

*Butt fusion machine*



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# FM -1200 Butt Fusion Machine Operation Mannual

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## Safety Rules According to Directives CE

(To be read carefully and apply while utilizing the FM1200)

Due to the specific use, this machine cannot be supplied with all kind of fix and removable protection suitable to avoid any risk of accident.

The machine, therefore, must be utilized, adjusted and keep in perfect functioning conditions by skill operators.

### Warning – Rules - Obligations

The use of machine composed by electrical components and movable parts, it's always a potential danger. In order to avoid any kind of accident caused by electrical or mechanical sources it's strongly suggested to read and follow carefully the following safety rules before operating the machine.

#### Transport

- ✓ **Basic Machine**, keep the maximum care while moving and it's suggested to utilize mechanical aids.
- ✓ **Facing Tool**, keep the maximum care while moving it and it's compulsory to utilize the handle also take care about the blades mounted in, it's compulsory use gloves.
- ✓ **Heating plate**, supplied with transport handle.  
keep the maximum care while moving it also keep the maximum care while utilizing it due to the high temperature involved always more than 200°C, it's strongly suggested to use suitable gloves.  
In order to move from one working place to the other, the facing tool and the heating plate must located into the special support. This support is heavy therefore it's necessary to utilize the maximum care to move it.
- ✓ **Hydraulic unit**, supplied with transport's frame.  
Keep the maximum care while moving and in case utilize two person.  
Avoid transport the components by holding from the cable and remember to use suitable gloves.

#### Electrical Connections

- ✓ The machine is operated by 380Volts 3 phases therefore be sure that the power supply plug is supplied with the safety devices according to the standard requirements, also check that the power supply will be on the rang of maximum 10% of the machine's nominal tension.
- ✓ While the facing tool is connected to the power supply do not leave it into the basic machine but place it into the special support. In this position, even if the start bottom is pushed the engine does not start.
- ✓ Check regularly the cable and the plug and in case substitute by qualify personnel.
- ✓ Before carry out a reparation or maintenance all the plugs must with plug out from the power supply.

#### Environmental Conditions

The working area must be clean and duly lighted. It's very dangerous to utilize the machine in case of rain or in wheat conditions or close to flammable agents.

#### Clothes

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Keep the maximum care while utilizing the machine due to the high temperature involved on the heating plate always more than 200 °C , it's strongly suggested to use suitable gloves. Avoid long clothes and avoid bracelets, necklaces that might be hooked into the machine.

**Correct machine's operation**

Remember to check and read carefully the manual before utilizing the machine and the accessories.

**Keep always the maximum attention**

After the heating plate has been disconnected temperature will be hot for some minutes.

Keep the maximum care while utilizing facing tool. Be carefully to the blades, it's strongly suggested to use suitable gloves. During the facing operation (facing tool in movement) it's forbidden to take out the shavings,

Avoid utilizing the machine after drinking or drugs use.

Take care that all the people around the machine are at safety distance.

While starting operating take care to avoid leave arms between the movable and fix trolleys. It's compulsory to

**Squashing danger**

While starting operating take care to avoid leave legs or arms between the movable and fix trolleys. It's compulsory to be far the basic machine.

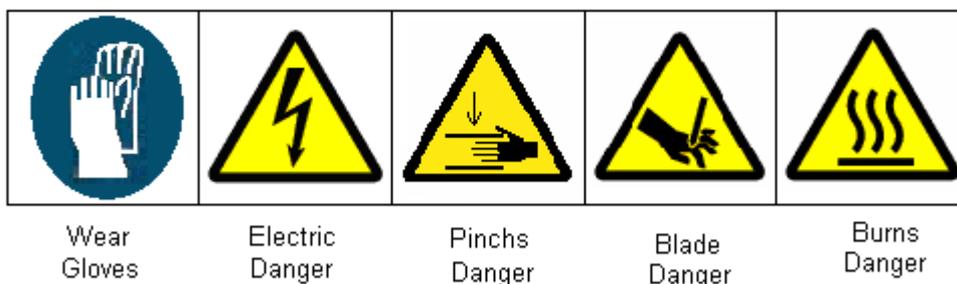
**Acoustic pollution**

The acoustic pollution of the drill engine is less than 85dB (value measured at 1 meter distance from the operator). Due to some particular cases such as too much pressure during the facing the noise should be increased, therefore it's suggested to protections.

**Important !!!**

Keep the maximum care reading and following the above Warning – Rules – Obligations the JILIN SONGJIANG THE EQUIPMENT OF PLASTIC CHANNELS. CO. LTD decline all responsibilities if are not followed totally.

Label on machine's components showing potential dangers



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## 1. Equipment Introduction

FM-1200 butt fusion machine is applicable to the butt fusion jointing of PE and PP plastic pipe between Dn710 –1200 ( $\Phi$ 710 – 1200mm).

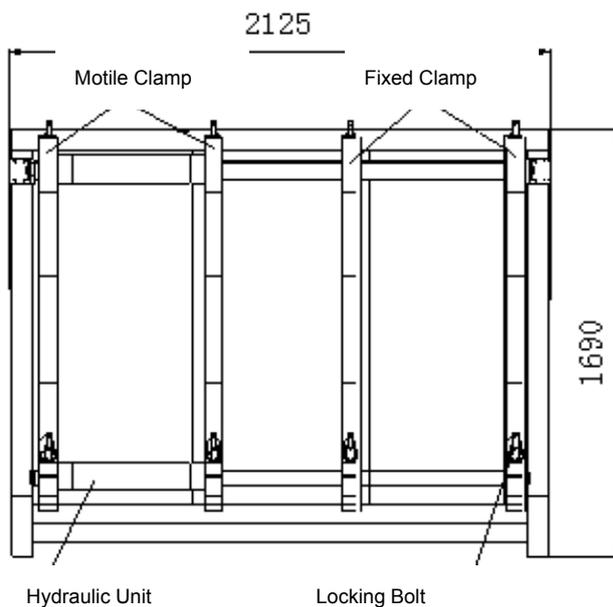
The base framework adopts the structure of two clamps, which leads to the accurate positioning of the pipe. Adjusting eight locking bolts on the clamps can calibrate the jointing ends of the pipe conveniently. The design of inclined opening plane makes the loading and unloading process quite convenient.

The hydraulic system is fixed on the base machine. The accurate welding pressure is set up through the pressure regulation valve. The hydraulic system is installed accumulator that enables the pressure to be extremely stable.

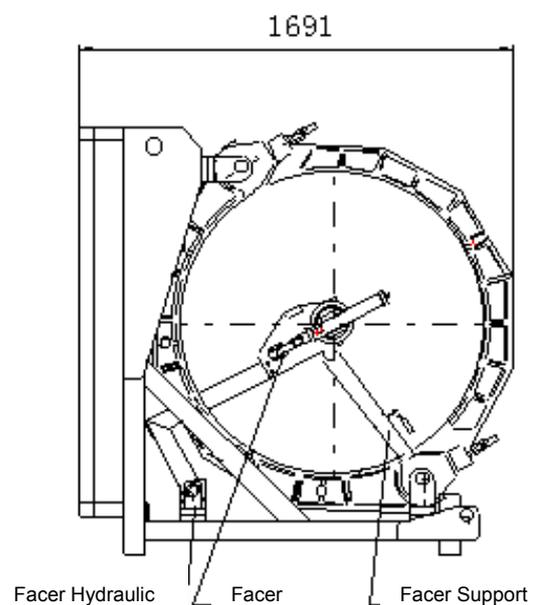
The planning tool adopts the hydraulic pressure as the motive source, its unique radial cutting mode makes the planning tool smart, light and easy manipulated.

The Heating plate adopts the automatically electronic temperature controlling instrument and supply with the electricity through alternating current, therefore making Heating plate work more accurate, more credible and more universal.

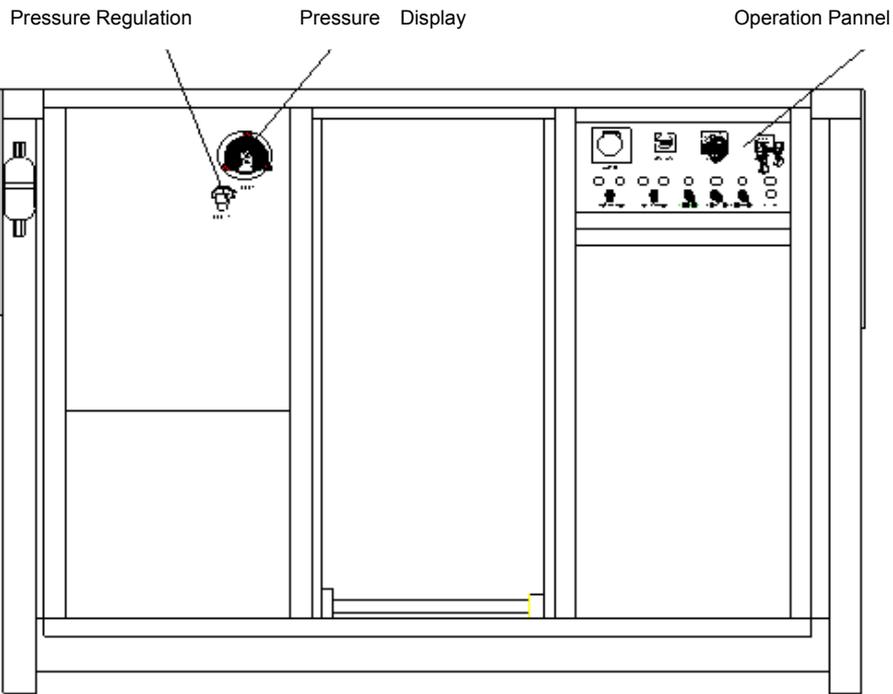
## 2. Structure Drawing



D1. Base Machine Structure



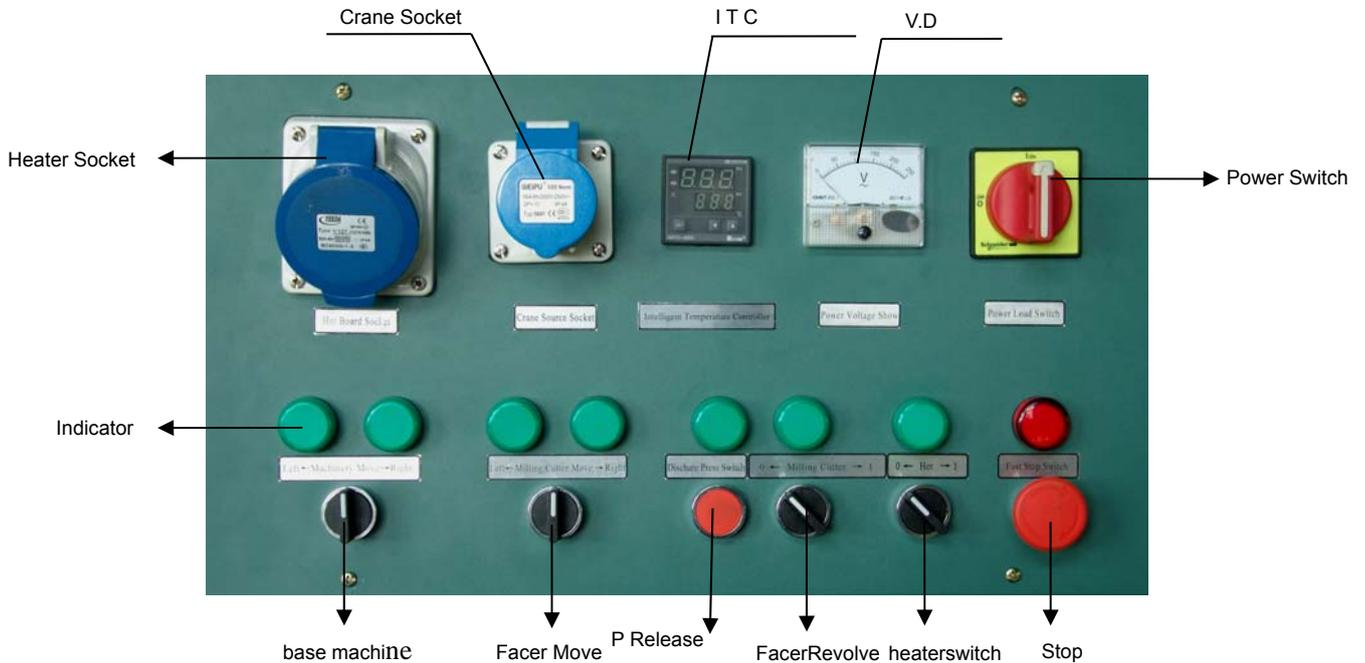
D2. Base Machine Structure



D3. Base Machine Structure

### 3. Operation Pannel Introduction

As D4, Operation Pannel are divided into 4 function areas: Fusion Area, Facer Operation Area, Base Machine Move Area, Clamp Operatio, beside there are voltage display, intelligent temperature controller, power switch, heater & crane socket and so on.



D4. Operation Pannel

#### Button and Function

- Base Machine Move Button : Driving pressure test, pipe ends check, pipe

- position set;
- Facer Move Button: Adjust the facer position between the clamps;
  - Pressure Release Button: Pressure release ;
  - Facer Revolve Button: Milling the pipe ends;
  - Intelligent Temperaturer Controller : Connecting with with heater temperature contacts, set the target temperature on Intelligent Temperaturerer;
  - Urgent Stop button : When machine is working, if there is any problem out of control, please press urgent stop button to cut the power supply.
  - Pressure regulation valve: Regulate the pressure.

#### 4. Main Parameter

1. Maximun Pressure: 8 Mpa;
2. Hydraulic Cyliner Surface: 6485 mm<sup>2</sup> (Double);
3. Voltage: AC 380V 3 Phases;
4. Total Power Consumption: 15.8 KW; (Motor: 2.2 KW; Heater: 13.6KW);
5. Heater Temperaturer Range: 40—250℃;
6. Material: PE、PP;
7. Hydraulic Oil: YB-32N or YA-48N;
8. Inserts: Φ1000、Φ900、Φ800、Φ710 .

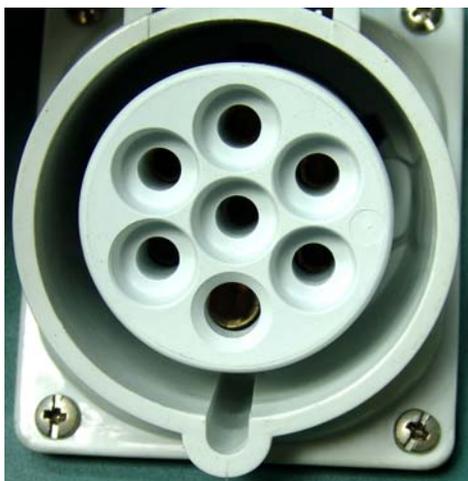
#### 5. Operation Preparation

##### 5.1 Power Connecting

Connecting Connecting 3 phases 5 wires mode power wires (ZY 3\*4mm+2\*2.5mm)

Connecting Heating plate power wire as D5

Connecting Heating plate crane power wire as D6



D5.Heater Power Supply Socket



D6.Crane Power Supply Socket

##### 5.2 Turn On Power Switch

Turn on power supply switch, the volage display and intelligence temperature controller

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start to show digits, when the operator turn on the heater switch on the operation pannel, the heating plate starts to heat.

### 5.3 Heating Plate Temperature Setting

Heating plate temperature is showed and controled on the intelligence temperature control. Press “set” , upper screen show “SV”,lower screen show“ the targeted set digit”, press “+/-” to set the heater temperature, when set finish, press “set” again to save the setting.

Remark: The heating plate temperature can reach 250℃, protection measures are required:

During the operation, please put on gloves and naked hands touching heating plate is forbidden.

Heating plate must be placed inside the storage shelf before and after pipe ends heating.

Transportation of heater can only be done when it is completely cooled down.

### 5.4 Pressure Adjustment

Hydraulic pressure is adjusted by the pressure regulation valve.Pressure are showed on the manometer on the base machine. When motile clamp move forward, adjust the pressure valve in clockwise position to increase the pressure. in unticlockwise position to reduce the pressure.

## 6. Fusion Operation

### 6.1 Pipe Loading

Step: Open Clamp→Load Pipe→Close Clamp→Locking Clamp.

### 6.2 Base Machine Move

Base machine move switch is as followed, turn left, the motile clamp move backward,turn right, the motile clamp move forward, in the middle, no move.



### 6.3 Facing Pipe Ends

Press“ Left←Facer→Right” button to adjust the facer position, put the facer in the middle of base machine, make sure the support arm steadily on the spindle, then insert the safety pin.

Adjust the facer position to make sure the facer can touch the pipe ends well( when motile clamp move, the pressure should not be too high, too much pressure will result in motile clamp moving too fast, inappropriate operation could damage the facer).

Adjust the facer arm length, turn the “Milling Cutter”right, starts the pipe ends milling.



Milling Cutter Move



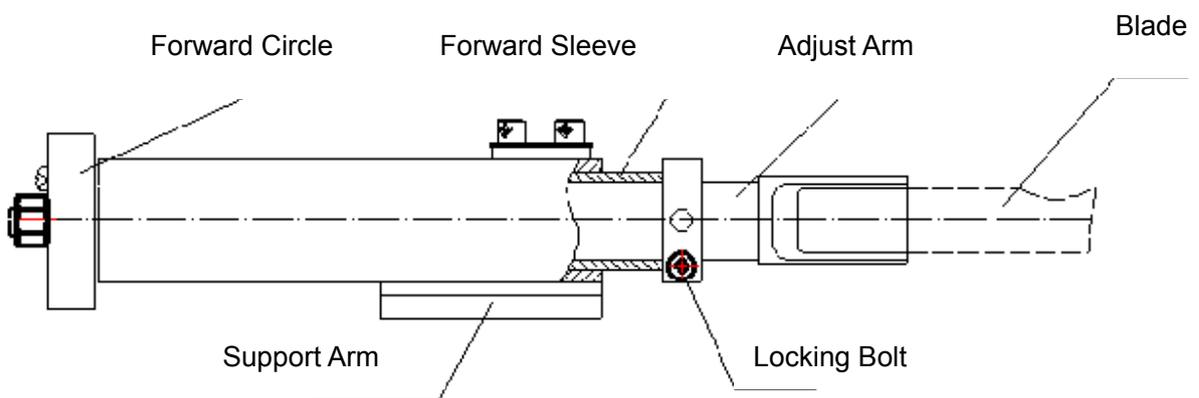
Milling Cutter Revolve

When facing finish, move the motile clamp backward, adjust the forward circle on the facer, go back to the initial condition. Pull out the safety pin, put the facer back to the storage shelf.

Take out the plastic crumbs and clean the pipe ends.

Close the pipe ends to check if the two pipes are even.

### 6.4 Facer Blade Arm Adjustment

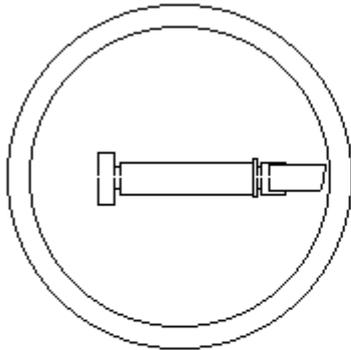


D7 Facer Structure

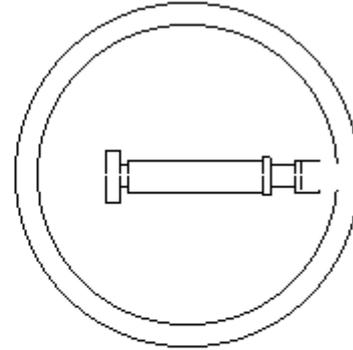
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Loose the locking bolt, adjust forward seelve and forward arm to make sure the distance between blade pipe wall is 3-5mm, then lock the locking bolt.

Suitable for this facer, min pipe size is 630mm.



Blade Head Between Pipe Wall 3-5mm Correct



Blade Head Between Pipe Wall Smaller than 3-5mm Wrong

D8 Facer Blade Position

## 6.5 Pipe Fusion

### 6.5.1 Driving Pressure Test(Pt)

Turn base machine move switch right, adjust the pressure regulation valve , note down the min pressure when motile clamp move forward(test at least 3 times), choose the middle one which is the driving pressure.

### 6.5.2 System Pressure Set (P<sub>1</sub>)

Close the two pipe ends, adjust the system pressure P1



Pressure Display



Pressure Regulation Valve

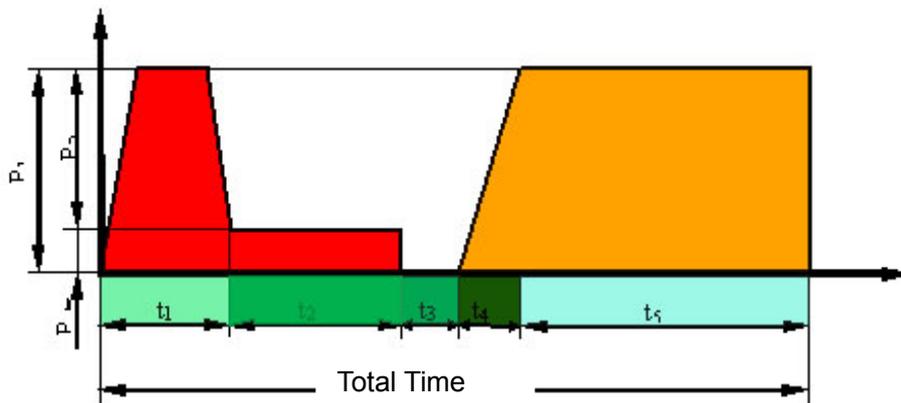
P1 System Pressure equals to Pt Driving Pressure plus P2 Standard Pressure.:

$$(P1) = P_t + (P2)$$

### 6.5.3 Load Heating Plate

When facing finish, press "backward" move the motile clamp backward, operate the heating lift up device manually, two persons are needed, one operates the control box, another holds the heater handle to make sure the heater are put steadily between the two pipe ends.

### 6.5.4 Fusion Phases



Fusion are divided into 5 phases:

- Heating Phase:  $t_1$ ,  $P_1 = P_t + P_2$
- Absorbtion Phase:  $t_2$ ,  $P_2 \approx P_t$
- Heater Take-out Time:  $t_3$
- Fusion Phase:  $t_4$ ,  $P_1 = P_t + P_2$
- Cooling Phase:  $t_5$ ,  $P_1 = P_t + P_2$

● **t1 Phase:** Pressure  $P_1$  works on the fusion interface, the purpose is to erase the distance between the pipe ends and heater so that the whole pipe ends can be heated in balance. That's why in this phase, there is no precise time for evaluation, it is checked according to the fusion loop height.

Operation: Turn "machinery move" switch right to move the motile clamp forward, at the same time adjust the pressure regulation valve to increase the pressure up to  $P_1$ .

● **t2 Phase:** Pressure  $P_t$  works on the fusion interface, the purpose is to make the pipe ends polyethelene melt enough,  $P_t$  is very important, it will decide the joint quality.

Operation: Press "Pressure Release", when pressure drop to  $P_t$ , stop the operation.

● **t3 Phase:** It is heater take-out time, melted pipe ends leave the heating plate surface,

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the temperature will drop very quickly. In theory, the shorter is the better.

Operation: Turn “machinery move” switch left to move the motile clamp backward, the take the heater out quickly.

● t4 Phase : Pressure P1 gradually establishes in this phase, the cell chain of polyethelene re-established and finally fused together.

Operation: Turn “machinery move” switch right to move the motile clamp forward, at the same time adjust the pressure regulation valve and set the pressure to P1, when two melted loop melted together and become standard fused loop, then loose the button.

● t5 Phase: Cooling phase under certain pressure, the pressure requires to be stable.

Remark: Enter t5 phase, when two loops contact together and forms standard welding loop, turn off the oil pump motor, the accumulator will maitain the pressure for cooling time.

#### **6.5.5 Fusion Record:**

The operator should record followed information:

1. Operator name & Construction company name;
2. Operation time and address;
3. Fusion machine item No. and machine No.;
4. Fusion environment temp. and condition;
5. Fusion joint No.;
6. Pipe diameter and thickness.

#### **6.5.6 Standard Pressure P<sub>2</sub> Calculation**

P<sub>2</sub> calculation formula:

$$P_2 = [0.15 \times \pi \times e \times (dn - e)] / S \text{ (Mpa)}$$

e: pipe wall thickness, mm;

π: circumferential;

dn: pipe diameter, mm ;

S: hydraulic cylinder surface

For example: (FM1200 S=6485mm<sup>2</sup>) ;

0.15Mpa in the pressure coefficient according to Standard DVS 2207

If to fuse SDR33 dnΦ800mm PE pipe with FM1200 butt fusion machine, execute fusion standard DVS-2207-2005, P2 Standard fusion pressure is :

$$dn=800\text{mm} \quad e=24.5 \text{ mm} \quad S=6485\text{mm}^2$$

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$$P_2 = [0.15 \times 3.14 \times 24.5 \times (800 - 24.5)] / 6485$$

$$= 1.38 \text{ Mpa}$$

## 7 Daily check and maintenance

- 1) Check the power supply, especially the voltage;
- 2) When check and install the oil hose, be careful and avoid the dirt fall into the oil tank. Oil in the oil tank should be higher than the hydraulic meter. Clean the oil tank and hydraulic components (such as filter) on time, change the hydraulic oil on time, keep hydraulic oil clean;
- 3) When there is any malfunction in the hydraulic system, operation should stop and check the problem until it is solved to avoid big accident;
- 4) Utilize the machine and adjust the pressure and working speed according to the design and the working requirement, excess operation may be an accident's last straw;
- 5) Before connecting, quick connector need be cleaned, when not under use, keep it in the protective cover to prevent the sand, dirt from entering the hydraulic system;
- 6) Make sure the plastic crumbs is less than 0.2mm, otherwise please adjust the thickness of the blade. Keep the blade sharp, when it is not sharp, please replace it on time, otherwise the resistance power from the face could possibly damage the transmission system;
- 7) Use a temperature tester to test the temperature on the heating plate surface, when the difference between the intelligence temperature and the temperature from tester exceed 10 °C. Calibration on the controller is required;

## 8 Malfunction and solution

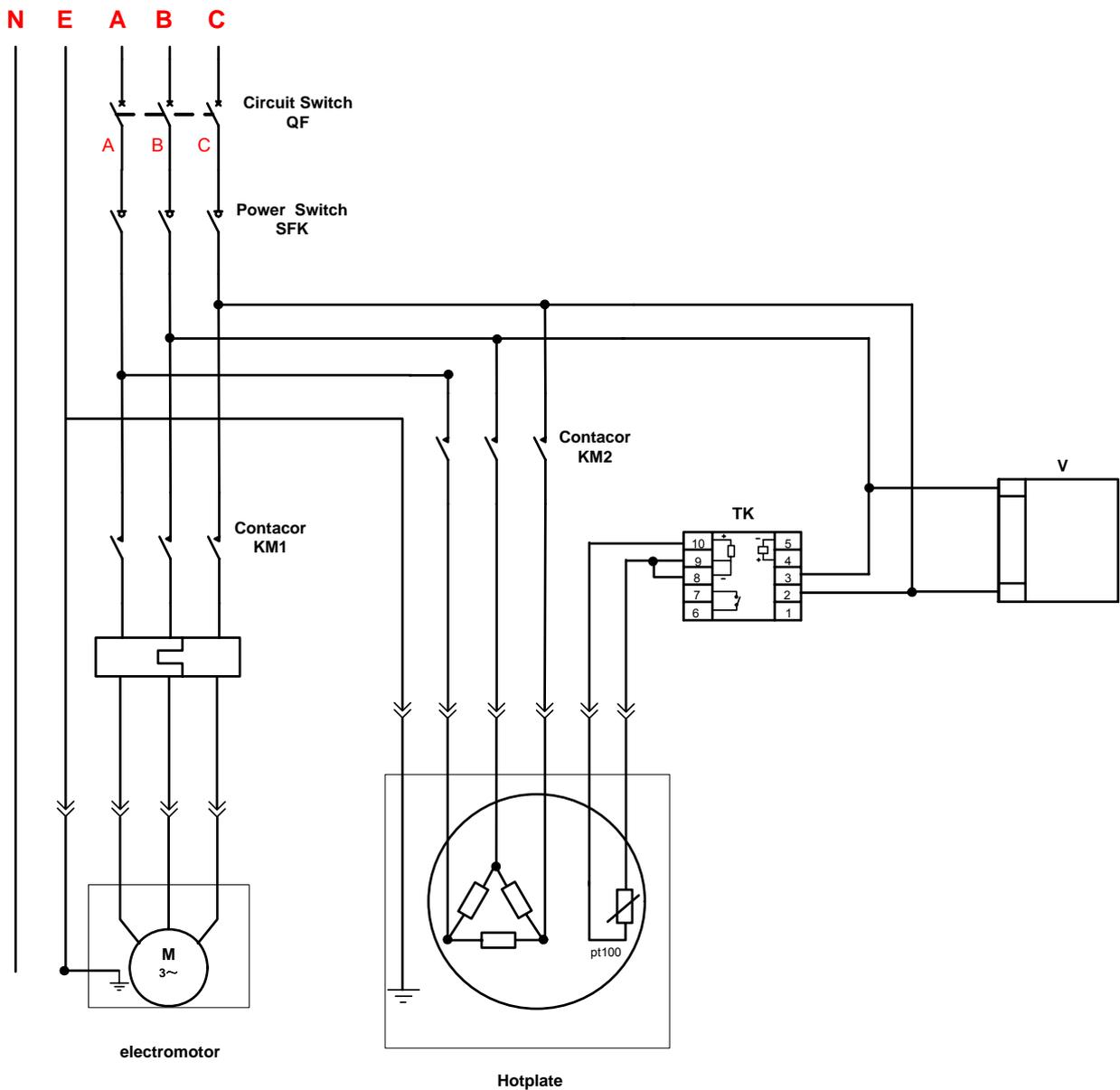
Malfunction	Reason	Solution
Leakage on hydraulic component	Seal aging or wear	Fixing or replace seal

Motor doesn't work	A、 load switch screw loose or the contact contacts bad; B、 power plug contacts bad, breaks on the power wire ;	A、 Fix the contact screw, or replace the load switch; B、 Replace wire; C、 Check plug.
Motor revolve slow, motor too hot, sound different.	Single power Voltage too low	Check the power voltage
Hydraulic system low pressure or no pressure Pump Damage	A、 Oil pipe block B、 Pressure regulation valve spring doesn't work C、 Pump Damage	A、 Clean the oil pipe B、 Replace the valve or the spring C、 Replace pump
Heating plate temperature doesn't increase	A、 Heating tube break; B、 Contact wire circle burn; C、 Contact wire pin contact not well; D、 Intelligence Temperature Controller Malfunction: No display on the controller Power part broken E、 Intelligence Temperature Controller show "HHH" or "-LL" F、 Wire broken; G、 Sensor Pt100 ( Platinum Resistance ) signal wire break or contact bad, or circuit short cut.	A、 Replace heating plate; B、 Replace contact; C、 Check the wire pin and fix it; D、 Replace Intelligence Temperature Controller; E、 Low input voltage check the power, F、 Replace the wire; G、 Replace the sensor;
Intelligence Temperature out of control, heating plate temperature still increase;	A、 Contacts inside the controller stick together; B、 Contacts inside the controller short cut	A、 Replace contact; B、 Replace contact;
Press forward or backward, motile clamps don't move	A Opening Device on the valve blocked B Valve and oil pipe block C Button contact bad	A、 Clean valve and oil pipe system; B、 Clean valve and oil pipe system; C、 Replace the button;
Facing no crumbs	A、 facer not long enough B、 Blade not sharp	A、 Adjust the facer length B、 Replace the blade

<p>Facer motor doesn't revolve</p> <p>Motor Revolve while facer plate doesn't revolve</p>	<p>Oil pipe system block or motor broken</p> <p>Transmission chain broke, or chain wheel broke</p>	<p>Clean oil pipe system or replace the motor</p> <p>Replace chain or chain wheel</p>
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## 11 Electric Diagram

Main electric drawing includes oil pump electric motor electric diagram, heating plate electric diagram, voltage. Temperature display electric diagram.



1-1 The principle diagram of main electrical control circuit

## 1-2 Electric Magnet Valve Controlling Circuit

