

OPERATION MANUAL

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1. GENERAL INFORMATION

1.1 General function

The vacuum cutter is used to produce products with various densities upon customers' demands. It also has the function of mixing. To produce emulsified products under vacuum state may increase elasticity and density of products; reduce oxidization and bacterial reproduction, so as to prolong their storage life. CO₂ and N₂ can be added as required, so as to lower materials' temperature and to keep tender taste. Therefore, this equipment is essential to produce sausages with best quality.

Uniformly emulsified products may further ensure high accuracy of quantitative filling. While muscular tissues are being emulsified under 3600 rpm cutting speed, more muscle protein are separated out and combine together with fat, water and salt sufficiently, which increases the capacities of water binding and fat binding, as well as the stabilities of products.

After vacuum cover is closed, actual production status can be observed through an inspection window on the cutter. And some additives can also be added by opening this transparent window. The window reduces operation noise for at least 10 db.

1.2 Operating Principles

Cutting bowl filled with materials rotates counter-clockwise slowly under vacuum state (about -85kPa) or under state of filling gas (CO₂ or N₂), and feed the materials towards the underside of cutting set. Cutting set, which rotates at high speed, chops into pieces and mixes the meat and other materials which are moving in a spiral way in cutting bowl. Under the splitting action generated by rapid rotation of chopping knives, meat and other auxiliary materials are chopped into pieces and mixed uniformly. High-speed chopping of sharp cutting set makes all materials mixed and emulsified sufficiently. The faster cutter assembly rotates, the better mixing and emulsification effect are. Since materials are emulsified under state of vacuum or inert gases, degree of oxidation and reproduction of aerobic bacteria are reduced, which may make freshness of food beyond comparison.

1.3 Outstanding Features

- Manual mode and automatic mode can be switched over as desired;
- Convenient touch screen for data display and setting;
- 1 mixing speed and 2 cutting speeds available;
- Friendly design of operation panel for manual operation;
- Digital setting for rotation speed of cutting bowl and unloading disc;
- Combination control of temperature, time and rotations of cutting bowl.

1.4 Technical data

	TT-S105
Bowl volume:	200 L
Capacity:	100-140 kg/a time
Requirements for unprocessed meat:	0°C ~ 5°C meat without bone and with weight less than 1 kg
Vacuum:	-80 ~ -85 kPa
Knife shaft speed:	200/1800/3600 rpm
Bowl speed:	5/8/12/15 rpm (Preset) 5-15rpm optional as desired
Unloading disc speed:	80 rpm (Preset) 30-100rpm optional as desired
Power supply:	AC 3-phases & 4-wires;
Voltage:	380 V
Frequency:	50 Hz
Power:	approx. 62.27 kW
Pressure of hydraulic system:	approx. 10 Mpa
Distance between knife and bowl:	min. 1-1.5mm
External dimension:	2480mm×2080mm×1950mm
Installation dimension:	4500mm×3500mm×3500mm
Weight:	approx. 4800 kg

2. STRUCTURE

2.1 Structure overview

This equipment consists of the following components: cutting set and its driving system; bowl and its driving system; hydraulic system; vacuum system and pipeline; power distributing system; control panel; loading device; unloading device; noise/vacuum cover; knife cover; as well as machine frame, etc.

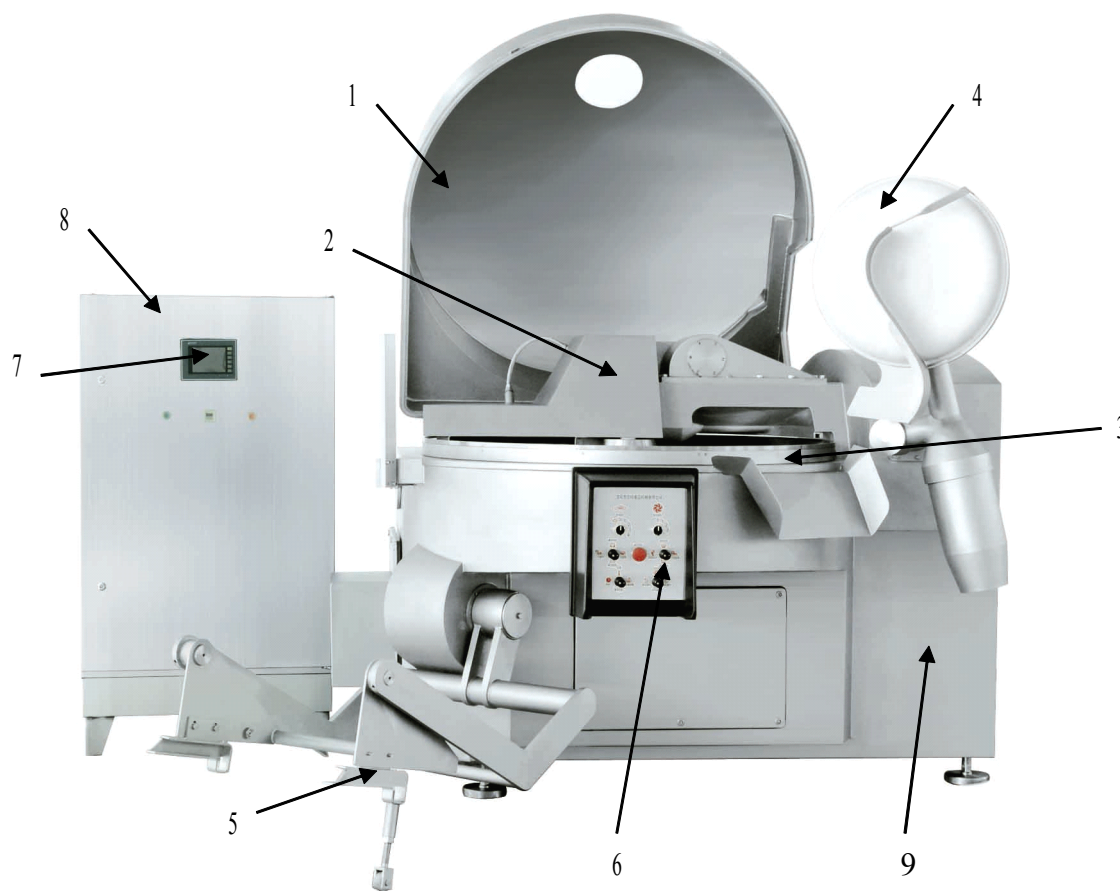


Figure 2-1 Structure overview

1. Noise/Vacuum Cover
5. Loading device
8. Electric cabinet

2. Knife cover
6. Control panel
9. Machine frame

3. Bowl
7. HMI (Human-machine interface)

4. Unloading device

2.2 Introduction of structure

2.2.1 Machine frame

Frame is the bearing component of this machine. It is a column structure made of good-quality steel plate and U-steel which are welded together. The frame features good intensity, rigidity and stability. The stainless steel skin is not only in line with requirements of Food Hygiene Law, but also easy for cleaning.

2.2.2 Bowl

Bowl is a disk-shaped stainless steel container with the center area raised. Its rated capacity is 200 liter.

2.2.3 Cutting set

Each cutting set includes knife holder, knife adjusting plate and 6 pieces of cutting knives in the middle.

There are 3 types of knife holders, and their keyway positions are different. Type I and type III cutter holder have only one keyway respectively. While, type II holder has two keyways, of which one keyway is 120° or 30° to the keyway of type III holder and the other one is 90° or 60° to the keyway of type I holder. The angle between keyways of type III holder and type I holder is 60° . (See Fig. 02 for details.)

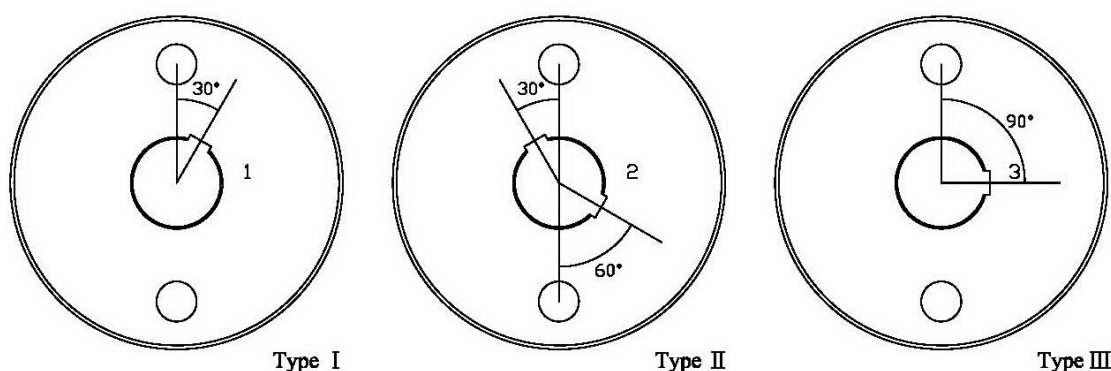
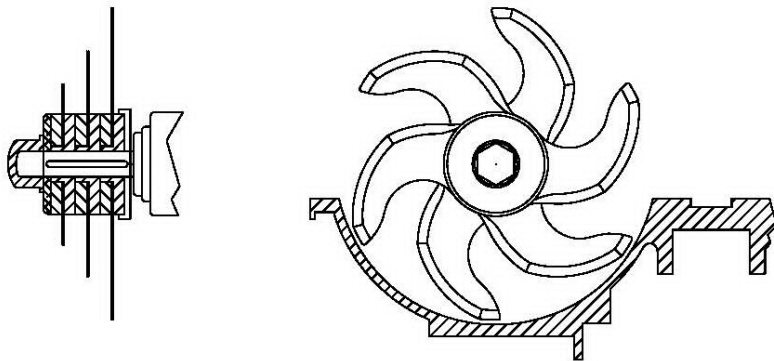


Figure 2-2 Positions of Cutter Holder and Keyway

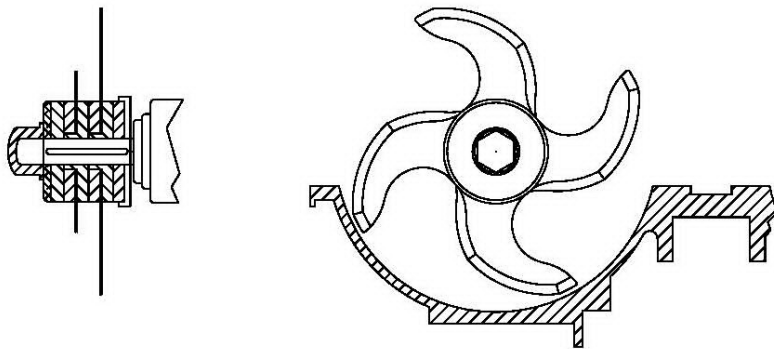
Cutting set containing type I cutter holder is called type I cutting set; the set containing type II holder is called type II cutting set; and set containing type III holder is called type III cutting set.

To cut different kinds of meat, cutter assemblies in this machine can be combined in 3 ways:

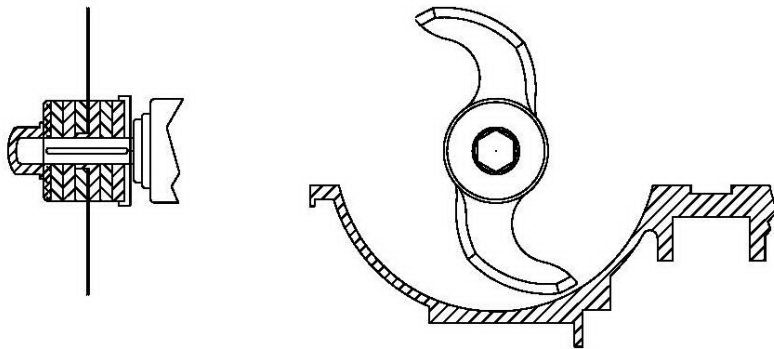
The first way is to combine 6 knives of type I, II and III cutting set together. Each of the 6 knives is 60° to the other. The second way is to combine 4 knives of type I and II set. Each of the 4 knives is perpendicular to the others. And the third way is to combine only 2 knives of type I, or II or III assembly. (See Fig. 03 for details.)



Cutting set with six knives



Cutting set with four knives



Cutting set with two knives

Figure 2-3 Three kinds of cutting sets

Cutting set is used to mix and cut unprocessed meat and various auxiliary materials. High quality knife with sharp blade is made of excellent material and not easily rusted. Difference of each cutter assembly in weight is less 2g, which can best meet the requirement of dynamic balance when knives are rotating at high speed.

2.2.4 Hydraulic system

Hydraulic system is used to control opening and closing of cutter cover and vacuum cover, lifting and lowering of loading device, immersing and lifting of unloading disc with arm, etc. The operation pressure of this hydraulic system is about 10 MPa. Feeding line and return line of oil cylinder adopts one-way and two-way throttles, which make the whole oil line easy and clear, moving-speed adjustable, and maintenance and repair convenient.

2.2.5 Knife cover

Knife cover is made of welded stainless steels. This cover shall be closed during operation for safety and protection and to prevent the splashing of cut materials. The jointed geometric parts with clear edges and corners, makes the cover more beautiful and neat.

2.2.6 Noise/Vacuum cover

Vacuum cover is also made of welded stainless steel. It's opening and closing is 90° to that of knife cover, which equipped with an inspection window.

2.2.7 Loading device

Hydraulically driven loading device is used to pour materials in the meat cart into the rotating bowl.

2.2.8 Unloading device

Unloading device driven by a hydraulic cylinder drives unloading disc immersing into the bowl. Inductive switch senses the rotary movement of speed reducer of motor driven by a frequency converter, and transmits the rotary movement to unloading disc. Rotation of unloading disc brings cut meat out of the bowl and then into hopper. Unloading disc is made of macromolecular polyethylene. All detail parts with direct contact to the meat are made of stainless steel, which is in line with the requirements specified in Food Hygiene Law.

2.2.9 Control panel

Control panel is formed by using injection mould of engineering plastic, which is beautiful in appearance and easily operated. It is on this operation panel that operators control operations of this machine.

2.2.10 Vacuum/Gas pipes

This machine adopts reliable water recycled pump, pipeline, and water circulation system. Its vacuum degree can reach -85 kPa, and vacuuming can be done in a continuous way. Water line equipped with water recycling tank, makes water circulate for purpose of water saving.

To produce emulsified products under vacuum state may increase elasticity and density of products, reduce oxidation and bacteria reproduction, strengthen sliceability and prolong storage life. In addition, there is also a pipeline for filling gas (such as CO_2 or N_2). User can add CO_2 or N_2 as required, so as to lower materials temperature and get tender taste

2.2.11 Electric cabinet

It is used to control hydraulic, mechanical and electrical system. This cabinet can be delivered together with machine with all wiring disconnected.

3. OPERATION

3.1 Start-up

Open power distribution cabinet and close air switch Q0, Q1, Q2, Q3, Q4 and Q5 for power on. And then close the cabinet. Press, in an inching way, the green button “Power” on the left side of the cabinet’s door. The indicator for power supply in the middle lights up. Touch screen displays “Welcome”, indicating that machine is in operation state.

3.2 HMI (Human-machine Interface)

3.2.1 Welcome

Figure 3-1 Welcome Display

Touch screen will run screen saver after operating for some time, i.e. dark screen, for purpose of life saving. In case that operator needs to check or review data, he (or she) only needs to move downwards the cross-stitch at the lower-right of manual control panel. And then the touch screen brightens again and goes back to the monitoring display.

3.2.2 Monitoring Center

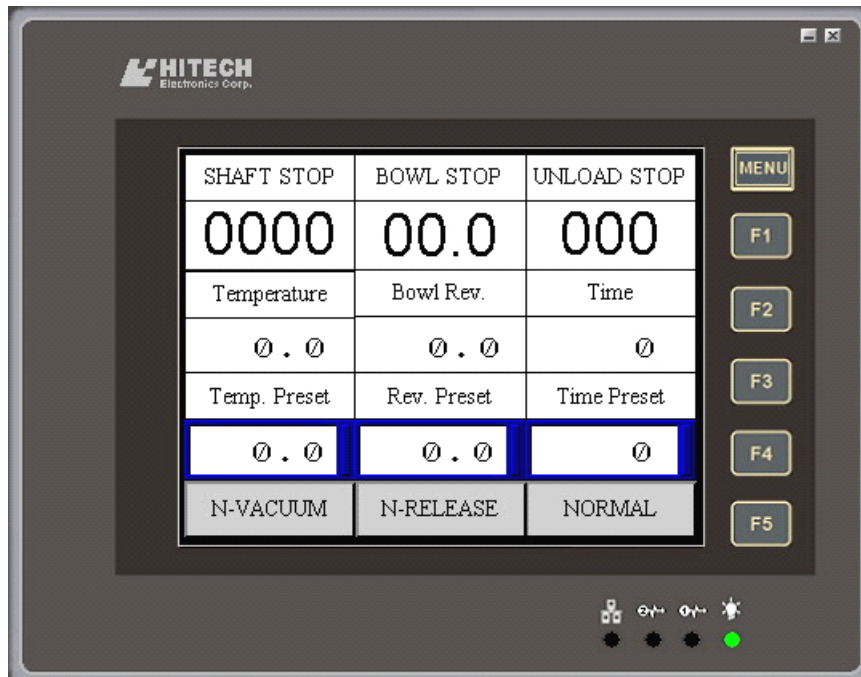


Figure 3-2 Monitoring Center

On this display, operation statuses of Shaft, Bowl and Unloading disc are shown in the top line, and their corresponding speeds (**in unit of rpm**) are shown below.

At the third line is control status for material temperature, bowl revolutions and cutting timing, below which are their corresponding values. The flashing parameter indicates that it is being controlled.

Material temperature is in centigrade, bowl revolution in circle, and cutting time in second.

[NOTE!]: Operator needs to touch certain area when making modification. In order to not scratch the touch screen and prolong its service life, operator shall only slightly touch the screen with fingertip. Do not touch with fingernail or touch heavily or roughly.

At bottom line on this display is setting values for material temperature, bowl revolutions and cutting time. To change certain value, operator shall directly touch the corresponding field on the display to pop up a numeric keyboard. And then enter desired values and confirm the change.

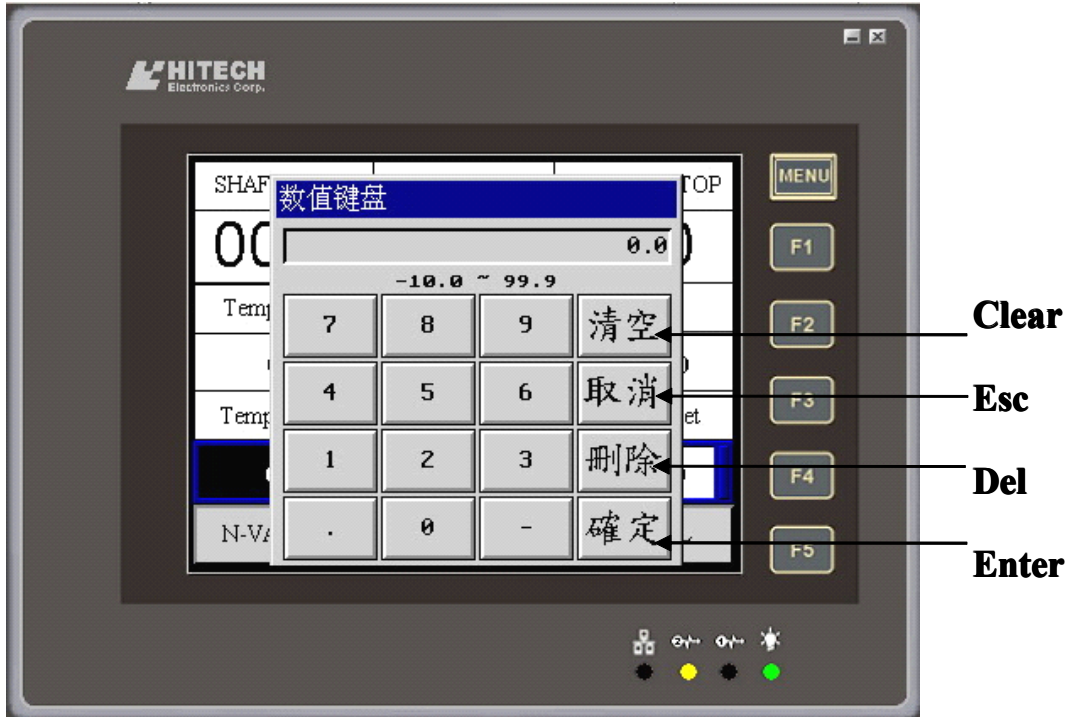


Figure 3-3 Preset value

In case of changing the speed of unloading disc, touch the field for displaying this speed at the upper-right area to enter into the display of “SPEED PRESET”.

3.2.3 Speed preset (Bowl and Unloading disc)

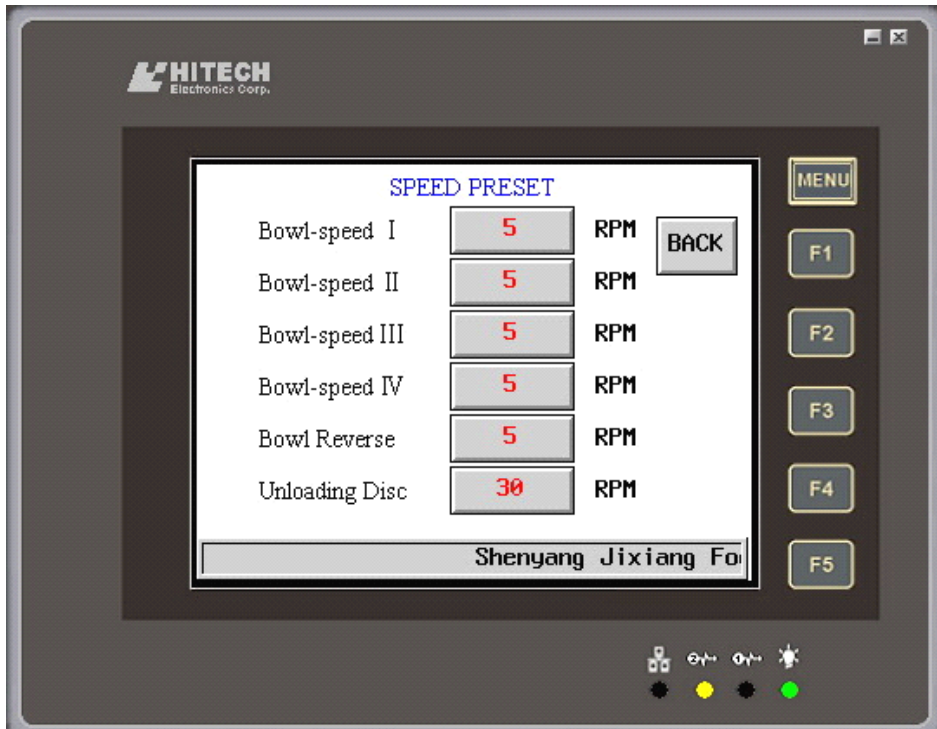


Figure 3-4 Speed preset

Every field on this display is used to set the speed of bowl and unloading disc. Each touch may change the speed for one step. The setting range is:

Forward rotation:	5 rpm ~ 15 rpm
Reverse rotation:	5 rpm ~ 10 rpm
Unloading disc:	30 rpm ~ 100 rpm

[NOTE!]: Customer shall set rotation speed of unloading disc according to materials' viscosity. For example, properly increase rotation speed for thin materials. And properly lower the speed for dry and thick materials; meanwhile lower bowl's speed so as to reduce the thrust of materials.

3.3 Control panel

3.3.1 Operation of Knife and Bowl

On top of this operation panel, the left switch is for Bowl speed and the right one is for Knife speed. The speed of knife has 3 levels: 200 rpm for mixing, 1800 rpm for medium speed and 3600 rpm for high speed. And speed of bowl has 5 levels: 4 levels for forward rotation and 1 level for reverse rotation.

[NOTE!]: Bowl can be started up at any time only during debugging. Otherwise, it can only be started up when required knives are rotating. This may protect still cutters against being directly pushed by accumulated materials, and even against being broken.

Turn "BOWL" switch and "KNIFE" switch with left hand and right hand respectively to select necessary speeds, **after verifying that there is no dead weight, iron chips, hard bones or other foreign object, and that knife cover is closed.** Bowl follows the knife's

start-up to rotate. During actual production, turn these 2 switches to select desirable knife speed and bowl speed.

During actual production, touch screen may also display the related speed values.

Turn “BOWL” switch and “KNIFE” switch to position “0” with left hand and right hand respectively. Without driving force, knives slow down and stop under its inertia. Pay more attention to the slow-down of knives.

[NOTE!]: In case that knives stop automatically under the control of temperature, bowl counting and timing, operator must turn “KNIFE” switch to “0” position first, and then make other following operations!!

[CAUTION!]: When knife is rotating, any part of your body under the cutter cover may cause severe injury, even death!!

[CAUTION!]: In case that knife is broken, or other emergent accident happens (such as special noise heard from the bowl), operator shall squat quickly, press down Emergency Stop switch on operation panel at the same time and shout to the people around the machine to squat too. When machine stops completely, they can stand up and inform of maintenance people immediately!!

To produce emulsified products, operator shall make knife rotate at high speed and bowl rotate at lower speed, so as to get better density, and reduce current for protection of the motor.

[NOTE!]: Interlock:

When knife cover is opened, any operation on knife is invalid.

When knife is in operation, lifting of knife cover driven hydraulically is invalid.

3.3.2 Hydraulic operation

At the 2 sides in the middle of control panel, are 2 cross-switches for hydraulic operations: the left one is for knife cover and noise cover(vacuum cover), and the right one for loader and unloader. Move the cross-switches to certain direction with description of symbol and letters for desired operation.

1. Lifting of knife cover:

In case that noise cover is not opened to the perpendicular position or cutter shaft does not stop yet, this operation is invalid. When vacuum cover is opened to the perpendicular position and cutter shaft is in still mode, move this cross-switch to “Knife Cover UP”. And then hydraulic pump and corresponding solenoid valve start up to make cutter cover move upwards. Move the cross-switch away from position of “Knife Cover UP”, cutter cover

stops moving upwards.

[NOTE!]: Interlock indication:

When cutter cover is opened, any operation on knife is invalid.

[CAUTION!]: When cutter cover is opened, do not try to move cutter shaft. Otherwise, serious accident may happen.

2. Lowering of knife cover:

When knife cover is opened, move the cross-switch to “Knife Cover Down”. Hydraulic pump and corresponding solenoid start to run and cutter cover moves downwards. When knife cover reaches the stop position, move the cross-switch away from “Knife Cover Down”, and the cover stops descending.

Notice for safety:

[CAUTION!]: Before moving knife cover downwards, check clamp nut on the knife for security, and bowl free from nut, wrench, or any other foreign object, so as to avoid accident!!

When knife cover is descending, no one is allowed under the cover to avoid personnel injury!!

3. Lifting of Vacuum cover:

When lifter is at position of descending stop, and unloading arm is at position of ascending stop, move the cross-switch to “Vacuum Cover UP”. And then hydraulic pump and corresponding solenoid valve start to run and vacuum cover moves upwards. When vacuum cover reaches the stop position or cross-switch is moved away from “Vacuum Cover UP” position, the vacuum cover stops ascending.

[CAUTION]: Do not place any object on top of vacuum cover to avoid serious accident!!

4. Lowering of vacuum cover:

When lifter is at position of descending stop, unloading arm is at position of ascending stop, cutter cover is closed and vacuum cover is opened. Move the cross-switch to “Vacuum Cover Down” to start up hydraulic pump and corresponding solenoid, which makes vacuum cover move downwards. When the cover reaches the stop position, move the cross-switch to “Vacuum Cover Down”. And the cover stops descending.

[CAUTION!]: When vacuum cover is descending, no one is allowed to stand under it to avoid personnel injury.

During operation, especially when cutting is rotating at high speed, vacuum cover is

very useful to protect operator's hearing. In addition, food processing manufacturer shall offer operators other protections for their hearing, such as earplugs.

5. Lifting of loader:

When vacuum cover is away from stop position of lifting, this operation is invalid. When vacuum cover is at position of lifting stop, move the cross-switch to "Loader UP" to start hydraulic pump and corresponding solenoid, which drives hopper move upwards, incline and turn over. When loader reaches stop position, move the cross-switch away from "Loader UP" to stop the loader.

[CAUTION!]: The surrounding area of loader shall be free from any person or object to avoid personnel injury or property damage!!

6. Lowering of loader:

When loader is away from the ground, move the cross-switch to "loader Up". And then hydraulic pump and corresponding solenoid valve start to run and lifter begins to move down. When the loader reaches the stop position, move the cross-switch away from "Loader Down" to make it stop.

[CAUTION!]: No one nor any object is allowed around or under the loader for safety!!

7. Lifting of unloading arm

When unloading arm is not at position of lifting stop, move the cross-switch to "Unloading Arm Up". The hydraulic pump and corresponding valve start to drive the arm upwards. In case that unloading disc is rotating when unloader is lifting, the disc may stop automatically when the arm lifts to certain position.

[CAUTION!]: No one or any object is allowed around or under the lifter for safety!!

8. Lowering of unloading arm

In case that vacuum cover is not at position of lifting stop, this operation is invalid. When vacuum cover is at position of lifting stop, move cross-switch to "Unloading Arm Down" to start up hydraulic pump and corresponding solenoid valve, which drives unloading arm to move downwards. When the arm reaches the stop position, move the cross-switch away from "Unloading Arm Down" to stop the arm.

When the unloading arm descends to the above of bowl and unloading plate moves close to edge of the bowl, unloading disc starts to move automatically; while the unloading arm continues to descend. When unloading plate moves close to bowl's bottom, the arm starts

to descend slowly. When unloading plate reaches the bottom of the bowl, the arm stops descending, while unloading disc is still moving.

3.4 Control operation

At lower-left of operation panel is a cross-switch used to control material temperature, bowl revolution and cutting time. Operator can combine the above controls together during operation for better quality and consistency of products.

3.4.1 Control of material temperature:

Operator sets the value for material temperature on touch screen and moves the cross-switch to “Temperature”. “Temperature” displayed on the screen is changed to the flashing “Temp. Control”, which indicates that it is in the mode for material temperature control. When material temperature exceeds this setting value, cutting and mixing operation stops automatically

In the mode of material temperature control, move the cross-switch again to “Temperature” to cancel this control. And then “Temp. Control” displayed on the screen is changed to “Temperature” and stops flashing, which indicates that it is in mode of material temperature monitoring.

[NOTE!]: When cutting and mixing operation stops automatically, operator turns knob “Knife Control” to position “0”. And then temperature control is cancelled automatically.

3.4.2 Control of bowl revolution:

Operator sets the value for bowl rotation counting on the touch screen and moves the cross-switch to “Bowl Revolution”. “Bowl Rev.” displayed on the screen is changed into the flashing “Rev. Control”, which indicates that it is in the control mode for bowl rotation cycles. When the actual rotation cycles is the same as the setting value, cutting and agitation operation stops automatically.

In mode of counting control, move the cross-switch again to “Bowl Revolution”, to cancel this control. And then “Rev. Control” displayed on the touch screen is changed into “Bowl Rev.” and stops flashing, which indicates that it is out of the mode to control the counting of bowl rotation cycles. The counter does not need to be zeroed.

[NOTE!]: When cutting and mixing operation stops automatically and operator turns the knob “Knife Control” back to “0” position, counting control of bowl rotation cycles is cancelled automatically and the counter goes back to zero.

3.4.3 Control of cutting & mixing timing:

Operator sets a timing value on touch screen and moves the cross-switch to “Time”. “Time” displayed on the screen is changed into the flashing “Timing Control”, which indicates that it is in the mode to control cutting & mixing timing now. When the pre-set timing value is reached, cutting & mixing operation stops automatically.

Counter starts to count only in cutting & mixing operation. And that is to say, if knife does not rotate, the counter does not time neither.

In the control mode for cutting & mixing timing, move the cross-switch to “Time” again to cancel this timing control. And “Timing Control” displayed on the screen is changed back to “Time” and stops flashing, which indicates that it is out of the control mode for cutting & mixing timing. The counter does not need to be zeroed.

[NOTE!]: When cutting & agitation operation stops automatically and operator turns knob “Knife Control” back to “0” position, the above-mentioned timing control is cancelled automatically and counter goes back to zero.

3.4.4 Cancel of all controls

In any control mode, move the cross-switch to “Control Cancel” to cancel all the control. At this point, both the counter and timer go back to 0.

3.4.5 Combination of controls

When any 2 or 3 control modes exist at the same time, the control whose setting value is reached first may prevail over the others. And cutting & agitation operation stops automatically

3.5 Other operations

3.5.1 Unloading disc

Unloading rotary disc descends when unloading arm moves downwards. When the disc moves close to the edge of the bowl, inductive switch on the disc transmits this signal to programmable controller, so that the unloading rotary disc starts to move automatically. In the same way, when the unloading rotary disc ascends together with unloading arm and just leaves the edge of the bowl, the inductive switch on the disc transmits the signal to the programmable controller to stop the unloading disc automatically.

[NOTE!]: Of course, operator can change the operating status (i.e. start-up or stop) of unloading disc at any time (including when unloading rotary disc is running automatically),

just by moving the cross-switch to ‘Unloading Disc’.

3.5.2 Testing

When the bowl is still, move the cross-switch to “CONTROL CANCEL” and keep for some time, so as to enter into testing mode. In this mode, the bowl rotates while cutter does not work.

In testing mode, move the cross-switch to “CONTROL CANCEL” to get out of the testing mode.

[NOTE!]: Testing is mainly used as an operation option for installation and in case that sensor for knife speed is damaged. Therefore it shall not be used very often.

3.5.3 Data review

Any operation on the bowl and cutter may make the touch screen back to the display mode from “Screen Saver”, and change the display back to “Monitoring”, which make operator free from repeated operations.

3.6 Switch-off and emergency stop

3.6.1 Normal switch-off:

When operations are completed, press the red “STOP” button on the door of distribution cabinet. Indicator for the power supply lights off. Open the cabinet to switch off all the air switches and close the door

3.6.2 Emergency stop:

Press the red “EMERGENCY STOP” button at the middle area of the operation panel, the machine stops immediately. Rotate “EMERGENCY STOP” button to get out of the emergency stop. Press “POWER SUPPLY” button to power on the machine again.

3.7 NOTICES FOR OPERATION

- 1. [CAUTION!]: During operation, it is forbidden to put hands under the knife cover of the bowl to avoid personnel injury!!**
- 2. [CAUTION!]: Do not put any object on top of the machine. Otherwise, the object may slide into the bowl under the vibration generated during the operation, which may cause knife broken, or other serious accidents!!**
- 3. [CAUTION!]: Check the materials to be poured into the bowl carefully. Bone, stone, iron chip or dead weight is forbidden, otherwise knife may be damaged or other serious accidents may happen!!**
- 4. [CAUTION!]: Water is forbidden to splash onto the electrical control box, so as to prevent electric shock or components being damaged!!**
- 5. [CAUTION!]: Clamp nut at front end of cutter shaft shall be tightening by each working shift, to prevent cutters becoming loose!!**
- 6. [CAUTION!]: Apply oil timely and carefully on all components with lubrication requirements as this manual state!!**
- 7. [CAUTION!]: Unloading and loading can be conducted only when vacuum cover is opened to the position of ascending stop. It is forbidden to unload or load when vacuum cover is not opened yet or not at the position of ascending stop yet. Otherwise the machine may be damaged!!**
- 8. [CAUTION!]: When machine needs to be moved or phase sequence needs to be changed, take off the triangle belt on wheel of agitating motor to check the rotation direction. After verifying that rotation direction is correct, place the triangle belt back. Wrong rotation direction may cause serious accidents!!**
- 9. [CAUTION!]: Rotation is forbidden when the bowl is being cleaned.**

4. INSTALALTION AND START-UP

After this machine is properly placed on production site, follow the steps for installation and test-run:

4.1 Ground Preparation

Distance between the machine and the wall is as below: (see Fig. 4-1 for details)

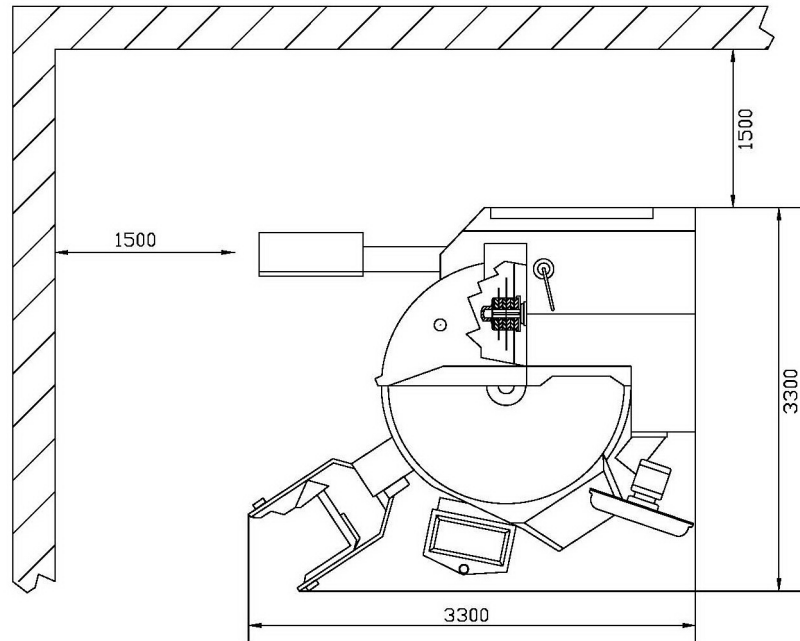


Figure 4-1 Installation space

4.2 Installation

Remove packing materials of the machine. Place its mainframe on the flat and solid ground. Adjust the distance between the machine and its surrounding walls per the Figure shown below. And then adjust the 4 feet with a leveler until the machine is leveled up. Height of hopper's stand shall allow standard hopper to be pushed in and out.

4.3 Electrical installation

Electrical engineer shall strictly follow the electrical diagram to make connection. Cables shall enter into the bottom of mainframe from distribution cabinet through cable duct. Installation shall be made according to related standards for electrical installation.

4.4 Adjustment of motor rotation direction of knife shaft

Rotation direction of high-speed motor of cutter motor: counter-clockwise rotation from head of the shaft. Rotation direction of mixing motor of cutter shaft: counter-clockwise from output shaft head. (See Fig. 4-2 for details.)

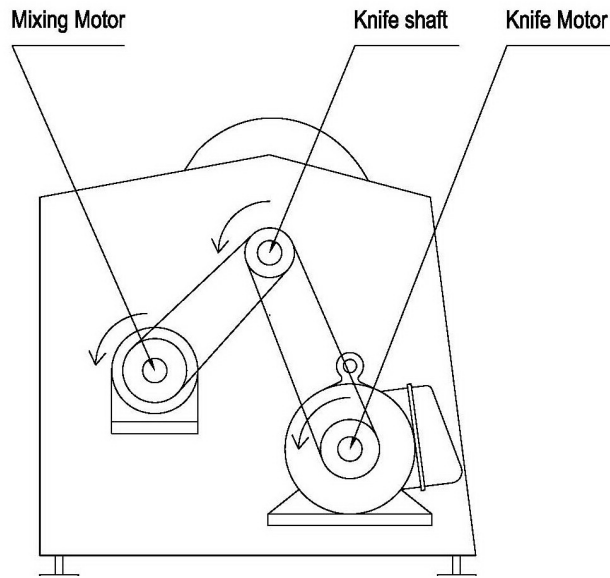


Figure 4-2 **Rotation direction of Knife-shaft motor**

4.5 Adjustment of rotation direction of bowl motor

Rotation direction of bowl motor: counter-clockwise rotation from the above of the bowl. (See Fig. 4-3 for details.)

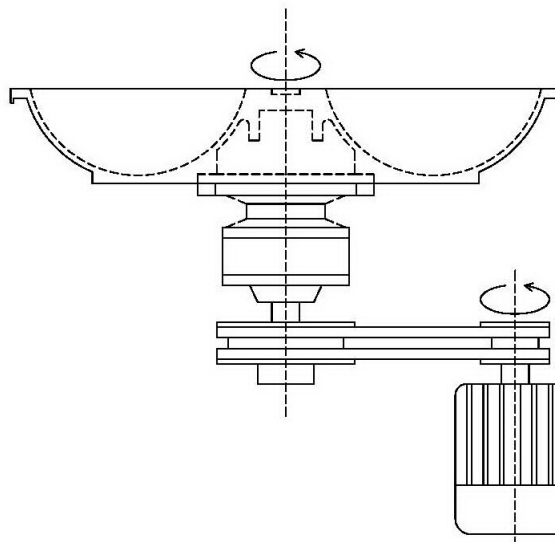


Figure 4-3 **Rotation direction of Bowl motor**

4.6 Adjustment of rotation direction of hydraulic pump's motor

Rotation direction of hydraulic pump's motor: per the direction pointed out on the hydraulic pump.

4.7 Adjustment of rotation direction of unloading disc's motor

Unloading rotary disc shall rotate counter-clockwise observed from the front of the disc. (See Fig. 4-4 for details.)

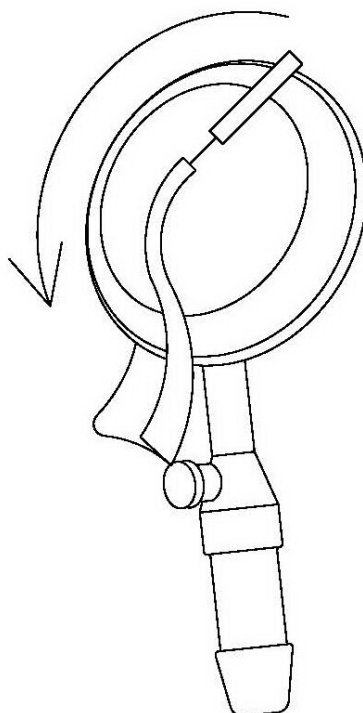
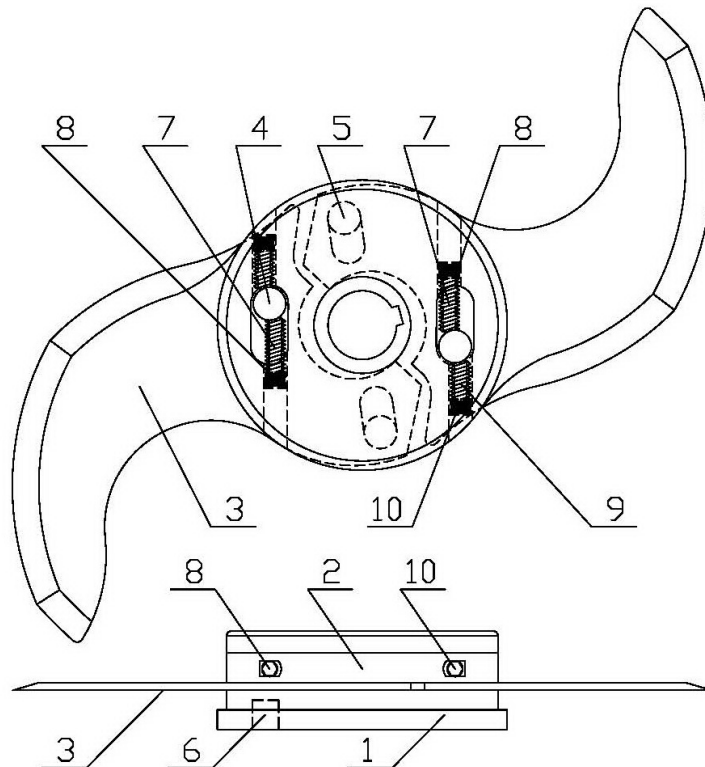


Figure 4-4 Rotation direction of Unloading disc

4.8 Assembling of cutter assembly

First, clean off the oil contaminant on knives, cutter holder and adjusting plate.

And then put 2 knives made of the same materials, with the same thickness and with weight difference of less than 2g into one group.(The requirement for weight difference less than 2g for each group must be followed.) One cutter assembly shall consists of one group of knives, one cutter holder and one adjustable plate. Adjust the 4 hexagon screws on the adjustable plate for proper length of knife.



- | | | |
|--|---|--------------------------|
| 1. Knife pedestal | 2. Adjusting plate | 3. Knives |
| 4. Barrel pin (Long) | 5. Barrel pin | 6. Weight-balanced block |
| 7. Hexagon socket head cap screw (M12) | 8. Hexagon socket head cap screw (M12) | |
| 9. Hexagon socket head cap screw (M10) | 10. Hexagon socket head cap screw (M10) | |

Fig. 4-5 Diagram for Assembling of Cutting set

1. Release the four hexagon screws (8 and 10 in Fig.4-5).
2. To extend the knifepoint in opposite direction of cutter shaft's axis, release the hexagon screw with flat head M12 (7 in Fig.4-5) to extend) and tighten hexagon screw with flat head M10 (9) to force straight pin 4 to move. When desired dimension is obtained, tighten screw 7, 8 and 10, as well as straight 4.
3. To shorten the knifepoint in direction of cutter shaft's axis, release screw 9 in Fig.4-5 and tighten screw 7 to force 4 straight pin to move. When desired dimension is obtained, tighten screw 8, 9 and 10, as well as straight pin 4.
4. Adjust the other knife in one group with the way mentioned above, to make the 2 knives in one group symmetric relative to the center of cutter shaft and in line with the requirements.
5. Place each cutter assembly onto cutter rest. Rotate the assembly to see whether they stop

at the same position. If yes, adjust the clump weight on the holder of that cutter assembly, until that cutter assembly can stop at any position.

4.9 Installation of cutting set

There are 3 ways to assemble the cutting sets according to different requirements of chopping process. The first one is to assemble 6 knives from 3 cutting sets together. The second is to assemble 4 knives of 2 assemblies together. And the third way is to assemble 2 knives of 1 cutter assembly together. The cutter assembly shall be installed as below:

1. Installation of cutter set consisting of 6 knives in 3 groups. (See Fig.4-6)

- Install baffle 1 on cutting shaft;
- Install “type II cutting set”;
- Install “type I cutting set”;
- Install “type III cutting set”;
- Each keyway of these 3 assemblies shall be 60° to the other.
- Put on clamp cover 2 and tighten the locknut (to the left) slightly

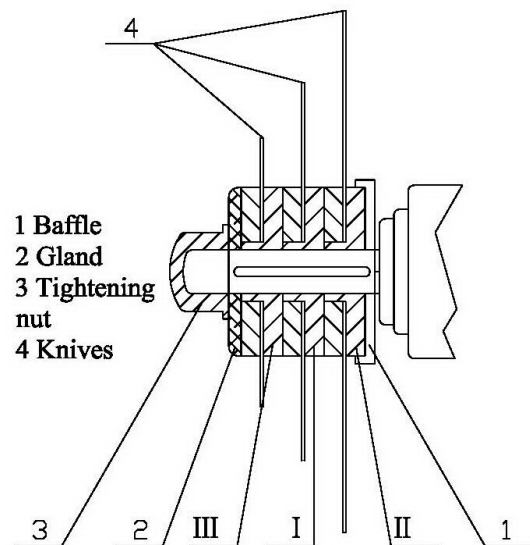


Fig. 4-6 Cutting set (6 pieces)

2. Installation of cutter set consisting of 4 knives in 2 groups. (See Fig.4-7)

- Install baffle 1 on cutter shaft;
- Install 2 pieces of adjustable plate 5;
- Install “type I cutting set”;
- Install “type II cutting set”;
- Each keyway on cutter holder of the 2 assemblies shall be 90° to the other.
- Install 1 piece of adjustable part 5;
- Put on clamp cover 2;
- Tighten the locknut (to the left) slightly

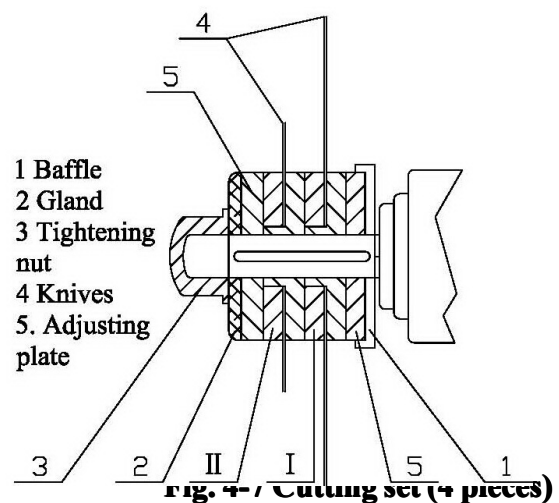
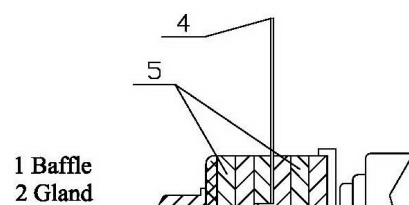


Fig. 4-7 Cutting set (4 pieces)



3. Installation of cutter set consisting of 2 knives in 1 group.

- Install baffle 1 on knife shaft;
- Install 2 pieces of adjustable plate 5;
- Install any type of cutting set (type I, II, or III). And install 2 pieces of adjustable part 5 and the gland;
- Tighten the locknut (to the left) slightly (in Fig.4-8).

Fig. 4-8 Cutting set (2 pieces)

4.10 Alignment of knives

Turn “Alignment Area” (with red dots) on the bowl to cutter assembly. Adjust length of the assembly as described above. Keep the distance between knifepoint and bowl’s arc between 1-1.5 mm (in Fig.4-9).

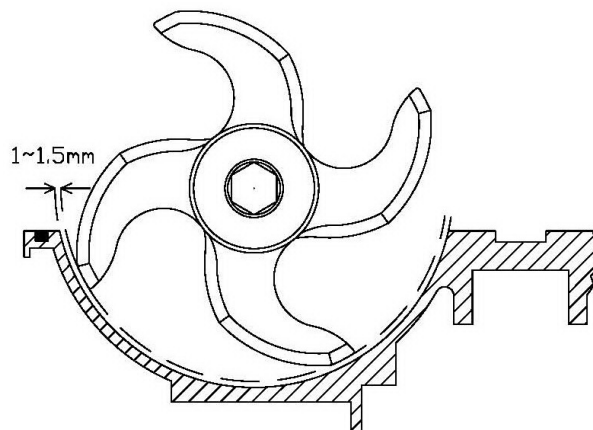


Fig. 4-5 Alignment of knives

4.11 Adjustment of magnetic induction switch for speed measurement

Distance between object to be sensed and the magnetic induction switch for speed measurement of bowl and cutter shaft shall be kept 1.5 – 3.5 mm. Power on the machine to test the speed and power off the machine to make the adjustment until required values are displayed. (It is forbidden to adjust the distance when machine is powered on.)

[CAUTION!]: To adjust the distance between the magnetic induction switch and the object to be sensed may cause injury!!

5. REPAIR AND MANITENANCE

5.1 Cleaning

Cleaning shall be done after operation is completed at the end of each day. First, open the cutter cover to clean the bowl with a nontoxic plastic plate so as to remove the remaining chopped meat on cutter shaft and cutter assembly and inside of cutter cover.

Take out the sealing strip on the bowl. Wash out the contaminant with hot water and brush, as well as the contaminant inside of the bowl and cutter cover, on cutter shaft, cutter assembly, discharging plate and the frame.

Brush and clean each corner of exterior surface with hot water and brush. If cleaning agent is used for cleaning, hot and clean water shall be used for sufficient washing and cleaning, so as to prevent food being contaminated by the remaining cleaning agent.

5.2 Maintenance of knives

To increase the durability of chopping knife, the knife shall be heated up to 100°C ~ 200°C with water or steam after being used 1 or 2 times so as to effectively release the internal tension of the material.

Chopping knife shall be stored at room temperature not lower than 20°C. Cooling measures shall be taken to keep the generated temperature not more than 45°C when the knife is being sharpened, so as to protect the knife against being broken due to the generated internal stress. When the knife is sharpened, annealing color and so-called brand shall be avoided.

The following measures shall be taken so as to eliminated the internal stress generated when knife is being sharpened:

Medium	Temperature	Time
Oil	160°C~200°C	2 hours
Steam	160°C~200°C	1 hour
Boiled water	99°C	8 ~ 16 hours

To improve knife's balance and bearing's endurance under stress, and to prolong service life of the bearing, weight difference between 2 pieces of knives of each cutter assembly shall be less than 2g. Otherwise knives shall be grinded again so as to make them in pair and to make their weight differences meet the requirements.

5.3 Maintenance of hydraulic pump

Three areas shall be lubricated on hydraulic pump (in Fig.5-1). Front and rear bearing (1 and 2 in Fig.5-1) of motor shall be greased every 3000 operating hours with 2/3 cavity filled in. Hydraulic oil in hydraulic tank (3 in Fig.5-1) shall be replaced after 50 operating hours for the first time of use and shall be thoroughly replaced every 2000 operating hours. 20 ~22 liter of YA-N46 , B2512-81 hydraulic oil is recommended.

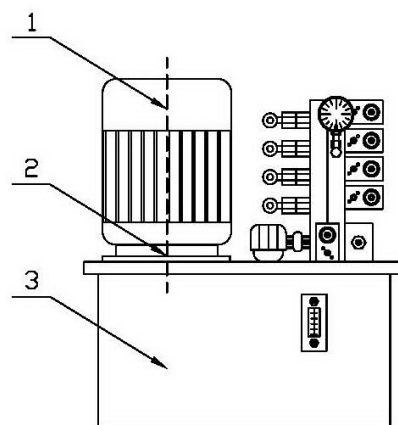


Fig. 5-1 Hydraulic pump

5.4 Periodic lubrication

5.4.1 Knife shaft:

Front bearing. High-temperature resistant and high-speed grease shall be applied by each work shift (FAG L74V KE2K-40 DIN 51 502 is recommended).

Rear bearing. High-temperature resistant and high-speed grease shall be applied by each work shift (FAG L74V KE2K-40 DIN 51 502 is recommended).

(See the attached drawings for details.)

5.4.2 Vacuum cover

Calcium-sodium-matrix grease shall be applied at 5 lubrication points on vacuum cover shaft every 500 operating hours.

1. Joint bearing of piston rod of hydraulic cylinder;

2. Joint bearing of base of hydraulic cylinder;

3. Bearing of shaft of vacuum cover;

(See the attached drawings for details.)

5.4.3 Transmission system of bowl:

5 lubricating points on this transmission system.

1. One lubricating point is on bowl shaft: take off the polyethylene cover at center of the bowl and apply 15 ~ 20 ml machinery oil into the threaded hole every 500 operating hours.

2. Thrust bearing used to support the bowl shall be applied with calcium-sodium-matrix grease every 500 operating hours, with 2/3 of the cavity filled in.

(See the attached drawings for details.)

3. Cycloid reduction gear. Oil for reduction gear shall be replaced after the machine has been operated for 300 for the first time. And after that, the oil shall be replaced every 5000 operating hours.

4. Lubrication of motor shaft: 2/3 cavity of bearings at both ends of motor shaft shall be lubricated with new grease (calcium-sodium-matrix grease).
Lubrication of adjustable bolt and fixed axis on motor frame.

5. Calcium-sodium-matrix grease shall be applied on bolt and fixed axis every 3 months, so as to avoid corrosion.

5.4.4 High-speed motor of knife shaft:

There are 5 areas on high-speed motor of knife shaft which shall be lubricated periodically. Front and rear bearing on main motor (1 and 2 in Fig.5-2) shall be lubricated with calcium-sodium-matrix grease with 2/3 cavity filled in every 3000 operating hours. Surfaces of sliding bearing (3 and 5) and of tension bolt (4) on main motor frame shall also be lubricated with calcium-sodium-matrix grease every 3 months so as to avoid corrosion.

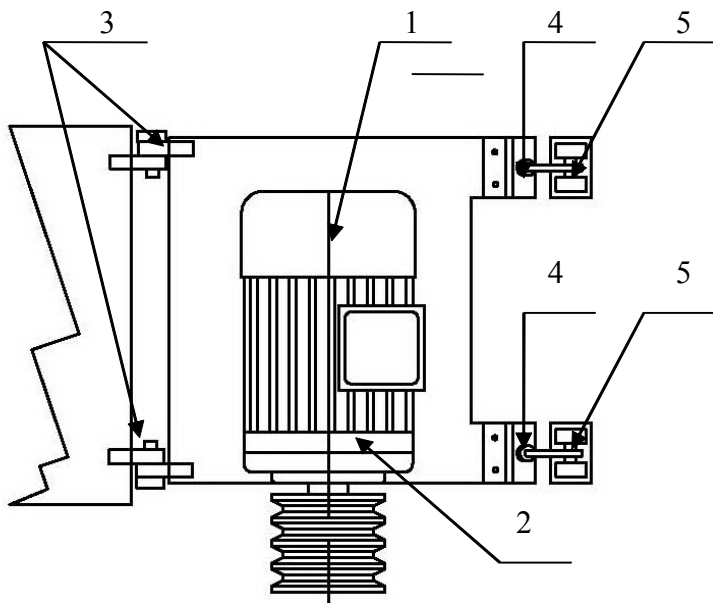


Fig. 5-2 High-speed motor

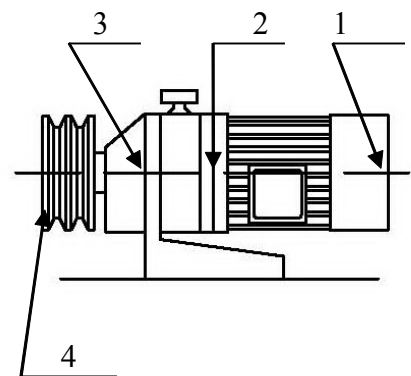


Fig. 5-3 Mixing motor

5.4.5 Mixing motor of knife shaft

There are 4 areas on mixing motor of knife shaft, which shall be lubricated. Front and rear bearing (1 and 2 in Fig. 5-3) of motor shall be applied with new calcium-sodium-matrix grease every 3000 operating hours and with 2/3 cavity filled in. Cycloid reduction gear (3

in Fig.5-3) shall be applied with new lubricant after being operated for 2 weeks for the first time. The lubricant stain inside the gear shall be washed away. And after that, it shall be lubricated every 3 ~ 6 months. Overrunning clutch (4 in Fig.5-3) shall be lubricated with high-temperature resistance and high-speed grease every 500 operating hours.

5.4.6 Loader

7 areas on lifting mechanism shall be lubricated. Calcium-sodium-matrix grease shall be filled in through the oil hole on the left and right copper bushing (1 and 2 in Fig. 20) of main shaft of this mechanism every week and lubricating gun shall be moved 2~3 times for each lubrication. Bearing lugs (3 and 4 in Fig.5-4) with joints on hydraulic cylinder shall be applied with grease every 500 operating hours. Sliding bearing (5 in Fig.5-4) on bracket shall be lubricated every 500 operating hours. Moveable small shafts (6 and 7 in Fig. 20) shall be lubricated every month against corrosion.

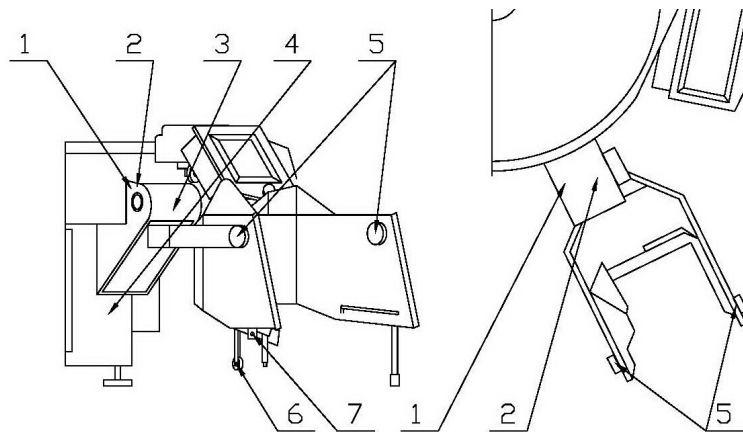


Fig.5-4 Lubiracation of loader

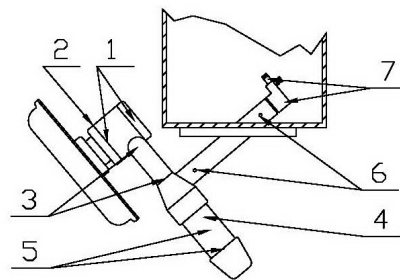


Fig.5-5 Lubiracation of unloader

5.4.7 Lubrication of discharging mechanism

There are 7 areas on the discharging mechanism which shall be lubricated. Rolling bearing (1 and 3 in Fig.5-5) shall be greased every 5000 operating hours with 2/3 cavity filled in. Cone gear (2) shall be greased every 5000 hours. Cycloid reduction gear (4 in Fig. 5-5) shall be greased every 5000 hours. Front and rear bearing of motor (5 in Fig. 21) shall be lubricated with calcium-sodium-matrix grease every 5000 hours with 2/3 cavity filled in. Oil feeding hole (6 in Fig.5-5) of front and rear copper bushing shall be greased every 500

hours, with 2~3 movements of oil gun. Front and rear joint bearing or lug (7 in Fig. 5-5) of hydraulic cylinder shall be greased every 500 hours.

5.5 Trouble shooting

Trouble	Analysis
Big noise when knife shaft is rotating.	Replace damaged bearing of main shaft. Or weight difference of knives is too big. Remove the knives to weigh and make their weight difference less than 2g.
Abnormal noise from rotating bowl	Thrust bearing at bottom of bowl might be damaged. Replace with new one.
Loading cart not lifts when lifting shaft of hopper is rotating.	Check expansion screws on feeding shaft for looseness. Adjust their locations and tighten them.
Unloading disc not rotate when unloading arm is rotating.	Check expansion screws on unloading shaft for looseness. Adjust their locations and tighten them.
Knife cover does not open when its shaft is rotating.	Check expansion screws on cutter cover shaft for looseness. Adjust their locations and tighten them.
Low speed and intermediate speed chopping is ok, but high speed chopping not work or there is twinkling noise from contactor.	Control voltage might be low. Adjust the control power supply to get 240V voltage.
Rotation speed not displayed on control panel.	Adjust measurement distance. If on value is displayed, sensor for rotation speed might be out of work. Replace with good one.
Indicator for hydraulic pipeline lights up, indicating the pipeline is blocked up.	Check to find out where is blocked out timely. Remove the contaminant and replace hydraulic oil.
Buffer and stop of cutter cover's descending and of arm descending not work.	Check limit switch to make position of the switch and bump block. No need to replace the switch.

6. ATTACHED DRAWINGS AND DIAGRAMS

Fig.-00 General Structure

Fig.-01 Machine Frame

Fig.-02 Mushroom

Fig.-03 Knife Shaft

Fig.-04 Noise/Vacuum Cover

Fig.-05 Knife Cover

Fig.-06 Loading Device

Fig.-07 Unloading Device

Fig.-08 Vacuum pipe and Inert Gas pipe

Fig.-09 Hydraulic System (General Structure)

Fig.-10 General Structure (Principle Diagram)

Fig.-11 General Structure (Action Diagram)

Fig.-12 General Structure (Electric Diagram)