in gearbox</td>
<td>SD120×150×12</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Oil sealer of screw outer seal</td>
<td>SD70×90×10</td>
<td>8</td>
<td>F rubber</td>
</tr>
</tbody>
</table>

13. **Trouble remove**

| Fault                  | Reason & solution |
| Lower vacuum degree | 1. Leakage: check if all valves are closed  
2. Tube blocked  
3. Materials are not plasticized in degassing zone, raise temps in 1 & 2 zones and feeding amount to keep material half plasticized. First fill in barrel (not exceed 90% of motor load) raise temps in 1 & 2 zones to 190°C. Not to be higher to prevent PVC sticking on barrel. Raise temp of screw core. Check it from appearance of plastic product. |
| Exceed load | 1. If material is plasticized in degassing zone, reduce temps in 1 & 2 zones to reduce feeding amount.  
2. If material is not plasticized in degassing zone, raise temps in 1 & 2 zones and adjust feeding speed. |
| Overheat caused friction in 4th heating zone | 1. Inspect flux of cooling oil  
2. Inspect temp of cooling oil to reduce oil temp  
3. Inspect floating cooling water temp and flux  
4. If no problem after inspection, reduce temp of screw core according to permissive range  
5. If material is not well plasticized at the degassing, friction occurs at the 4th zone. As material is processed in this stage, raise temps in 1 & 2 zones to reduce temp in 3rd zone |
| Low output | 1. Caused by overload  
2. Caused by input material, inspect cooling effect of cooling tube  
If fluidity is not very good, install a vibrator or blender. |
| Pipe bended Anomalistic over cold | 1. Raise temps in 1 & 2 zones  
2. Raise filling amount of screw  
3. Raise temp at screw core  
4. According to 1st point  
5. Install multi-hole plate |
<p>| Too thick pipe Different central height | Raise temp in screw core to keep temp in die from influence and cover the die. |
| Too thick pipe Wavy pipe edge | Reduce temp in screw core and screw speed. |
| Anomalistic pipe wall (especially for thin pipe) | Raise temp in screw core. If the problem appears at the below of pipe, increase filling degree and raise temps in 1 &amp; 2 zones. |</p>
<table>
<thead>
<tr>
<th>Issues</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bad pipe roundness</td>
<td>1. Inspect central of extrusion line</td>
</tr>
<tr>
<td></td>
<td>2. Inspect the compression distortion caused by haul off and reduce</td>
</tr>
<tr>
<td></td>
<td>pressure difference according to permissive range</td>
</tr>
<tr>
<td>None glabrousness</td>
<td>Caused by direction for ram materials and increase out temp of male die.</td>
</tr>
<tr>
<td>Different performance</td>
<td>Test raw material in lab</td>
</tr>
<tr>
<td>Larger torque</td>
<td>1. Change lubricating system</td>
</tr>
<tr>
<td></td>
<td>2. Raise temp in 1 &amp; 2 zones</td>
</tr>
<tr>
<td></td>
<td>3. Raise screw speed</td>
</tr>
<tr>
<td></td>
<td>4. Reduce feeding amount</td>
</tr>
</tbody>
</table>
Certificate

Production Model: SJJZ65/132

Production Name: Conical Twin-screw Extruder

Serial Number: __________

This production is qualified after checking, allowing to deliver.

Inspector: __________
Manager of inspection: __________
Date: __________
# Packing List

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Qty</th>
<th>Remark</th>
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<td>1</td>
<td>SJZ65/132 Conical Twin-screw Extruder</td>
<td>1</td>
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<tr>
<td>2</td>
<td>Electric cabinet of SJZ65/132 Conical Twin-screw Extruder</td>
<td>1</td>
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</tr>
<tr>
<td>3</td>
<td>Flange of die-head</td>
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<tr>
<td>4</td>
<td>Arc spanner</td>
<td>1</td>
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<tr>
<td>5</td>
<td>Manual of temperature controller Operation manual</td>
<td>1</td>
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<tr>
<td>6</td>
<td>Manual of frequency inverter</td>
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<tr>
<td>7</td>
<td>Operation Manual</td>
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Principal: _______
Date: ___________