
CAUTION



IMPORTANT SAFETY INSTRUCTIONS BELOW READ BEFORE USE OF THE MACHINE

To ensure the safe and reliable use of this machine please carefully read the following instructions:

THE CUTTING WIRES RUNNING SPEED ARE VERY FAST. USE CAUTION WHEN REPLACING THE CUTTING WIRE , TO ENRURE THE DRIVE WHEEL HAVE STOP.

DO NOT STAND ON OR NEAR THE CONVEYOR OR MAIN FRAME WHILST THE MACHINE IS OPERATING.

DO NOT OPERATE THE MACHINE WHILST PERSONNEL ARE IN THE IMMEDIATE VICINITY OF THE MACHINE.

ENSURE THAT ONLY QUALIFIED PERSONNEL HAVE INSTALLED THE MACHINE AND THAT SUITABLY QUALIFIED AND TRAINED PERSONNEL OPERATE THE MACHINE.

READ THE MANUAL FULLY PRIOR TO USE TO OBTAIN A FULL UNDERSTANDING OF THE MACHINE.

EMERGENCY STOP SWITCHES ARE LOCATED ON THE CONSOLE PANEL.

IT IS RECOMMENDED TO TEST THE EMERGENCY STOP BUTTONS AT THE START OF EVERY SHIFT.

ISOLATE THE MACHINE BEFORE ANY MAINTENANCE OR SERVICE WORK IS CARRIED OUT.

ALL SERVICE WORK IS TO BE CARRIED OUT BY SUITABLE QUALIFIED PERSONNEL.

DO NOT OPERATE THE MACHINE WITH OUT THE SAFETY SCREENS IN PLACE.

Chapter 1 Summary:

1.1 HW-FM series Foam Cutting Machine tool use a fast wire saw knife that with a high speed, under high-speed of driving wheel; Foam will be cut into powder and adsorbed by vacuum cleaner and cut into the standard shape and size through controlling tow board with control card in the computer and the transmission of conveyor belt.

Work principle of HW-FM series Foam Cutting Machine tool

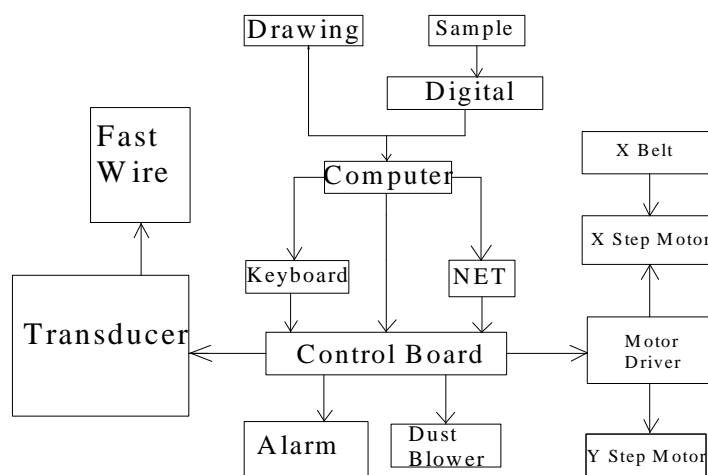


Figure 1.1

Processor inputs the data, plans the graph and procedure by the ways of keyboard(mouse) or internet according to the size of the picture or the sample(by digitized meter), and control card will carry out the process. The control card receiving the processing order and start the frequency changer and the vacuum cleaner, carries on inserting operation. It will send out a entering pulse in every operation, and acuates the motors of X axis and Y axis through driver.

The X axis rotates when the conveyor belt is transmitted by synchronized wheel, Y axis moves up and down when chain wheel drives the chain link and steel wire. The speed of the process is controled and adjusted directly by control software. All the movement system is controled by the control card, which guarantee precision, simple operation and speed.

Chapter 2 The operation instruction of the electricity

2.1 Summary

HW-FM series Foam Cutting Machine tool designed by our company is a kind of programmed-control cutting machine, providing the high-level PC computer and the high accuracy straight control card, with complete function, reliability, simple and practical software and formidable function.

2.2 Electric appliances of machine tool

Electric appliances of machine tool includes: computer with controller card, frequency changer ,strong electric board, the vacuum cleaner, X.Y step motor and step motor driver.

Strong electric board controls the machine tool and other transmission of other electric appliances through the contacts of the intermediate relay, and uses the breaker to make the protection.

The movement of the cutting wire works when driving pulley motor M1 drives other driven wheels. The movement of Y axis rotates when the step motor of Y axis drives the synchronous belt and the steel wire. X axis movement system works when the step motor of X axis drives the conveyor belt.

Foam dust is adsorbed by the vacuum cleaner motor M2.

2.2.1 Main parameter of the electric appliances

Name	Type	Voltage	Power
Cutting wire motor M1	Siemens	AC three phase 380V	3 kw
vacuum cleaner	Standard	AC three phase 380V	3kw
(X、Y) step motor	Standard	AC 110~220V	2KW
KM1~3 cocontactor	Standard	AC single phase 220V	

2.2.2 The operation instruction of the motor electrical appliance

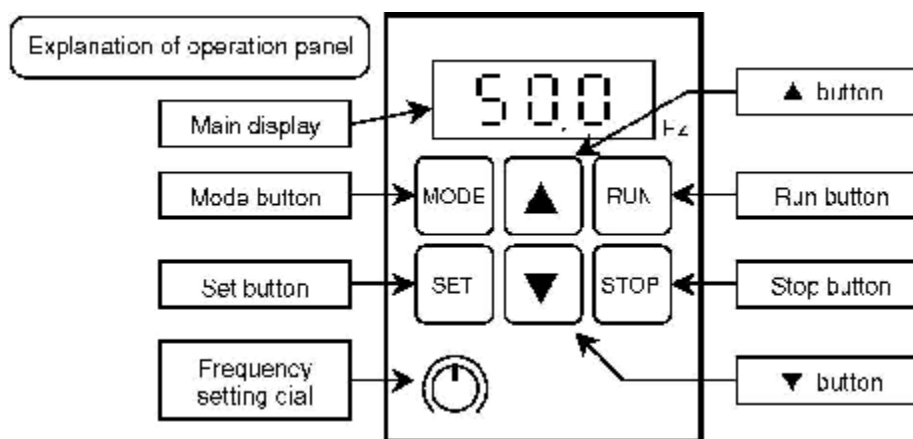
It's simple to operate, According as following step to running the machine:

- 1) turn on the power switch
- 2) turn on the computer power switch
- 3) turn on the step motor driver switch
- 4) make cutting path and program
- 5) start the cutting wire motor
- 6) turn on the vacuum cleaner power.

2.3 The usage of the frequency changer

2.3.1 Introduction

Machine use the VFO Series-400V class frequency changer as the following :



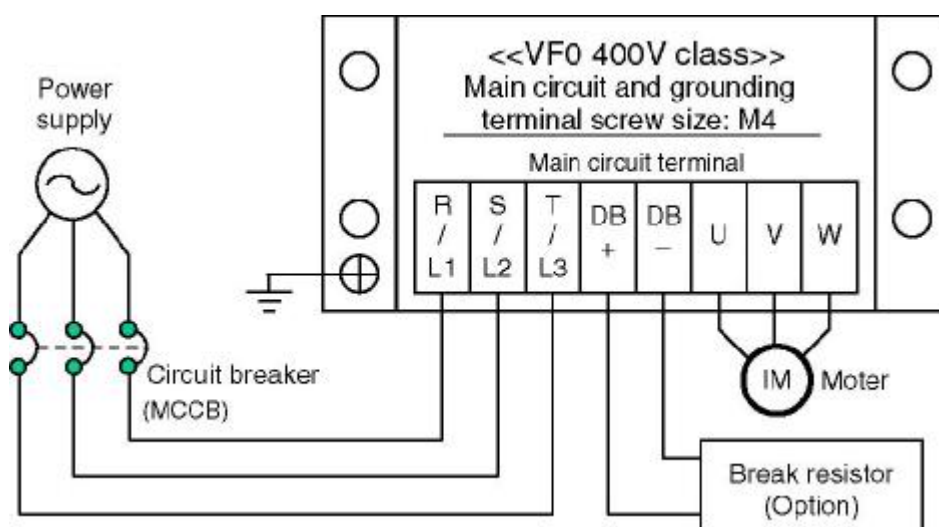
Main display	The output frequency, current, line speed, error details, data for function setting and parameter numbers are displayed.
Run button	This switch is used to start the inverter.
Stop button	This switch is used to stop the inverter.
Mode button	This switch is used to change to each "output frequency, current display", "frequency setting, monitor", "rotation direction setting" and "function setting" mode, and to switch the display from the data to mode display.
Set button	This switch is used to change the display between the parameter No. and data display, and to save the data. In the "output frequency, current display mode", this switch changes the display between the frequency and current.
▲ (up) button	This switch is used to change the data and output frequency, and to set forward run direction when carrying out forward rotation with the operation panel.

▼ (down) button	This switch is used to change the data and output frequency, and to set reverse run direction when carrying out reverse rotation with the operation panel.
Frequency setting dial	This is the dial for the potentiometer used to set the operating frequency with the operation panel.

[Handling when output current is displayed]

- 1) The displayed output current is not intended for precise measurement. Use this only as a guide value. (Use a separate measuring instrument when precise values are required.)
- 2) A relatively large value may be displayed especially at approx. 40% or less of the rated current. (For example, even if there is no output current, a certain level may be displayed. Note that when the inverter is stopped, "0A" will be displayed.)

2.3.1.1 Main Circuit Wiring

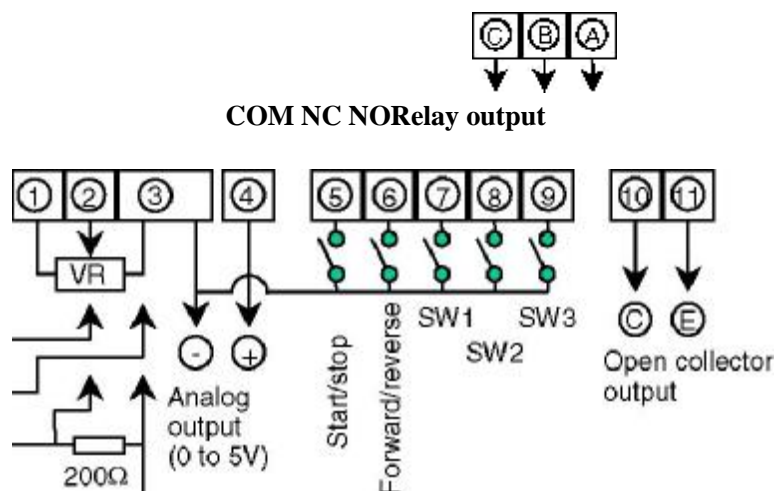


Note 1) If the breaker's overcurrent trip is a magnetic type, the device could overheat due to higher harmonics. Use a load rate of 50% or less in this case.

Note 2) When using an installed circuit breaker with motor protection, remove it.

Note 3) Crimp connectors used must be ring terminals.

2.3.1.2 Control Circuit Wiring



Terminal No.	Terminal function	Related parameter No.
1	Frequency setting potentiometer connection terminal (+5V)	P09
2	Frequency setting analog signal input terminal	P09
3	Common terminal for 1, 2, 4 to 9 signals	
4	Multi-function analog signal output terminal (0 to 5V/PWM)	P58, P59
5	Start/stop, forward run signal input terminal	P08
6	Forward/reverse, reverse run signal input terminal	P08
7	Multi-function control signal SW1 input terminal	P19, P20, P21
8	Multi-function control signal SW2 input terminal Frequency setting signal changeover input terminal	P19 to P21 P22 to P24
9	Multi-function control signal SW3 input terminal PWM signal input terminal	P19 to P21 P22 to P24
10	Open collector output terminal (C: collector)	P25
11	Open collector output terminal (E: emitter)	P25
A	Relay contact output terminal (NO: at factory setting)	P26
B	Relay contact output terminal (NC: at factory setting)	P26
C	Relay contact output terminal (COM)	P26

2.3.1.3 Functional Descriptions (Parameter Table)

No.	Parameter name	Setting range	Factory setting data
★P01	1ST ACCELERATION TIME (sec)	0•0.1 to 999	05.0
★P02	1ST DECELERATION TIME (sec)	0•0.1 to 999	05.0
P03	FREQUENCY RANGE (V/F PATTERN)	50•60•FF	50
P04	V/F CURVE	0•1	0
★P05	TORQUE BOOST LEVEL (%)	0 to 40	04
P06	OVERLOAD FUNCTION	0•1•2•3	2
P07	OVERLOAD CURRENT (A)	0.1 to 100	<input type="checkbox"/>
P08	LOCAL/EXTERNAL CONTROL	0 to 5	0
P09	LOCAL/EXTERNAL FREQUENCY	0 to 5	0
P10	REVERSE LOCKOUT	0•1	0
P11	STOP MODE SELECT	0•1	0
P12	STOP FREQUENCY (Hz)	0.5 to 60	00.5
P13	DC BRAKE TIME (sec)	0•0.1 to 120	000
P14	DC BRAKE LEVEL	0 to 100	00
P15	MAX. OUTPUT FREQUENCY (Hz)	50 to 250	50.0
P16	BASE FREQUENCY (Hz)	45 to 250	50.0
P17	ACCELERATION FREQUENCY HOLD	0•1	1
P18	DECELERATION FREQUENCY HOLD	0•1	1
P19	SW1 FUNCTION SELECT	0 to 7	0
P20	SW2 FUNCTION SELECT	0 to 7	0
P21	SW3 FUNCTION SELECT	0 to 8	0
P22	PWM CONTROL FUNCTION SELECT	0•1	0
P23	PWM SIGNAL AVERAGING	1 to 100	01
P24	PWM SIGNAL CYCLE (ms)	1 to 999	01.0
P25	OUTPUT TR FUNCTION SELECT	0 to 7	0
P26	OUTPUT RY FUNCTION SELECT	0 to 6	5
P27	DETECT FREQUENCY (OUTPUT TR)	0•0.5 to 250	00.5

P28	DETECT FREQUENCY (OUTPUT RY)		0•0.5 to 250	00.5
★P29	JOG FREQUENCY	(Hz)	0.5 to 250	10.0
★P30	JOG ACCELERATION TIME	(sec)	0•0.1 to 999	05.0
★P31	JOG DECELERATION TIME	(sec)	0•0.1 to 999	05.0
★P32	PRESET FREQUENCY 2	(Hz)	0•0.5 to 250	20.00

No.	Parameter name		Setting range	Factory setting data
★P33	PRESET FREQUENCY 3 (Hz)		0•0.5 to 250	30.0
★P34	PRESET FREQUENCY 4 (Hz)		0•0.5 to 250	40.0
★P35	PRESET FREQUENCY 5 (Hz)		0•0.5 to 250	15.0
★P36	PRESET FREQUENCY 6 (Hz)		0•0.5 to 250	25.0
★P37	PRESET FREQUENCY 7 (Hz)		0•0.5 to 250	35.0
★P38	PRESET FREQUENCY 8 (Hz)		0•0.5 to 250	45.0
★P39	2ND ACCELERATION TIME (sec)		0.1 to 999	05.0
★P40	2ND DECELERATION TIME (sec)		0.1 to 999	05.0
P41	2ND BASE FREQUENCY (Hz)		45 to 250	50.0
★P42	2ND TORQUE BOOST LEVEL (%)		0 to 40	04
P43	SKIP FREQUENCY 1 (Hz)		0•0.5 to 250	000
P44	SKIP FREQUENCY 2 (Hz)		0•0.5 to 250	000
P45	SKIP FREQUENCY 3 (Hz)		0•0.5 to 250	000
P46	SKIP FREQUENCY BAND WIDTH (Hz)		0 to 10	0
P47	CURRENT LIMIT FUNCTION (sec)		0•0.1 to 9.9	00
P48	POWER LOSS START MODE		0•1•2•3	1
P49	INSTANTANEOUS POWER FAILURE RESTART SELECT		0•1•2	0
P50	WAIT TIME (sec)		0.1 to 100	00.1
P51	RETRY FUNCTION SELECT		0•1•2•3	0

P52	NO. OF RETRIES	1 to 10	1
P53	LOWER FREQUENCY CLAMP (Hz)	0.5 to 250	00.5
P54	UPPER FREQUENCY CLAMP (Hz)	0.5 to 250	250
P55	BIAS/GAIN FUNCTION SELECT	0•1	0
★P56	BIAS FREQUENCY (Hz)	-99 to 250	00.0
★P57	GAIN FREQUENCY (Hz)	0•0.5 to 250	50
P58	ANALOG/PWM OUTPUT FUNCTION SELECT	0•1	0
★P59	ANALOG/PWM OUTPUT COMPENSATION (%)	75 to 125	100
P60	MONITOR SELECT	0•1	0
★P61	LINE SPEED MULTIPLIER	0.1 to 100	03.0
P62	MAX. OUTPUT VOLTAGE (V)	0•1 to 500	000
P63	OCS LEVEL (%)	1 to 200	140
★P64	CARRIER FREQUENCY (kHz)	0.8 to 10	1.6

No.	Parameter name	Setting range	Factory setting data
P65	PASSWORD	0•1 to 999	000
P66	DATA SETTING CLEAR	0•1	0
P67	FAULT DISPLAY 1	Latest	Refer to page 74.
P68	FAULT DISPLAY 2	Previous	
P69	FAULT DISPLAY 3	Second to latest	
P70	FAULT DISPLAY 4	Third to latest	

Note 1) The asterisk * indicates the inverter's rated current.

Note 2) The star ★ mark indicates parameters that can be changed during operation.

2.3.2 Setting the frequency

2.3.2.1 Setting the frequency

- 1) Potentiometer setting method (Parameter P09 set to "0": Factory setting)
Set with the rotation angle of the frequency setting dial on the panel. The operation will stop at the Min. position (0V stop: refer to page 73), and the maximum frequency will be attained at the Max. position.
- 2) Digital setting method (Parameter P09 set to "1") Press the MODE button on the panel to enter the frequency setting mode (Fr). Press the SET button, set the frequency to be set with the

▲ (up)
button and

▼ (down) button, and then press the SET button to enter the data. The frequency can be changed by holding down the

▲ (up) button and ▼ (down) button during operation. (Hereafter, this function is called the MOP function.) This MOP function cannot be used when parameter P08 is set to "1".

2.3.2.2. Forward/reverse run operation

- 1) Forward run/reverse run method (Parameter P08 set to "1") Press the

▲ button (forward run) or

▼ button (reverse run) on the panel to select the rotation direction. Operation will start when the RUN button is pressed, and will stop when the STOP button is pressed.

- The inverter will not start running just by pressing the RUN button.
- The MOP function cannot be used if the frequency is set with the digital method.

- 2) Start/stop, rotation direction mode setting method (Parameter P08 set to "0") First, press the MODE button twice to enter the rotation direction setting mode. Press the SET button to display the rotation direction data, change the rotation direction with the

▲ (up) button and

▼ (down) button, and then press the SET button to enter the data. (Forward run is set as the factory setting.) Operation will start when the RUN button is pressed, and will stop when the STOP button is pressed.

2.3.2.3. Combination of "MOP function", "rotation direction setting mode", and forward/reverse run operation

Forward/reverse run operation	MOP function	Details of rotation direction setting mode
Forward run/reverse run method	× (Cannot be used)	Only monitor function
Start/stop, rotation direction mode setting method	(Can be used)	Monitor function and direction setting

Note) When the forward/reverse run operation is set to "forward run/ reverse run method", the MOP function cannot be used even if the frequency is set with the digital method.

— Operating with the operation panel -1 (Factory setting state)

- Forward/reverse run operation: Start/stop, rotation direction mode setting (Parameter P08=0)
- Frequency setting: Potentiometer setting (Parameter P09=0)

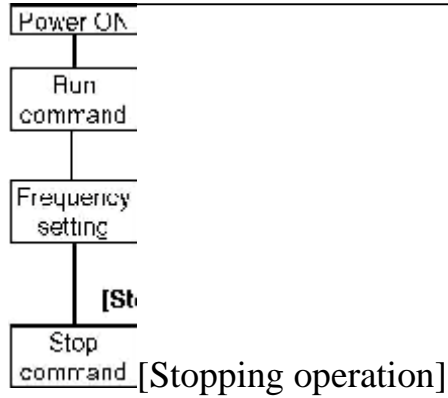
[Example for rotating in forward direction at operating frequency 25Hz]

The main display lamp will turn ON.

RUN Press the RUN button. The run state will be entered, but as the frequency setting dial is set to Min., the 0V stop state will be entered.

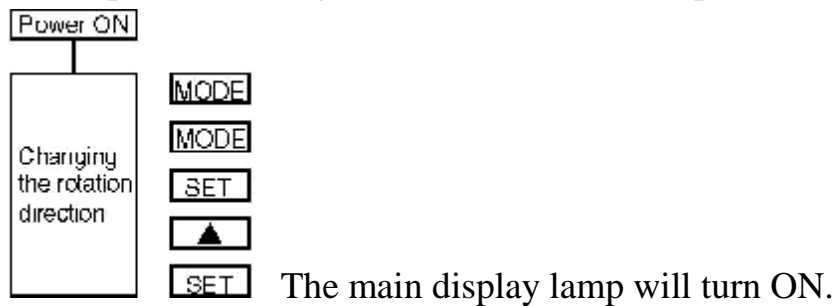


Gradually turn the frequency setting dial clockwise. The motor will start rotating, and will reach 25Hz operation when 25.0 is displayed.



STOP Press the STOP button. The motor will start to decelerate and will stop in approx. 2.5 seconds.

[Example for rotating in reverse direction at operation frequency 25Hz]



[MODE]

[MODE]

[SET]

Press the MODE button. Press the MODE button. Press the SET button. (The main display will flicker)

[▲] Press the

▲ (up) button. (The main display will flicker)

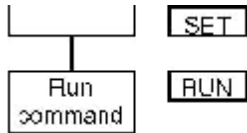
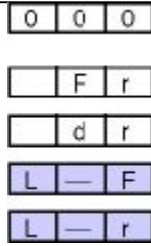
Main display

0 0 0

0.0

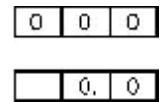
25.0

0 0 0



Press the SET button to set the data.

Press the RUN button. The run state will be entered, but as the frequency setting dial is set to Min., the 0V stop state will be entered.



Carry out in the same manner as forward rotation [Frequency setting] → [Stop command]

[Changing the rotation direction during operation]

Use the same procedures as [Changing the rotation direction] explained above. In this case, when the SET button is pressed last the display will change to the output frequency display, the motor will decelerate and then will start rotating in the reverse direction.

—Operating with the operation panel - 2

- Forward/reverse run operation:
Forward run/reverse run (Parameter P08=1)
- Frequency setting: Potentiometer setting (Parameter P09=0)

[Example for rotating in forward direction at operating frequency 25Hz] Main display

The main display lamp will turn

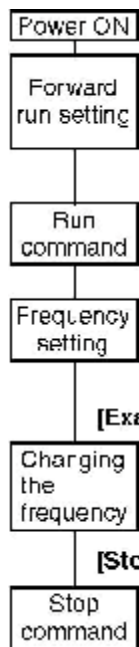
▲ | Press the

- ▲ (up) button, and set the rotation direction to forward run. (Press the ▼ button to set reverse run.)
- Current state (0: Stop, F: Forward run, r: Reverse run)
- Set rotation direction (F: Forward run, r: Reverse run)

RUN Press the RUN button. The run state will be entered, but as the frequency setting dial is set to Min., the 0V stop state will be entered.



Gradually turn the frequency setting dial clockwise. The motor will start rotating, and will reach 25Hz operation when 25.0 is displayed.



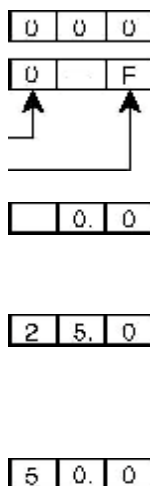
[Example to set operating frequency to 50Hz]



Turn the frequency setting dial clockwise, and set to the Max. position. The motor speed will increase and reach 50Hz in approx. 2.5 seconds.

[Stopping operation]

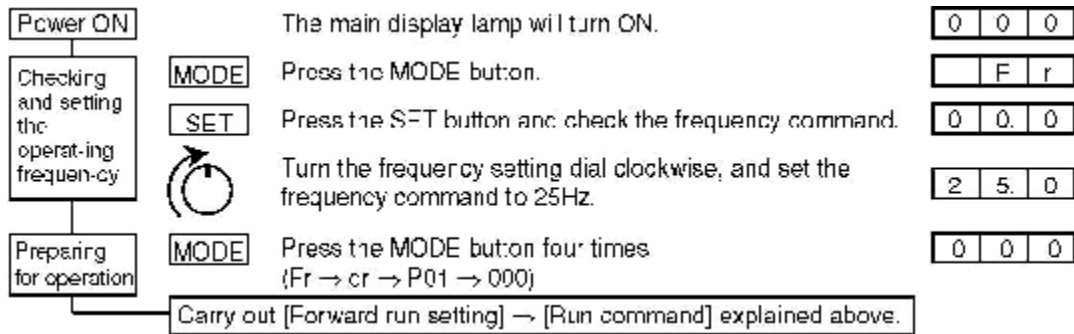
STOP Press the STOP button. The motor will start to decelerate and will stop in approx. 5



0 0 0

seconds.

[Monitoring and setting the potentiometer frequency command before operation]



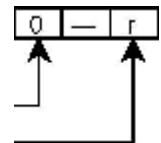
[Continued from previous page, Example to rotate in reverse at operating frequency 50Hz]

Main display

▼ I Press the

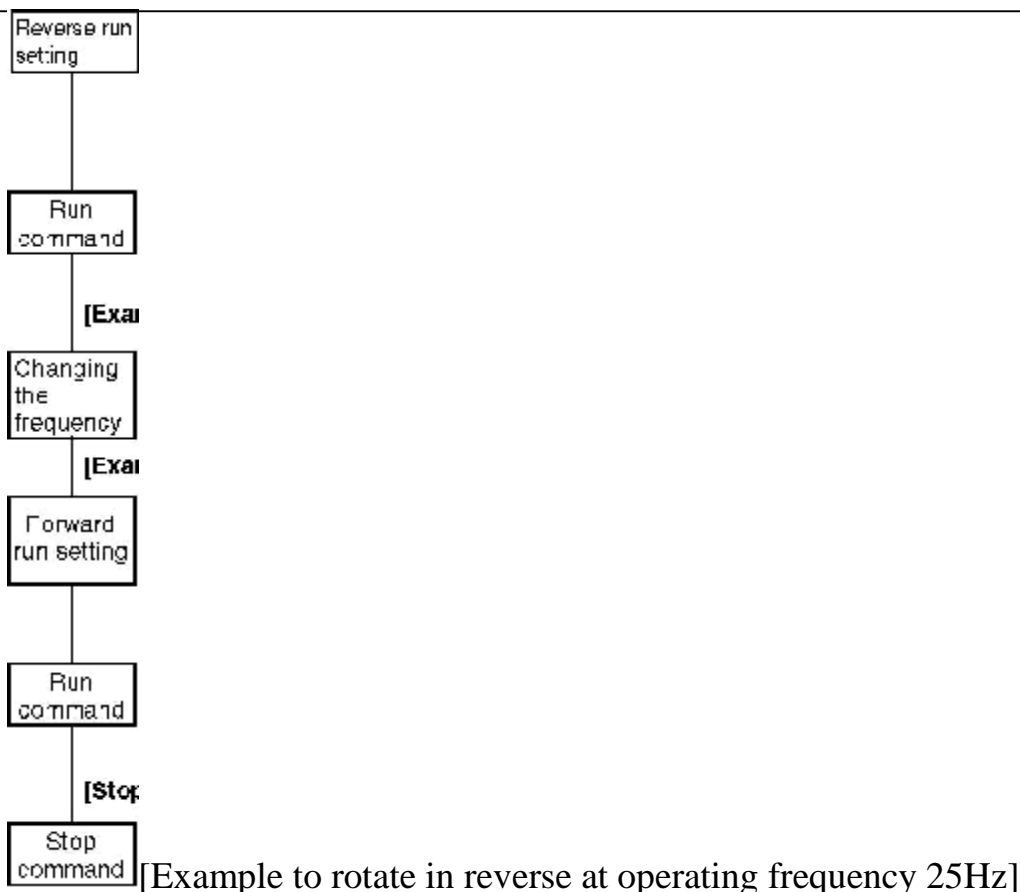
▼ (down) button, and set the rotation direction to reverse run.

- Current state (0: Stop)
- Set rotation direction (r: Reverse run)



RUN Press the RUN button. As the frequency setting dial is at the Max. position, the motor will start rotating and will reach 50Hz in approx. 5 seconds.

5 0 0



Gradually turn the frequency setting dial counterclockwise. The motor will gradually decelerate, and the motor will attain 25Hz operation when 25.0 is displayed.

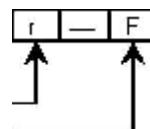
2	5	0
---	---	---

[Example to change from reverse run to forward run during operation]

▲ | Press the

▲ (up) button, and set the rotation direction to forward run. · Current state (r: Reverse run)

· Set rotation direction (F: Forward run)



Reverse run
 RUN Press the RUN button. The motor will gradually decelerate,

and will start forward rotation at 25Hz again.

2	5.	0
---	----	---



	0.	0
--	----	---

Forward run

[Stopping operation]

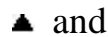
STOP Press the STOP button. The motor will start to decelerate and will stop in approx. 2.5 seconds.

2	5.	0
---	----	---

0	0	0
---	---	---

[Canceling the rotation direction setting]

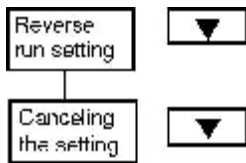
After setting with the



▼ buttons, the rotation direction can be canceled by pressing the same button again.

★ Example: When rotating in forward direction at 25Hz

.....

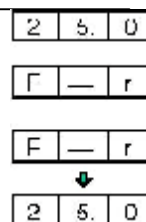


Press the

▼ (down) button, and set the rotation direction to reverse run.

When the

▼ (down) button is pressed, the display will change from the rotation direction to the frequency display, and the rotation direction setting will be canceled.



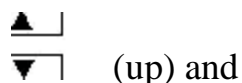
Note 1) The setting can be canceled with the same procedure even when stopped. Note 2) If the RUN button is not pressed after setting the rotation direction, the rotation direction will not change.

—Operating with the operation panel - 3

- Forward/reverse run operation: Start/stop, rotation direction mode setting (Parameter P08=0)
- Frequency setting: Digital setting (Parameter P09=1)

[Example for rotating in forward direction at operating frequency 25Hz]

The main display lamp will turn ON. MODE
Press the MODE button. SET Press the SET button.
(The main display will flicker) Press the

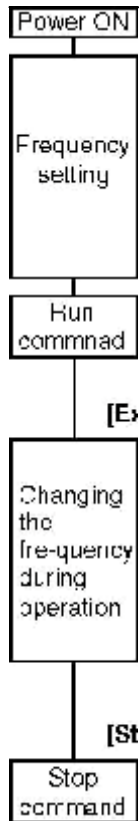


▲ (up) and ▼ (down) buttons to display 25Hz on the main display. (The main display will flicker)



SET Press the SET button to set the data.

RUN Press the RUN button. The factory setting is forward run, so the motor will start rotating in the forward direction, and will reach 25Hz operation in approx. 2.5 seconds.



[Example for rotating in forward direction at operating frequency 50Hz]

MODE Press the MODE button. **SET** Press the SET button. (The main display will flicker) Press the

▲ | Press the ▲ (up) and

▲ (up) and ▼ (down) buttons to display 50Hz on the main display. (The main display will flicker)

▼

▼

SET Press the SET button to set the data. The display will change to the output frequency, and will reach 50Hz in approx. 2.5 seconds.

[Stopping operation]

STOP Press the STOP button. The motor will start to decelerate and will stop in approx. 5 seconds.

Main display

0 0 0

F r

0 0. 5

2 5. 0

0 0 0

2 5. 0

F r

2 5. 0

5 0. 0

5 0. 0

0 0 0

[Changing the frequency with the

▲ and

▼ buttons during operation (MOP function)]

The operating frequency can be changed with the

▲ and

▼ buttons during operation. · If the

▲ (up) button is held down, the operating frequency will increase. · If the

▼ (down) button is held down, the operating frequency will decrease.

Note) Once the operating frequency is determined, press the MODE button and then press the SET button twice to set the operating frequency. If this is not carried out, this frequency will not be saved when the power is turned OFF.

[Continued from previous page, Example to rotate in reverse at operating frequency 50Hz]

Main display

MODE Press the MODE button. MODE Press

SET

the MODE button. **▲** SET Press the SET button. (The main display will flicker) Press the

▲ | Press the **▲** (up) button. (The main display will flicker)



SET Press the SET button to set the data.

RUN Press the RUN button. As the frequency is already set to 50Hz, the motor will start rotating in the reverse direction and will reach 50Hz in approx. 5 seconds.



[Example to change to forward rotation during reverse rotation]

MODE Press the MODE button. MODE Press

SET

the MODE button. **▼** SET Press the SET button. (The main display will flicker) Press the

▼ | Press the **▼** (down) button. (The main display will flicker)



SET Press the SET button. Reverse run The motor will decelerate, and will start forward rotation at 50Hz.



Forward run

[Stopping operation]

STOP Press the STOP button. The motor will start to decelerate and will stop in approx. 5 seconds.

	F	r
--	---	---

	d	r
--	---	---

L	—	F
---	---	---

L	—	r
---	---	---

0	0	0
---	---	---

5	0.	0
---	----	---

	F	r
--	---	---

	d	r
--	---	---

L	—	r
---	---	---

L	—	F
---	---	---

5	0.	0
---	----	---

	0.	0
--	----	---

5	0.	0
---	----	---

0	0	0
---	---	---

2.3.2.4 –Operating with the operation panel - 4

· Forward/reverse run operation:

Forward run/reverse run (Parameter P08=1)

· Frequency setting: Digital setting (Parameter P09=1)

1 Carry out the same operation as "Operating with the operation panel -2" for forward run/reverse run, stopping.

2 Carry out the same operations as "Operating with the operation panel -3" to set and change the frequency.

Note 1)The rotation direction cannot be set with the "rotation direction setting mode (dr)" in this Operating with the operation panel -4. In the "rotation direction setting mode (dr)", only the rotation direction and local/external operation control state can be monitored.

Note 2)The MOP function cannot be used with this Operating with the operation panel -4.

2.3.3 The maintenance and inspection of frequency changer

The frequency changer must be kept clean in routine work, keep dirty or other foreign matters out of it, it needs specially careful when it is revised connection mistake or shut off the wire; don not use it in moist or multi-oils environment, or it will be damaged by dust , the iron fillings or other foreign matters, it should be paid special attention to accident unexpected.

Make sure the inspection maintenance must be carried out after five minutes' dump in case receive an electric shock. Main items of Daily inspection and periodic inspection of frequency changer are as follows:

2.3.3.1 The routine inspection work includes: the whole environment temperature, the humidity, the dust, the corrosion degree gas, the oil mist and so on. Inspect innormal vibration and noise and the voltage of input line.

2.3.3.2 inspect whether the ...module of main circuit part is in good condition, whether there is a divulge or a inflation of the flat wave electric capacity, the relay opetation is smooth, and whether there is a big crack or a colored change.

2.3.3.3. inspect and control circuit.

1.Movement inspection

(1) Inspect the balance situation between phases when the frequency changer works independently.

(2) carry out a series of proection operation, make sure there is no problem with protection and demonstration.

2.Inspect components, including electric circuit board

(1) no unusual smell or color change

(2) no obvious crack

(3) No divulge of liquid or any distortion of electric capacity

(4)

2. Demeonstration part

Inspect whether the demonstration on the digital operation board is clear, and whether the LED is damaged.

2.4 The usage of subdivide driver for X.Y axis with a high performance:

MD2282 is a high performance microstepping driver based on the most advanced technology in the world today. It is suitable for driving any 2-phase and 4-phase hybrid step motors. By using advanced anti-noise control technology, it can decrease motor noise and vibration during motion, which makes the step motor's noise and stability inclined to that of servo motor. Compared with the normal micro stepping drivers in the market, the step driver and motor's heating can be off by 15-30%.

High performance, low cost, extremely low noise Both driver and motor low heating Supply voltage up to 80-250VAC, current output up to 7.8A peak (RMS5.57A) TTL compatible and optically isolated input signals, pulse frequency up to 400 KHz Automatic idle-current reduction 16 selectable resolutions in decimal and binary Suitable for 4,6,8 lead motors DIP switch current setting with 8 different value CW/CCW mode available (optional)
Over-voltage,short-voltage,over-current, over-heating and short-circuit protection

Suitable for a wide range of stepping motors of NEMA 43 and 51, and usable for various kinds of machines, such as X-Y tables, labeling machines, laser cutters, engraving machines, and pick-place devices. Particularly useful in applications with low vibration, high speed and high precision are desired.

2.4.1 Control Signal Connector P1-pins

The driver has two connectors, P1 for control signals, and P2 for power and motor connections.

The following is a brief description of the two connectors of the driver. More detailed descriptions of the pins and related issues are presented in section 4, 5, 6, 9

Signal	Functions
PUL + (+5V)	Pulse signal: in single pulse(pulse/direction) mode, this input represents pulse signal, effective for each upward – rising edge; in double pulse mode (pulse/pulse) this input represents
PUL- (PUL)	

	clockwise(CW)pulse. For reliable response, pulse width should be longer than 1.2 μ s.
DIR+ (+5V)	Direction signal: in single-pulse mode, this signal has low/high voltage levels, representing two directions of motor rotation; in double-pulse mode (set by DIP switch SW5), this signal is counter-clock (CCW) pulse, effective on each rising edge. For reliable motion response, direction signal should be sent to driver 5 μ s before the first pulse in the reverse motion direction.
DIR- (DIR)	
ENA+ (+5V)	Enable signal: this signal is used for enable/disable, high level for enabling driver and low level for disabling driver. Usually left unconnected(enabled).
ENA- (ENA)	
READY+	Output alarm signal positive: READY is an output from open collector photocoupler, effective when driver operating, maximum permitted input voltage is 30VDC, max. output current is 20mA, usually can be series connected to PLC input.
READY-	Output alarm signal negative

Remark 1: DIP switch SW5 ON represents PUL/DIR mode CW/CCW (pulse/pulse) mode.

Remark 2: Please note motion direction is also related to motor-driver wiring match. Exchanging the connection of two wires for a coil to the driver will reverse motion direction.(for example, reconnecting motor A+ to driver A- and motor A- to driver A+ will invert motion direction)

Power connector P2 pins

Signal	Functions
AC	AC input, varies from 80V to 220V, recommended to use 180V.
AC	
Phase A	Motor coil A (leads A+ and A-)
Phase B	Motor coil B (leads B+ and B-)
PE	Connect ground terminal

2.4.1 Microstep Resolution Selection

Microstep resolution is set by SW1-SW4 of the DIP switch as shown in the following table:

ustep/rev.(for 1.8°motor)	SW1	SW2	SW3	SW4
400	ON	ON	ON	ON
500	OFF	ON	ON	ON
600	ON	OFF	ON	ON
800	OFF	OFF	ON	ON
1000	ON	ON	OFF	ON
1200	OFF	ON	OFF	ON
1600	ON	OFF	OFF	ON
2000	OFF	OFF	OFF	ON
2400	ON	ON	ON	OFF
3200	OFF	ON	ON	OFF
4000	ON	OFF	ON	OFF
5000	OFF	OFF	ON	OFF
6000	ON	ON	OFF	OFF
6400	OFF	ON	OFF	OFF
8000	ON	OFF	OFF	OFF
10000	OFF	OFF	OFF	OFF

2.4.2 Current setting

The SW6-SW9 of the DIP switch are used to set the current during motion (dynamic current). Select a setting closest to your motor's required current.

DIP Setting for current during motion:

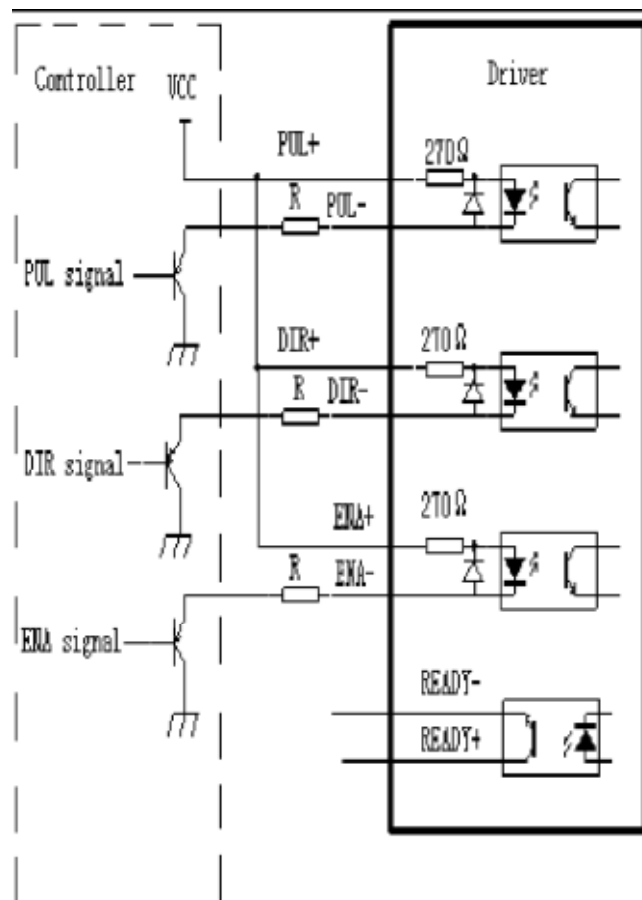
MD2282		DIP switch setting			
Peak current (A)	RMS (A)	SW6	SW7	SW8	SW9
0.45	0.32	OFF	OFF	OFF	OFF
0.63	0.45	OFF	OFF	OFF	ON
1.41	1.00	OFF	OFF	ON	OFF
1.88	1.34	OFF	OFF	ON	ON
2.33	1.66	OFF	ON	OFF	OFF
2.85	2.04	OFF	ON	OFF	ON
3.23	2.31	OFF	ON	ON	OFF
3.75	2.68	OFF	ON	ON	ON
4.26	3.04	ON	OFF	OFF	OFF
4.65	3.32	ON	OFF	OFF	ON
5.18	3.70	ON	OFF	ON	OFF
5.55	3.96	ON	OFF	ON	ON

6.15	4.39	ON	ON	OFF	OFF
6.60	4.71	ON	ON	OFF	ON
7.20	5.14	ON	ON	ON	OFF
7.80	5.57	ON	ON	ON	ON

2.4.3. Control Signal Connector (P1) Interface

This driver uses differential inputs to increase noise immunity and interface flexibility. Single-ended control signals from the indexer/controller can also be accepted by this interface. The input circuit has built-in high-speed opto-coupler, and can accept signals in the format of line driver, open-collector, or PNP output. Line driver (differential) signals are suggested for reliability. In the following figures, connection to open-collector is illustrated

Open-collector (common-anode)



2.4.4 Problem Symptoms and Possible Causes

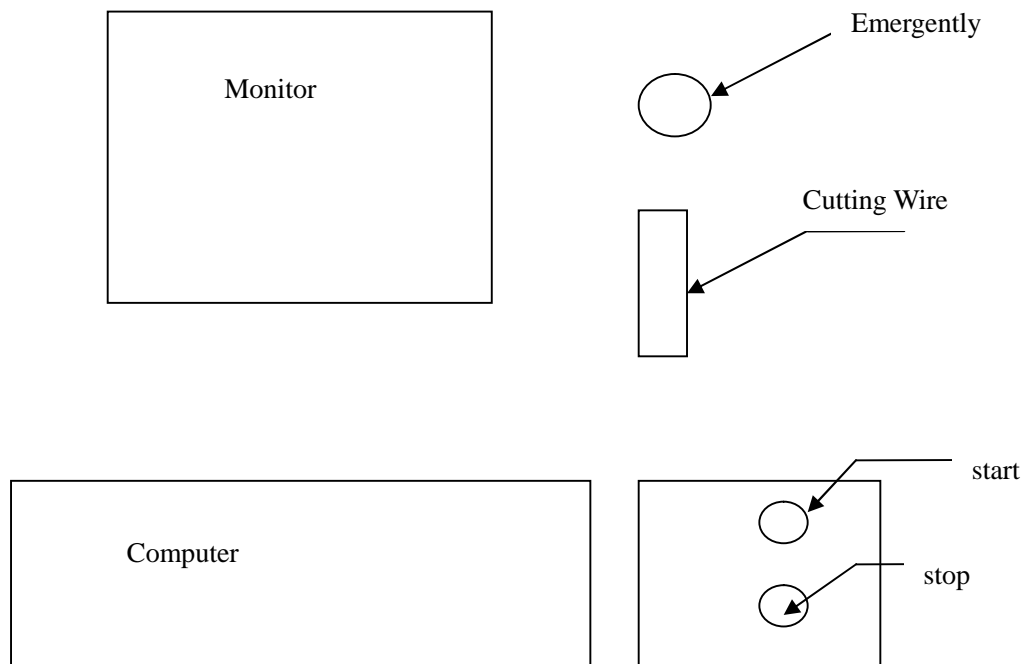
Symptom	Possible Problem
Motor not rotating	No power
	Invalid microstep resolution select setting
	DIP switch current setting is wrong
	Fault condition exists
	Unit is disabled
Motor rotating in the wrong direction	Motor phases may be connected in reverse
Unit in fault	DIP switch current setting is wrong
	Motor phase winding shorted
	Power input or output driver electrically overstressed
Erratic motor motion	Motor or power wiring unshielded or not twisted pair
	Logic wiring next to motor/power wiring
	Ground loop in system
	Open winding of motor
	Phase bad on driver
Motor stalls during acceleration	DIP switch current setting is wrong
	Motor is undersized for application
Excessive motor and driver heating	Acceleration on controller is set too high
	Power supply voltage too low
Excessive motor and driver heating	Inadequate heat sinking / cooling
	Current reduction not being utilized
	Current set too high

2.5 The usage of maintains of the vacuum cleaner:

The machine tool is entire automatically controled by computer, providing a force convulsion vacuum cleaner, after the user starts the frequency changer approximately 10 seconds, the computer control card will receive the instruction and turn on the relay with 24V automatically, the relay opens the electronic contact, which causes the coil in the middle of vacuum cleaner telegrams, thus intermediate relay can attract and gather and vacuum cleaner revolutes. The vacuum cleaner also can be opened and closed manually on the condition that the frequency changer must be started first manually.

The detritus grinded by the line knife adsorbed into the vacuum cleaner by the vacuum mouth along the moving route of line knife, thus it prevents the sponge detritus from being brought into the dragon gate, affecting guide rail, the slide and service life of other electric appliances. There are two cloth sacks in the vacuum cleaner, the user must clean up promptly when 2/3 of its amount is used.

2.5.1 The drawing of machine tool cabinet board:



Chapter 3 Problem Symptoms and Possible Causes of electricity control

As to the system of machine tool electricity, the damage of each primary will affects its normal operation. In this chapter, we unable to nattate damage phenomenon of each primary device, so we here analyze and give some instruction of some common breakdowns. Hope it can be granted, also we hope users can summarizes the breakdowns discovered in the usage process and give us your valued suggestion. We will consummate our products unceasingly and diligently and make every effort to service users with best products quality.

Considering the particularity in the sponge process, we make every effort to make it stable, succinct and bright when we design the electricity, which facilitates users to maintenance. Here we will analysis some common breakdowns and ways to remove, and hope it can provides some convenience for users.

3.1 The driving pulley doesn't revolve

3.1.1 Start the botton and listen whether KM1 is gathered, if not, check whether the voltage on the two ends is 220V; if not, check whether the contact of start botton is gathered.

3.1.2. If the KM1 is gathered, start the control software, if the driver can't be started even you press Ctrl B or click on the frequency changer botton with mouse, then you shall check whether the frequency changer starts or whether the thermal relay gathers.

3.1.3 .The broken line protection switch is under malfunction. The contact is not good. And the frequency doesn't work.

3.2 Innormal work of the vacuum cleaner

3.2.1 Check whether the motor wiring colum of the vacuum cleaner is stable and whether the manual dial switch is under ON condition before start the machine tool power and control software, listen whether there is a sound of contact gathering of the relay when start the line knife motor. If the KM2 has gathered, check whether the three phase voltage of the vacuum cleaner motor

is all 380V, if not so, check FU1 is completed. If KM2 can not gather, check the direct current voltage-stabilizer of circuit KM4 and +12V is normal.

3.2.2 If the vacuum cleaner motor revolves but can not absorb the dust, check whether the motor reverses, if so, you should trade the motor foreword meets.

3.3 Cutting wire runs out from the wheel

The reason that cutting wire runs out from the wheel is mainly because of the main wheel out-circle center is not straight with the driving wheel center .

3.4 The frequency changer does not work

3.4.1 Check whether three-phase power line turns on L1, L2, L3 correctly. If so, check whether KM1 gathers is completed.

3.4.2 Check whether the contact of holding wires are in good condition.

3.4.3. If the establishment of frequency changer is wrong, adjust the establishment condition to make it works

3.5 Step motor falls out of step or does not work

As to the electrical failure, there are mainly flollowing several aspects:

3.5.1 if the actuation power burns out, check whether FU5 is completed, firing line and zero curve do short-circuit.

3.5.2. the fault of the driver internal line may cause output of electric current and voltatge unstable.

3.5.3 the contact of four cores plug of step motor is not in good condition.

3.5.4. the contact of connection card and driver connection line is not in good condition.

3.5.5. the data of control software is improper. The scope of the acceleration establishment has surpassed the permissible value.

3.5 Breaker down

The strong electrode breaker on the machine tool will burn down immediately when turn on the power swith of the machine tool, you should check whether the three-phase power in 26 cores plugs does short-circuit.

Chapter fourth security protection measure of machine tool electricity

The entire machine tool system, there is a strong electricity police symbol on those involving strong electricity connectrion ($\sim 220V$ 、 $\sim 380V$) and the tag board, thus to reminds the users of safety.

4.1 There are insulation tubes wrapped on the wiring column and the weld point of the primary device. The wires not in the wire chase are tied by the tube, thus it makes the wires neat and safe.

4.1.1 There is a quick stop switch on the machine tool electricity, press the botton when meet emergency case.

4.1.2 The machine tool system touched the ground safely, there is a earth symbol on the earth place, users should make it touch reliably.

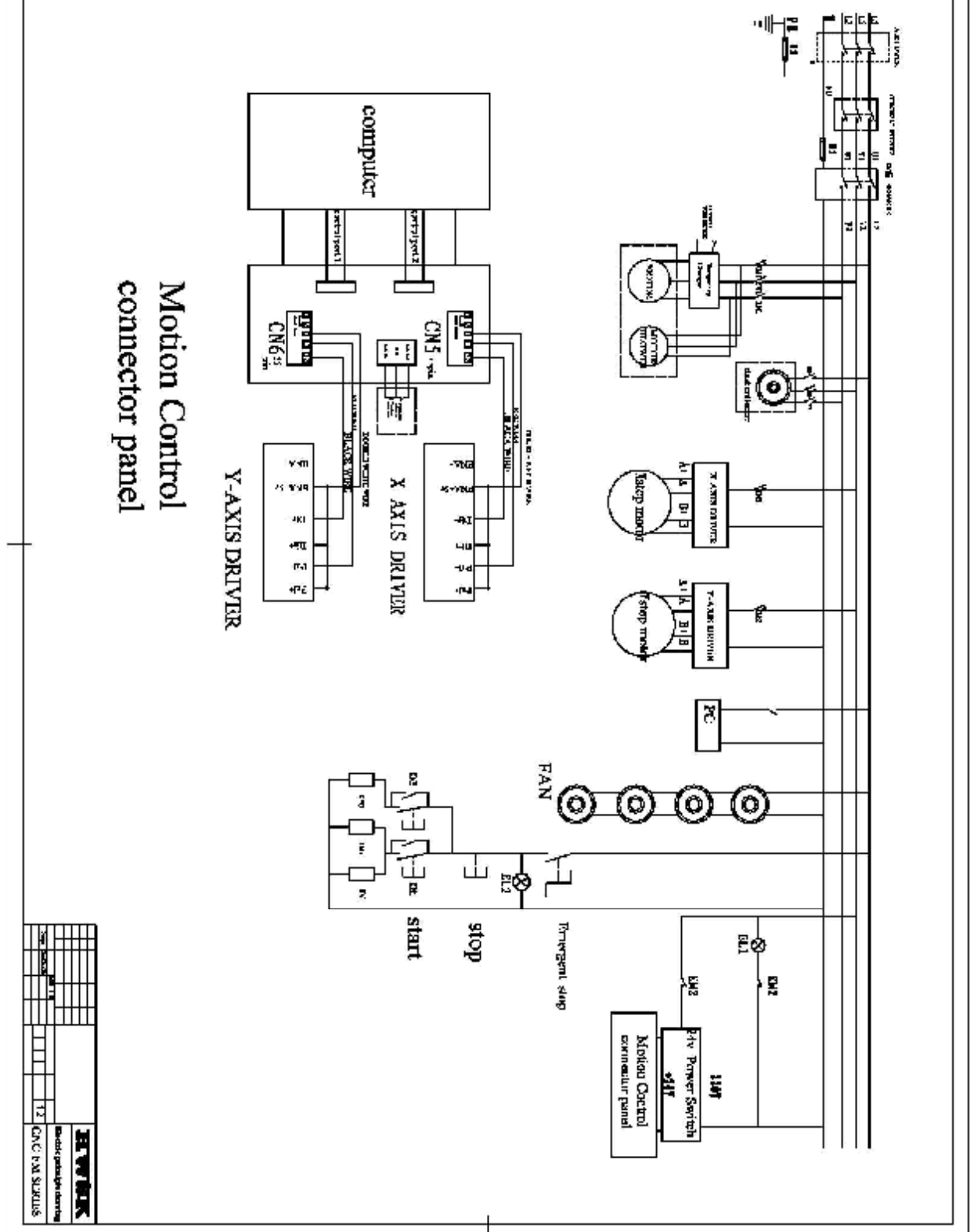
4.1.3 There is a broken line protection loaded on the driving pulley motor, the system stops automatically when the line knife breaks.

Appendix

Electric parts list

Driving pulley motor		
90L-2	1	3KW
vacuum cleaner	1	3KW
Breaker	1	32A
Intermediate relay		
	1	
Exchange contact device		
	1	
transformer		
	1	
Frequency changer		
	1	3.7kw
Name and specification	quantity	note
Y axis limit switch		
	2	
Broken line protection switch		
	1	
LA25-2J Button	1	
LA19-20 Button	2	
Warning light		
	1	
Electric capacity		
	1	
Relay		
	1	
IN4007	5	
26 points Core aviation plug	2	
4 points core plug	2	

Driver	2	
Actuating power	1	1kw
Step motor	2	20N.M
Name Size	Quantity	Note
Design	Standard	Machine tool electric parts list
Check	Date	



Motion Control connector panel

NO.									
DATE									
BY									
REVISION									
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
HWSK Electric parts list drawing CNC FM SERIES									

