FORNAX
MOTORIZED VINYL (PVC) PROFILE BENDING MACHINE

User's Manual

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1 IMPORTANT SAFETY INSTRUCTIONS

-Before putting machine into operation read the Operating and Maintenance Manual carefully.

-Produce multiple copies from the Operating and Maintenance Manual and give it to the operators for reference to keep it in their possession anytime they need to refer.

-If you notice any abnormal situation on the machine, immediately inform the safety responsible of your plant.

-In case of any dangerous situation stop the machine via the emergency button or turn of electric power via the main switch.

-Since the temperature of the heating liquid in the heater is 120 ^{0}C, protective gloves or wet towels **must** be used while putting the profiles into or removing from the heater.

-The heating fluid is technical glycerin and is not harmful to health.

-Do not move the heater with the **hot heating fluid** in. The hot heating fluid may pour out of the heater and may cause harm to the operator others.

-Do not stay behind the driving motor. Although the probability is very small, the belt may brake. In this case press the Emergency Button.

-The main electrical connections and repairs **MUST BE CARRIED OUT BY QUALIFIED ELECTRICIANS ONLY.** In case of any problem consult to your authorized electrician.

-Do not work on the machine that does not have grounded connection.

Do not hold buttons of control panels with your hands wet. Do not place the movable control panel on a wet place.

-Keep the control buttons and control panels away from water.

ATECH CANNOT BE HELD RESPONSIBLE FOR ALTERATIONS, MODIFICATIONS MADE ON THE MACHINE OR ON SAFETY DEVICES OF THE MACHINE WITHOUT GETTING PRIOR WRITTEN APPROVAL OF ATECH, WHICH MUST BEAR AUTHORIZED SIGNATURE AND STAMP OF THE COMPANY

2 TECHNICAL SPECIFICATIONS

DESCRIPTION	UNIT	
Model and Type		**FORNAX**
Dimensions of work table	mm / inch	800x2850x3000 32"x112"x118"
Height of work table from ground level	mm / inch	900 / 35"
Weight of work table	kg / lb	548 / 249
Left/right movement allowance of work table	mm / inch	300 / 12"
No. of mould holders mounted on work table	Pcs	74
HEATER		
Heater volume	m3	0.350
No. of heaters	Pcs	2
Heating Capacity	kW	2 x 10
No. of hold down weights	kg / lb	3 x 1870 / 3 x 850
Type of heating liquid		Glycerin
No. of ventilating fan	Pcs	1
Capacity of ventilating fan	m³/h	1650 - 1400 rpm 2800 - 2800 rpm
Ventilating fan power	kW	0.85
Ventilating fan discharge pressure	Pa	40mmss - 1400 rpm 80mmss - 2800 rpm
No. of ventilating fan connection	Pcs	1
Size of ventilating fan connection	mm / inch	152 / 6"
Volume of washing tank	m³	0.282
Heater drainage valve size.	mm / inch	13 / ½"
ELECTRIC MOTOR		
No. of Electric motors	Pcs	2
Power of Electric motors	kW	2.2 and 0.85
POWER SUPPLY		
Total power absorbed	kW	23.05
Electric connection	V, Hz, Ph	CE: 380, 50, 3 UL: 400, 60, 3
GENERAL SPECIFICATION		
General dimensions (length x width x height)	mm / inch	8350 x 3000 x 865 329" x 118" x 34"
Weight (total)	kg / lb	2300 / 1045
Profile drawing speed		
Fast backward	m/sec	1.825
Slow forward	m/sec	0.939
Slow backward	m/sec	0.939

This profile bending machine is designed and constructed in accordance with the following standards:

89/392/EEC Machinery Directive 14.06.1989
91/368/EEC Machinery Directive 20.06.1991 dated revision
93/44/EEC Machinery Directive 14.06.1993 dated revision
93/68/EEC Machinery Directive 22.07.1993 dated revision

73/23/EEC Low Voltage Directive 19.02.1973
93/68/EEC Low Voltage Directive 22.06.1993 dated revision

EN 292-2 Safety of Machinery- Technical principles and specifications
EN 294 Safety of Machinery- Safety distances to prevent danger zones being reached by the upper limbs
EN 349 Safety of Machinery- Minimum gaps to avoid crushing of parts of the human body
EN 563 Safety of Machinery- Temperature of touchable surfaces
EN 60204-1 Electrical Equipment of Machines- General Requirements

3 DESCRIPTION OF THE MACHINE

The FORNAX Vinyl (PVC) Profile Bending Machine is used to bend every kind of vinyl (PVC) window profiles to a desired form. The machines consists of the following main components, Please see the attached Main Components Drawing.

1- Work Table (See Picture 5)
2- Heater (See Picture 8)
3- Motor chassis (See Picture 9)
4- Right Side Extension (See Picture 6)
5- Left Side Extension (See Picture 7)
6- Rear Support Table (See Picture 11)
7- Profile drive Motor
8- Ventilation Fan
9- Profile Stop Switch (See Picture 15)
10-Profile Stop Safety Switch
11-Fan Switch (See Picture 16)
12-Fixed Control Panel
13-Movable control Panel
14-Temperature Indicator (digital)
15-Temperature Control Panel
16-Motor Control Panel
17-Work Plate left-right movement arm
18-Right Side Extension (4) left-right movement arm
19-Left Side Extension (5) left right movement arm
20-Right Side Extension (4) work table connection lever
21-Left Side Extension (5) work table connection lever
22-Heater (2) height adjustment arm (See Picture 18)
23-Heater "Profile carrying pan" raising/lowering arm (See Picture 33)
24-Heater liquid collection pan (See Picture 12)
25-Washing Pan (See Picture 14)
26-Drying Pan (See Picture 13)
27-Front Support Table (See Picture 10)

The vinyl (PVC) profile heated in the heater is bent to a desired form via moulds already fixed on the work table by drawing the profile through the moulds with Profile Drive Motor and the belt.
To discharge the heating liquid vapor from the working area, the machine is equipped with a ventilation fan. By means of suitable duct system the vapor should be conveyed to outside the working area.

4 LOADING, TRANSPORTATION, UNPACKING AND DISMANTLING INSTRUCTIONS

The machine is shipped on 8 separate wooden pallets as packed and protected with wooden poles around, which is suitable for overseas transportation.
Every wooden pallet contains information label about the contents.

Whatever the type of loading/unloading do not stay under the machine during handling.

The content of each wooden crate is placed on wooden pallet. It is completely covered with nylon protective cover. Then, the sides are secured with vertical and diagonal wooden poles. (see Picture 1,2,3,4)

Moulds are located in a fully closed wooden box.

While removing wooden supports remove the nails with a suitable lever. Do not use any parts of the machine as a support to a lever. Do not leave the nails on the wooden poles unattended to cause danger. The nails either have to be removed from the wood or has to be bent sideways and tips must be buried into wood by means of a hammer. During opening of the packing first remove the protective wooden poles and then remove the support poles.

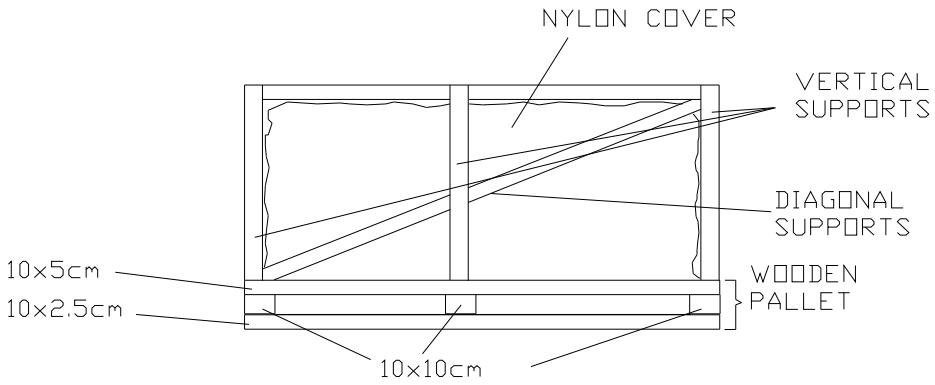


Figure 1

If the machine will be lifted with crane, use wide lifting belts. Do not use steel wire ropes. It may damage the machine. Every machine part is marked with respect to center of gravity to show proper locations for lifting with fork lift or with lifting belt.
Lift only from these points.
Forklift must be used to lift the machine when in packed condition. For this, use forklift with long forks having 1.5 tons capacity.

The locations where the forks to be inserted is indicated with red on the packing.

The size and weights of 8 packing are shown in below table.

Packing No.	Contents	Width (cm)	Length (cm)	Height (cm)	Net Weight (kg)	Gross Weight (kg)
1	Work Table	125	300	100	548	638
2	Heater	70	550	100	445	505
3	Motor chassis	50	480	100	240	272
4	Right Side Extension	120	170	85	143	173
5	Left Side Extension	100	170	85	118	148
6	Heating Liquid	60	60	100	250	270
7	Moulds	20	310	24	102	134
8	Guides and inner linings	20	410	24	50	68

Packing and their contents

PACKING NO: 1

Name of part	pcs	Name of part	pcs	Name of part	pcs
Work Table	1	Profile Stop Safety Switch Arm	1	Drive apparatus center piece	1
Support Table	2	Profile moving arm	1	Drive apparatus nut	1
Washing pan	1	Allen bolt M8x35	81	Weights	3
Drying pan	2	Stainless washer	81	M6 Allen wrench	2
Heater liquid collection pan	1	Canal pieces	31	Spanner 19-22	1
Aluminum mould holders	74	Stainless bolt M12x20	1	Control Thermometer	1
Panel key	1	Stainless nut M12	2	Bucket with funnel	1
Plier	1	Stainless washer M12	2	Raising/lowering arm	1
Drawing pin	2	Compass center piece	1	Nylon rope 5m	1
Profile Stop Switch Arm	1	Compass head	1		

PACKING NO: 2

Name of part	pcs	Name of part	pcs
Heater	1	Compass ruler	3
Drive apparatus arm	1	Compass Extension	1

PACKING NO: 3

Name of part	pcs
Motor chassis	1

PACKING NO: 4

Name of part	pcs t
Right side Extension	1

PACKING NO: 5

Name of part	pcs
Left Side Extension	1

PACKING NO: 6

Name of part	kg
Heating Fluid	250

PACKING NO: 7

Name of part	pcs		Name of part	pcs
Complete bending molds (2500 + 3000)	3		Distance pieces	3
Hole mandrel	3		Distance blocks	3

PACKING NO: 8

Name of part	pcs		Name of part	pcs
Drawing guides	3		Glazing bead	1
4000mm internal linings	3			

DISMANTLING INSTRUCTIONS OF THE MACHINE

1-At first, the machine should be washed and dried completely.
2-The machine can be dismantled by applying the reverse of the procedure used for assembling. For this see item 5 "Assembling of the machine and connections".
If the dismantled machine will be packed the followings should be made in below given sequence.

RE-PACKING OF THE MACHINE

A-HEATER

1-Discharge the heating liquid in the heater via the drain valve at the bottom of the heater and filter it. You may store the drained heating liquid in barrels for future use.
2-Wash and dry inside the heater.

3-Remove the side pan from the heater
4-Remove the side pan holders.

B-MOTOR CHASSIS
1-Remove rail of cable carrier,
2-Coil the cables neatly.
3-Remove the Fixed Control Panel (12) located on Left Side Extension(5).
4-Remove Profile Stop Switch (9) on Right Side Extension.
5-Remove the switch holder for this switch (9).(See Picture 45).
6-Place the cable rail, cables, movable control panel (13) and switch holder on the motor chassis and fasten them firmly by means of suitable rope.
7-Long items (like compass) should be wrapped with nylon cover first and then should be placed on motor chassis.
8-Remove the mold holders on Side Extensions (4 and 5) and on work table. Place them in a separate box.

Pay attention not to damage the steel sheet parts/body of the machine. If transportation is necessary, then a supporting wood structure (like the original packing of the machine) must be used. The wooden poles must support the machine at the bottom of chassis

STORING CONDITIONS OF THE MACHINE (FOR FUTURE USE)

The machine parts dismantled as explained above, can be placed side by side to occupy minimum place as much as possible and stored in a dry warehouse environment.

The machine which is dismantled above for future use, **the work table must be thoroughly cleaned and dried**. (see section 11 Maintenance and Troubleshooting)

To protect from dust cover the parts with a suitable cover.

5 ASSEMBLING THE MACHINE AND CONNECTIONS

The machine does not require a special foundation.

The ground for which the machine will be placed on should be flat and must not be slippery when the water is on, should not retain the water on it and should be a material like glazed tile or similar. The slippery ground when get wet with water or heating liquid may cause the operator or the other personnel to slip and fall down

The strength of the ground should be sufficient to support the machine weight of 2300kg (5060 lb).

The place where the machine is to be located has to have discharge opening for discharging the waste water or other liquids. For this reason the ground has sufficient slope towards this discharge point.

The location where the machine will be placed has to have water and pressurized air supply mains.

Water supply**:** The water tap is required to wash and clean the machine or to remove the heating liquid from the bent profiles. For this, a connection to an ordinary city water supply is sufficient.

Air supply**:** After cleaning of the machine, air is required to dry / remove the water/liquid from the parts of the machine which may probably be left on the work table or in the canals of the work table. For this purpose, pressurized air of 5 Bar will be sufficient.

The advisable height of the ceiling of the room where the machine will be located is 4 meters.
For the machine operators to walk around the machine freely a space of min. 2 meters must be left. The minimum clearance around the machine for proper operation is shown in Figure 2 below.

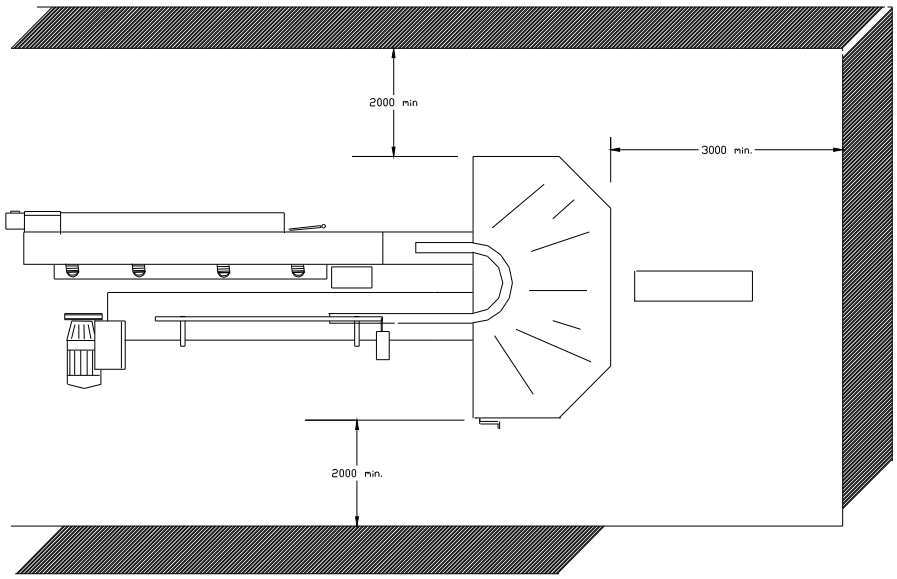


Figure 2

Together with the machine a ventilating fan (8) is also given to discharge the heating liquid vapor from the working area. But an additional ventilating unit is recommended to be installed on one of the side walls for discharging the air in the room.

For comfortable working of the operator a minimum room dimensions of 7 x 12m or close to these dimensions is recommended. This should also include space for the washing pan (25) and drying pan (26) with profile preparation area.

Sufficient illumination is required in the working area. For this, a standard plant illumination level of 800 Lux provides necessary illumination level.

Attention must be paid to keep the temperature of the working environment around 18 – 20^0 C. This temperature must not drop below 15^0C. The heated profile must be taken into the moulds before cooling down. For this reason, the machine must be preferably placed in a closed room. The temperature of the environment is very important regarding the quality of bending to be obtained.

The machine parts removed from the packing has to be installed at the following sequence. See Figure 3

1- First, place the heater (2) in its place in the room.
2- Mount the Profile Moving Arm shown in Picture 40 onto Right Side Extension (4).
3-Mount the Holder shown on Picture 39 onto the Right Side Extension as shown in Picture 35. On this Holder install the Fixed Control Panel (12) via the parts shown in Picture 46.
4-Attach both of the Side Extensions (4 and 5) to Work Table as explained below (See Picture 5 and 7)

Bring the Right Side Extension (4) and Left Side Extension (5) into the vicinity of the Work Table (see Picture 5)
Attach them to the worm gear of the work table with the use of the work table connection lever (20 and 21) by fitting the guide of the side extensions into a slot on Work Table. (see Picture 17)
5- Push the Work Table with the Side Extensions attached towards the heater by sliding on its wheels as a single unit till it slightly touches the heater. There is no mechanical connection between the Side Extensions and the Heater.
6- Push slowly the Motor Chassis (3) (see Picture 9) till it touches the Right Side Extension (4). There is also no mechanical connection between the two.
7- Place the Rear Support Table (6) (see Picture 11) behind the Work Table in line with the Heater.
8- Fix the Emergency Button Panel (12) into its place.
9- Connect the Digital Thermometer (14).
10- Mount the Motor Control Panel (16).
11- Mount the Profile Stop Switch (9) to its place (See Picture 15). Here the place of the switch should be decided according to the length of your profile.(See Picture 45). This switch is located to a place where the profile will rest at the end of bending operation. Then mount the Profile Stop Safety Switch (10) to its place on the Motor Chassis.

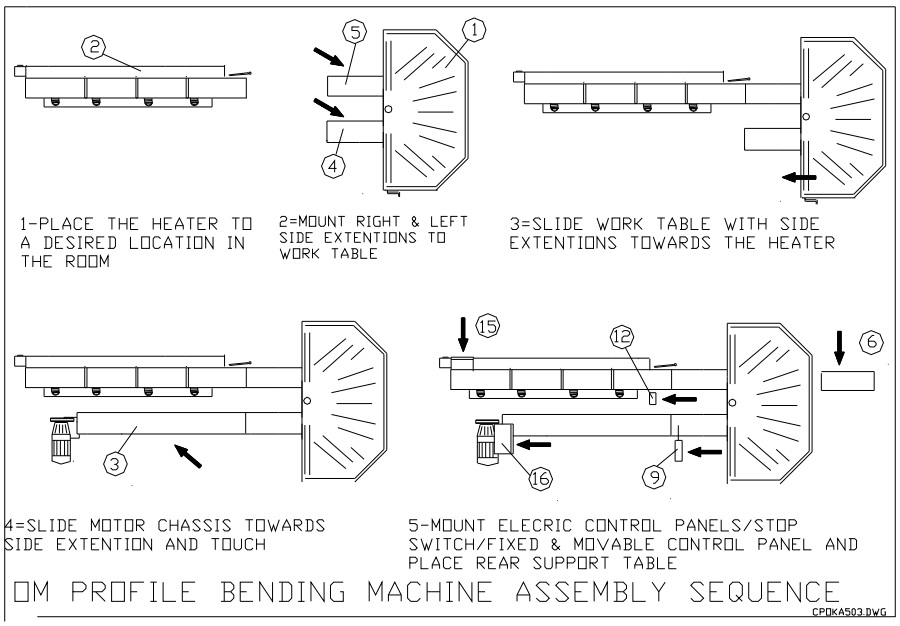


Figure 3

No special tool is requested for the assembling of the machine.

After completion of the assembly of the machine fix the wheel brakes of the Heater (2)(see Figure 4) and other parts of the machine. When it is required to change position of the machine, the wheel brakes can be loosened, its position is adjusted and then the brakes are re-tightened again.

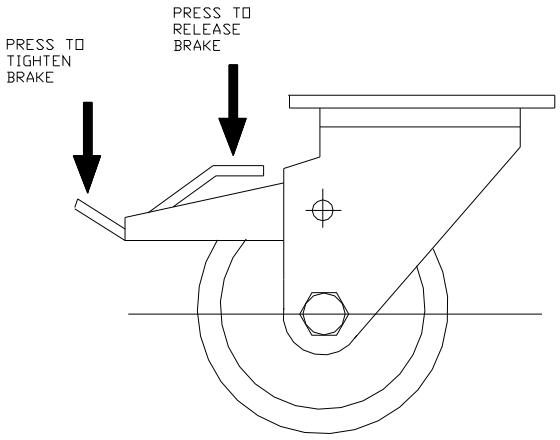
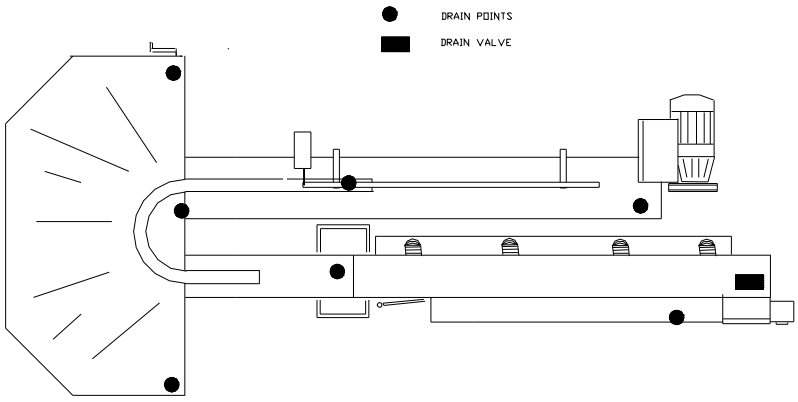


Figure 4

After completion of mechanical and electrical assembly of the machine put the heating fluid (Technical Glycerin) into the Heater. Before this, check the drain valve is closed.

Put the drain hoses to drain sockets located on various places of the machine and place the collector buckets below. Machine has totally 7 pieces 16mm diameter drain sockets and 1 piece ½'' heating fluid drain valve located at the bottom of the Heater. The drain points are indicated in the below figure.



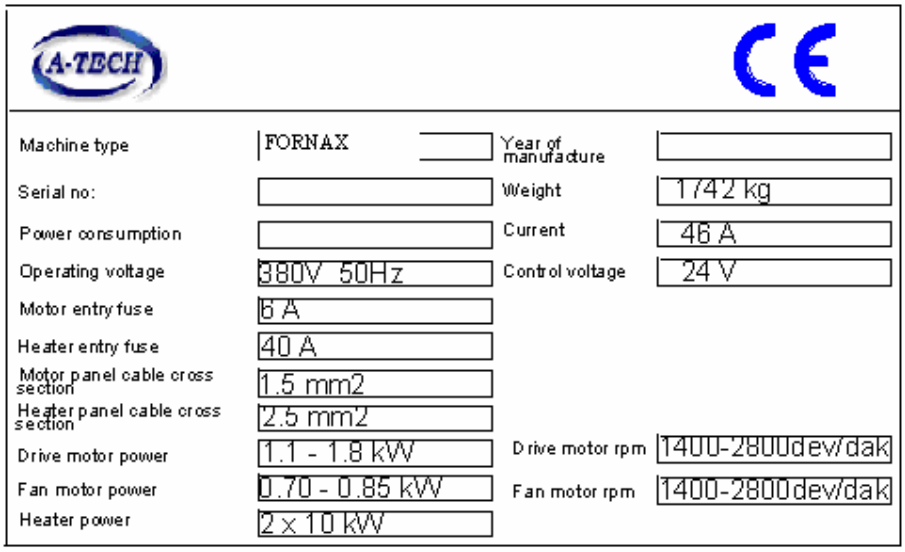
DRAIN POINTS ON THE MACHINE

The electric connections of the machine MUST be made by a qualified electrician.

Grounded connection MUST be used.

The electric diagrams of the machine are attached in the appendix.

Electric connection must be made to an electric source in accordance with the specifications indicated on the name plate. These connections must also be made in accordance with the electric diagram given. The electric connection to Motor Control Panel has to be made with a 5 x 2.5mm^2 cable and the electric connection to Heater Panel has to be made with a 6 x 5 mm^2 cable.



Machine type	FORNAX	Year of manufacture	
Serial no:		Weight	1742 kg
Power consumption		Current	46 A
Operating voltage	380V 50Hz	Control voltage	24 V
Motor entry fuse	6 A		
Heater entry fuse	40 A		
Motor panel cable cross section	1.5 mm2		
Heater panel cable cross section	2.5 mm2		
Drive motor power	1.1 - 1.8 kW	Drive motor rpm	1400-2800dev/dak
Fan motor power	0.70 - 0.85 kW	Fan motor rpm	1400-2800dev/dak
Heater power	2 x 10 kW		

The electric power to the machine should reach from the top with a flexible, rubber cable.

It is advisable to keep the electric power cable sufficiently longer than necessary keeping in mind that the motor chassis may be moved left or right (in case of disassembling or when making larger diameter bending).

The machine has 2 electric panels. One of them is for electric motor used to draw profiles through molds and the other is for heater and ventilating fan. These two panels are totally independent from each other and separately connected to electric power source.

Near the heater cover there is a switch (11) (see Picture 16) used the control the rpm of the ventilating fan. Normally (when the heater cover is closed) rotates at 1400 rpm. When the heater cover is opened to remove the heated profile for bending, via this switch the fan starts to rotate at 2800 rpm and increases the suction capacity of the fan. This prevents more heating liquid vapor to fill the working room.

The connection of ventilating fan outlet should be made towards the rear of the heater. This connection either should be taken out from the ceiling or should be discharged outside from one of the sidewalls at above the man level (approx. 2 meters above).

IMPORTANT NOTE;
THE MACHINE IS MOUNTED TO A DESIRED LOCATION, OPERATED AND THE OPERATORS OF THE CLIENT ARE TRAINED BY OUR SUPERVISORS.

6 OPERATING INSTRUCTIONS OF THE MACHINE

The profile lifting pan in the heater must be adjusted so that (when raised to remove the profile from heater) the surface of the pan must be at the same level with the work table. For this, the heater height adjustment arm (22) at the back end of the heater is used (See Picture 18). The upper dead point of the pan must be adjusted to be in line with the work table and then fixed in this position. When the arm is removed from the machine the machine does not change its elevation anymore.

PUTTING THE MACHINE INTO USE

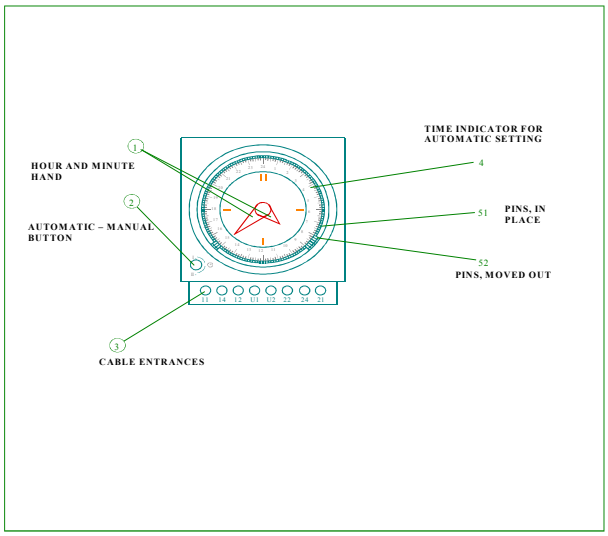
1-Switch ON the main switch (Q1) on the Heater Panel.
a- Light H1 becomes ON indicating presence of electric power.
b- The timer will start to run.
2-Turn ON the fan motor switch (Q3).
a- If the cover of the heater is closed, the ventilator electric motor (M1) will work at low rpm and the indicator light H2 will be on.
b- If the cover of the heater is open, the ventilator electric motor (M1) will work at high rpm and the indicator light H3 will be on.
3-Turn ON the switches of both heaters (Q4 and Q5).
a- When switch Q4 is turned ON, the thermostat C1 is energized.
Enter the required temperature value.
If the temperature of heating liquid is lower than the set value, the relays P1, P2 and P3 are actuated and heater starts to work and the indicator light H4 turns ON.
When the temperature of the heating liquid reaches or exceeds the set temperature the indicator light H5 turns ON.
b- When switch Q5 is turned ON, the thermostat C2 is energized. Enter the required temperature value. If the temperature of heating liquid is lower than the set value, the relays P4, P5 and P6 are actuated and heater starts to work and the indicator light H6 turns ON.
When the temperature of the heating liquid reaches or exceeds the set temperature the indicator light H7 turns ON
4-Adjust the timer (N1) to the local time (upon power failure the timer continues to work for 100 hours without setting is changed).

ADUSTMENT OF TIMER

1-First, set the timer according to your local time. For this, move the hour and minute end of the clock with your fingers.
2-Move the pins out for the hours corresponding the working hours which you wish the heater to work. These pins are the ones shown with number 4 on below figure.
Example: Let's assume that you want the timer work at 08:00 and stop at 09:00 in the morning and again start to work at 15:00 and stop at 15:30 in the afternoon.

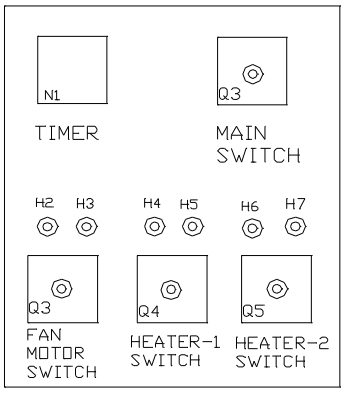
Based on this;
- Move the six (6) blue pins out between 8 and 9
- Move the three (3) blue pins out after 15
3-To start the timer to work switch the manual button to (operate) position.

ATTENTION: For the timer to work automatically after being adjusted, the heater switch on the heater electric panel MUST be ON.

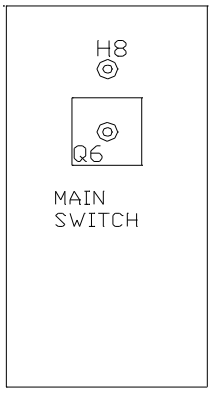


5-Set the digital thermometer to 120^0 C.
When digital thermometer is energized the preset temperature value is displayed. If the temperature is suitable there is no need to make re-setting and the heaters works at this temperature value. If this setting required to be changed then by pressing up or down buttons new temperature value is set. Then the heater will continue to work with the newly set value. (Turning the thermometer on/off does not change the setting)
6- Switch ON the main switch (Q6) on the Motor Panel
Light H8 become ON indicating presence of electric power.
a- When button B1 is pressed on Fixed Control Panel (12), the profile drive motor (7) works in reverse direction to draw the profile into molds. It stops when profile hits switches (9) or (10). When the button B3 is kept pressed on Fixed control panel (12) , the profile drive motor (7) works forward at slow speed to release the tension on drive belt.
b- When the button B2 is kept pressed on Movable Control Panel, the profile drive motor (7) works in reverse direction at slow speed to remove the inner linings from the profiles.
c- When the button B4 is kept pressed on the Movable Control Panel (13), the profile drive motor (7) works forward at low speed to release the tension on drive belt.

CONTROL PANELS HAVE THE FOLLOWING COMPONENTS ON COVERS.



HEATER PANEL



MOTOR PANEL

1- HEATER PANEL
- Main switch (Q3)
- Timer (N1)
- Signal Lamps (H2,H3,H4,H5,H6,H7)
- Fan motor switch (Q3)
- Heater switches (Q4 VE Q5)

2- MOTOR PANEL
- Main switch (Q6)
- Electric Power Indicator lamp (H8)

1- Fixed Control Panel

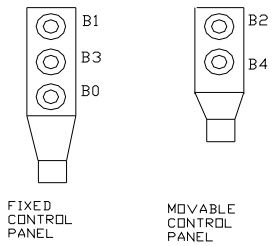
Location: Mounted on Left Side Extension at operator's side

. Following functions exist on this buttons

Fast reverse	- arrow symbol	(B1)
Forward	- green	(B3)
Emergency stop button	- red	(B0)

2- Movable control panel

Internal lining draw



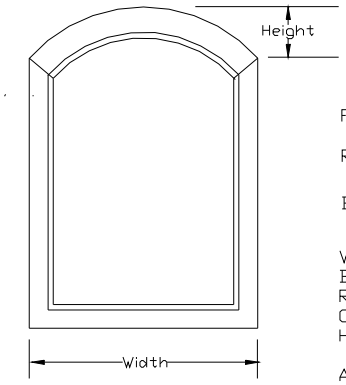
Preparation of heater

Fill the heater (2) with heating fluid. The level of heating fluid should be 2cm above the profile to be heated. Since each profile has different height, heater is not equipped with level gauge. Adjust the level of heater such that profile lifting pan and work table to be at the same level. For this, with heater cover is open raise the profile lifting pan by means of lever (23) (See Picture 32). At this position, with the aid of heater height adjustment arm (22) located at the back of the

heater adjust the height of the heater (See Picture 18). This adjustment arm (See Picture 52) can be removed from its place and keeps the height of the heater fixed at this position.

Adjustment of mold holders

In order to prepare the Work Table (1) for working, first determine the required bending radius of the profile. As in the below given formula, calculate the radius and add 20mm (outer thickness of the mould) to this figure in order to find the final bending radius. Set the Mould Holder Adjustment Compass (see Picture 53) given with the machine. If the addition of 20mm is forgotten, the final radius of the profile is always 40mm less than the desired bending radius.



Formula

$$R = \frac{(G/2 \times G/2)+(H \times H)}{2 \times H}$$

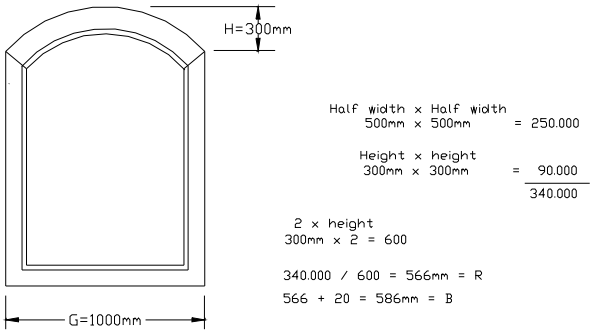
$$B = R + 20$$

Where.
B= Bending radius
R= Radius
G= Width
H= Height

All dimensions are in mm.

Get the square of half of the width G and multiply this with the square of the height H and add these two values and then divide this by 2H. To this figure, add 20mm to reach a final bending radius.
Note: **The 20mm is outer thickness of the moulds. If not added, the final radius will be 40mm less.**

Sample calculation:



To the end of mold holder adjustment compass, insert the compass holder (See Picture 43). Adjust the center connection piece to a previously calculated bending radius (B).

Mount the canal pieces (Picture 19) onto a work table. The center connection piece of the mold holder adjustment compass (see Picture 48), is screwed to the centering piece at the center of the work table as shown in Picture 20. Fix the outer mould holders by pressing them to the outer surface of the mould holder adjustment compass (see Picture 21). The first and last mould holders are adjusted with the help of set-square given with the machine as shown in Picture 22. Then remove the compass from its place. Following this, adjust and fix the inner mold holders with the help of distance blocks as shown in Picture 23. The mold holders with short canals on Side Extensions will always be kept fixed to its position. The adjustment via the distance blocks will be made with outer mould holders (see Picture 15). While fixing the moulds to the mold holders (see Picture 25), pay attention that the canals both on mold holders and at the back of the molds fits each other completely. In addition, the joint of the bending molds should coincide with middle of the mold holders.

The thermostat should be adjusted to 120^0 C and ± 3 degrees of tolerance is allowable.

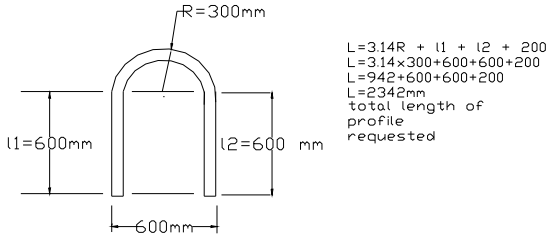
Preparation of the profile

Cut the profile to be bent to a suitable length. This length can be calculated as shown below;

$L = 2 \times \pi \times R + l_1 + l_2 + 200mm$

where,

L = Length of profile to be bent (mm)
l_1 and l_2 = The straight part of the profile after bending (mm)
R= Bending Radius (mm)
π = 3.14
200mm = Extra length to be cut after bending
(This is the section where the tools for drawing the profile is to be attached)



(After completion of the bending, the profile will be cut from both ends to bring it down to required length)

The ends of profile to be inserted into the mold which is already cut to the required length, must be ground by means of file or grinding wheel to obtain a smooth finish. This will provide better insertion of the profile into the mold and easy advancement of the profile in the mold. With the use of hole gauge given with the machine (see Picture 26) , make a 7mm hole through the profile. Then insert the inner linings into the profile with the color painted sides facing upwards (see Pictures 27, 28, 29 and 30).

When the profile is cold, the inner linings may not fit in the profile. In this case, immerse the profile into the heating liquid for approximately 1 minute and then re-try (see Picture 31). (Use an insulated gloves or wet towel while holding the profile to insert the inner linings. The heated profile is at a temperature of 120^0C). When the holes on the profile coincides with the holes on inner linings insert the drawing pins from top to bottom given with the machine (See Picture 51). Pay attention and check that the pin is fully inserted into the hole. (Otherwise, the profile may be torn and drawing operation may be interrupted). In this way, the profile is made ready for bending.

Insertion of Drawing Guide

Drawing guide, is used to draw the heated profile through the molds. Insert the drawing guide into the molds from the motor end side with the red painted end pointing upward. This red end should be moved through the mold till it is out from the other end by approximately 10 cm. For very large radius bending where the drawing guide is short, add drawing belt to the drawing guide.

ATTENTION: While using the movable control panel DO NOT press the buttons continuously. Press only with short intervals. Pay attention that the drawing belt do not get loose from the pulley. In such cases tighten the belt by turning the motor pulley

Bending operation

For the last time, check the temperature of the heating liquid in the heater by using control thermometer given with the machine (See Picture 44). Immerse the profile into the heater (2) with profile raising lowering pan mounted in the heater (See picture 32). **NOT WITH YOUR HANDS!!!** Immerse the profile into the heater slowly. Otherwise the hot heating liquid may splash on operator

While immersing the profile into the heater, you MUST use protective gloves or wet towel to handle the profile.

Place the immersion weights (see Picture 53) on the profiles to prevent them floating on the surface of the heating liquid due to its low density compared to heating liquid. Before starting the drawing operation pour some heating liquid taken from the heater on bending molds by means of a small cup to heat up the molds while the profiles are still in the heater. This provides lubrication of the molds for easy drawing of the profile and by establishing temperature equilibrium between the mold and profile which helps to obtain fine surface finish of the profile. .After allowing the profile approximately 3 minutes of heating in the heater, open the heater cover and raise the profile lifting pan by means of lever (23) to bring it near to the bending mold.
(In this case, check that the lever is moved to the end point. Otherwise, the pan may go backwards into the heater and could cause splash of hot liquid on the operator). Insert the drawing pin after fitting the Inner lining connection piece and inner lining drawing guide piece to each other.

While removing the profile from the heater, you MUST use protective gloves or wet towel to handle the profile.

Insert the end of the profile into the mold (see Picture 29) and press the green button (START) on the fixed control panel (see Picture 33) and leave it after the profile is drawn.

DO NOT KEEP THE BUTTON PRESSED

The profile will be drawn through the mould and the drawing motor will stop when the drawing pin (see Picture 15) hits the Profile Stop Switch (9). After the stop of the motor press shortly the yellow button on fixed control panel to loosen the drawing belt. After removing the drawing guide, move the profile by means of profile moving arm by swinging it right and left to prevent it sticking to the mold (See Picture 40 and 35). Continue to do this till the profile gets cold enough. Remove the small inner linings by using plier (see Picture 54), given with the machine, from the profiles one by one (see Picture 34). Place the inner lining neatly into a pan near the heater (see Picture 36). The bigger inner linings will be removed from the profile by using the movable control panel (13). While performing this, profile may move easily since it is warm. To prevent this, use fixing tool given with the machine. Insert this fixing tool into one of the slots and assure that it rests on the profile. This way, the bended profile cannot move forward.

ATTENTION: As soon as the inner lining comes out from the profile leave the button (13). Otherwise, inner lining may wind around a motor pulley.

Approximately 3 minutes after completion of the drawing operation, remove the bended profiles from the molds. For this, first, loosen the shoes of the mold holders by means of eccentric arm. Since the bended profile is still warm it must be cooled down on flat surface and then rinsed with clean water.

Mark the bended profile from the mid points and at the end of radius points by means of a pencil before removing from the mould. This will provide the operator an easy operation. Repeat the same procedure for each bending operation..

Up to now, we described **U** bending made by using motor. At the same time, by using the motor it is also possible to make **C** bending, arc bending and bending acc. to gauge (**S** bending)

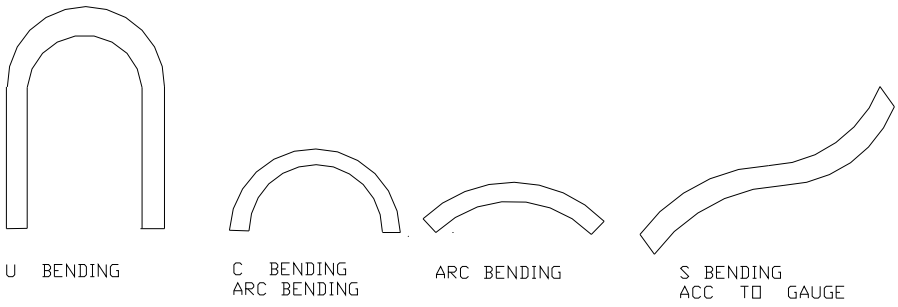


Figure 5

In all bending except U bending, the motor chassis and side Extensions must be removed from the main machine. Mould holders and profiles are prepared in the same way as before in U bending (especially, for small bending radius, moulds may hang down from the work table. In this case use the support tables given with the machine (see Picture 37). For the molds hanging down from the front of the table, use Front Support Table (27) (the small one) (see Picture 10) and for the moulds hanging down from the rear of the table, use Rear Support Table (6) (see Picture 11).

Screw the centering piece (see Picture 47) to the center of work table (see Picture 38). Screw the pin holder (see picture 49) for which the drawing pin will be inserted in a suitable hole on drive arm acc. to the length of diameter. After heating the profile , open the heater cover and raise the profile lifting pan by means of lever (23)(see Picture 32) to bring it near to the mold for inserting it into the mold. Move the profile slightly in the mould, insert the drawing pins from top to bottom when the hole on the profile coincides with the hole on inner linings. Turn the drive arm around the center (when inserted to work table) to draw the profile into the mold. This completes the bending operation.

IMPORTANT POINTS TO BE NOTICED

1- The heater temperature must always be 120^{0}C. A ± 3^0 C tolerance is allowable.
2- This 120^{0}C is dangerous. Protective gloves or wet towels MUST be used while immersing or removing the profile into the heater and inserting into the mold.
3- NEVER interfere with the electric system of the machine EXCEPT authorized electrician. In case of any problem, consult to authorized electrician.
4- Heater MUST be grounded. Do not work on the machine if it has not been grounded yet.
5- Heating liquid in the heater decreases in time. Heating liquid level must be 2cm above the profile. The amount of decreased heating liquid must be added to the heater with the same type and quality of heating liquid already present in the heater. (NOT WITH WATER)
6- Since the covers of electric panel cannot be opened with the switches are on, do not try to open the panel covers before turning the switches to off position.

7 SAFETY DEVICES ON THE MACHINE

If the Profile Stop Switch (9) does not work for any reason, Emergency Stop Button (B0)(see Electric Schema) must be pressed. The Profile Stop Switch (9) can be turned sideways during removal of the molds. Before starting for the next bending operation this switch **MUST** be re-located to its original position. Otherwise, the profile drawing motor will not operate. As an additional safety measure, the machine is equipped with a Profile Stop Safety Switch (10). This switch prevents the damage and winding of the profile and inner linings onto the motor pulley. But in this case, the profile do not take its required form. Wait for the profile to cool down and repeat the same bending operation

8 ELECTRICAL EQUIPMENTS OF THE MACHINE

The electric control panel covers can not be opened without turning OFF the main switch on motor control panel or on heater control panel (Q1 and Q6) .

Against short circuit and overloading, the system is equipped with fuses and thermal-magnetic relays. In case of electric power failure and re-supply, the machine cannot re-start automatically. But, upon re-supply of the electric energy the heater starts to work.

If power failure occurs with the profile at any position in the mould, do not press the start button as the profile will cooled down during this time.

During bending of the profile, if electric power failure occurs, the profile cools down and takes a different form than requested. In this case, remove the profile from the molds and start the whole bending procedure from the beginning.

There is no re-setting operation need to be done.

Machine is separated from the power source by means of industrial plug and socket. The heater and the motor electric panels connected to electric power source separately. Connection to client's power source is made with EMO plug and socket which is delivered by A-TECH.

10 LUBRICATION AND LUBRICATION TABLE

The points indicated on the Lubrication Scheme (see Figure 6) must be lubricated with grease and machine oil at intervals shown in the Table below.

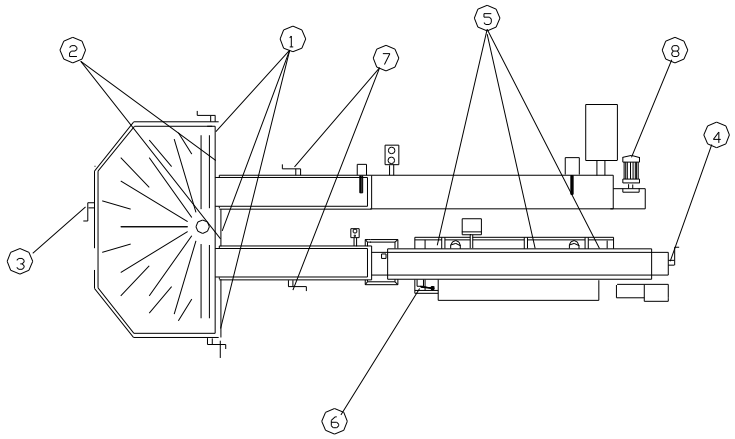


Figure 6

LUBRICATION POINTS AND INTERVALS

Lubrication points	Part to be lubricated	Oil type	Period	Quantity (cm^3)
1	Shaft bearings (3 pcs)	30 viscosity oil	Once every 2 weeks	0.5
2	Shaft (2 pcs)	Grease	Once every 2 weeks	5
3	Pinion gear bearing	30 viscosity oil	Once every 2 weeks	0.5
4	Heater raise/lower arm shaft bearing	30 viscosity oil	Once every 2 weeks	0.5
5	Gearbox	30 viscosity oil	Once every 2 weeks	0.5

6	Heater pan lever bearing	30 viscosity oil	Once every 2 weeks	0.5
7	Side Extension raise/lower lever bearing	30 viscosity oil	Once every month	1
8	Electric Motor	Mobil Gear 632 or equivalent	Once every year	1000

11 MAINTENANCE AND TROUBLESHOOTING

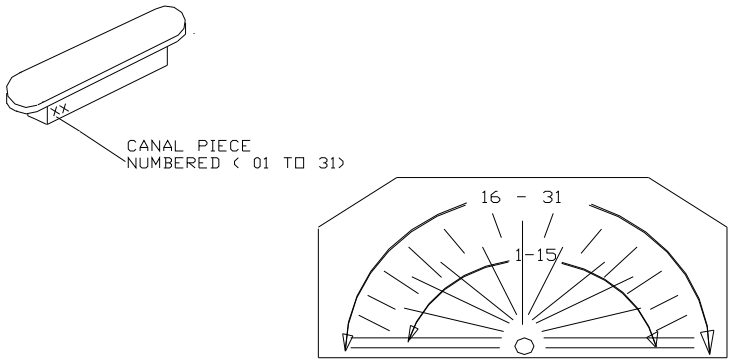
MAINTENANCE

If you follow the below given maintenance and cleaning rules, this machine can serve you for long years.

1-Remove the mold holders (See Picture 42) and canal pieces (see Picture 19 and 50) mounted on work table and wash and dry them completely. Place these cleaned and dried parts on the cover of the heater to be ready for use next morning.
2-Completely clean the work plate on the work table (1) and table canal pieces from the heating fluid at the end of every working day. For this, use slightly warm water, detergent and a brush. The hardness of the brush must be such that it will not scratch the work table. A 3R type brush is suitable for this purpose.
3-While washing the surface of the work table, place a bucket under the discharge hose at the work table. Thus, the water can be collected without being spread to the working area.
4- After completion of the cleaning with water, dry the work table and the canals with a piece of cloth. Then use pressurized air on the work table and to the canals to make sure that no water is left on the work table and in the canals.
5- Clean other parts of the machine if there is any heating liquid on the surface.
6- Wash the bending molds and inner linings with pressurized water or with the water collected in washing pan (25). Then dry them with pressurized air.
7- Wash the mold holders with water and dry them with air.
8- In order not to mix the inner linings of bending moulds, insert them into a piece of short profile after each use and keep them like that till next use.

IMPORTANT NOTE - 1:
If you do not wash to clean and dry the work table at the end of each working day, the work table and the canals will absorb the heating fluid in a short time and cause deformations on the work table and in the canals. These deformations causes undesired traces on the profiles.

IMPORTANT NOTE -2:
The canal pieces which are removed during cleaning of the work table or for any other reason must be placed back into their place exactly in the same order as you have removed as starting from left with the part no 01 to 15 with the numbers facing outwards and then again starting from 16 to 31 with the numbers again facing outwards. Since canal pieces are specially made to fit each canal one by one, the change in their order may cause deformations or traces on the bottom of profiles. (see Picture 19)



If the machine will not be operated for more than 24 hours, in addition to the above cleaning procedure, the mold holders must also be removed , cleaned and dried completely.

TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE	SOLUTION
Machine does not work	- There is no power supply	-Check the phases of power supply. -Check the neutral line
	- Fuses may be blown out.	-Check the fuses in the control panel. Replace if necessary. .
	- Main switch may be off	-Turn on the switch
Heater does not work	- Main switch may be off	- Turn on the switch.
	- Heater switch may be off	- Turn on the switch
	-Thermo-element may be broken	-Check and replace if necessary
	-Thermostat may not be working	- Check and replace if necessary.
	-Timer may be off	-Check and turn ON if it is off
	- Fuses may blown out	- Check the fuses in the control panel. Replace if necessary.

	-Heater cable may be broken off -Resistances may be faulty	- Check and replace if necessary.. - Check and replace if necessary..
Fan motor does not work	- Main switch may be off -Motor switch may be off -The plug to fan not in place. -Thermal switch may be blown off	- Turn on the switch. - Turn on the switch. -Check and insert the plug. - Set the switch again.
Profile drive motor does not work	- Main switch may be off -Motor switch may be off -The plug to motor is not in place - Thermal switch may be blown off. -Buttons may not working -Switches may be faulty	- Turn on the switch. - Turn on the switch. -Check and insert the plug. -Set the switch again. - -The buttons in control panels bx2 and bx3 may be faulty -buttons b0,b1,b2,b3,b4 may be faulty - -Check switches s1 and s2

If you are still unable to identify the problem or cannot be solved by above measures, please consult to your supplier of this machine.

WARNING!
IN CASE OF ANY ELECTRIC PROBLEMS ON THE MACHINE, THE MACHINE OPERATOR MUST NOT ATTEMPT TO INTERFERE ELECTRIC SYSTEM OF THE MACHINE. CONSULT TO YOUR AUTHORIZED ELECTRICIAN

12 ORDERING SPARE PARTS

THE PARTS POSSIBLE TO WEAR AND THE PARTS NEED TO BE REPLACED ARE GIVEN IN THE SPARE PARTS LIST

Aluminum Mould Holders	once every 3 years
Work Plate	once every 5 years
Drawing Belt	once every 2 years

ELECTRICAL MATERIAL LIST

No	Code No.	Name of part	Reference no	Supplier	Quantity
1	Q1	Heater panel main switch	VCF-3	SCHNEIDER	1
2	Q2	Fan motor protection switch	GV2-M07	SCHNEIDER	1
3	Q3,Q4,Q5	Fan motor, Heater 1 & Heater 2 buttons	XB2-ED21	SCHNEIDER	3
4	Q6	Motor panel main switch	VCF-01	SCHNEIDER	1
5	P1.....P6	SSR Relay	G3NA-220B	OMRON	6
6	F1.....F6	25A NC Automat	12144	SCHNEIDER	6
7	F7 , F8	6A NC Automat	12140	SCHNEIDER	2
8	T1,T4	Transformer	ABL-6TS04B	SCHNEIDER	2
9	T2,T3	Bridge diodes	25A	PHILIPS	2
10	K1.....K7	Contactor	LC1D0901B7	SCHNEIDER	7
11	N1	Timer	497-57	LEGRAND	1
12	Q7	Drive motor protective switch	GV2-M08	SCHNEIDER	1
13	C1,C2	Thermostat	TC8311	ENDA	2
14	TC1	4m cable thermo element		KONTEL	1
15	TC2	7m cable thermo element		KONTEL	1
16	X1	Terminal ϕ6	8WA10111DH11	SIEMENS	12
17	X1	Terminal ϕ4	8WA10111DF11	SIEMENS	10
18	X2	Movable plug 10x16	581-10-105	METESAN	1
19	X2	Machine plug 10x16	581-15-305	METESAN	1
20	H1,H8	Signal, white	XB7-EV61	SCHNEIDER	2
21	H2,H4,H6	Signal , green	XB7-EV63	SCHNEIDER	3
22	H3,H5,H7	Signal, yellow	XB7-EV65	SCHNEIDER	3
23		Signal lamp 30V	DL1-CE024	SCHNEIDER	8
24	S1	Switch	D4B-1171N	OMRON	1
25	S2,S3	Switch	WLNJ-G	OMRON	2
26	BX3	Control panel with 3 buttons		EMFA	1
27	BX2	Control panel with 2 buttons		EMFA	1
28	X3	Terminal	8WA10111DH11	SIEMENS	12

IMPORTANT NOTE!
This manual will guide you sufficiently during the use of this bending machine. But, we believe that even with a most detailed explanation of bending process may not give you necessary information to start for bending. For this reason, we advise that our supervisor should assist and train your operators during initial use of the machine.

SPARE PARTS LIST

No	Name of part	Drawing no	Pcs
1	Table(Rezopal)	OM1-0203-08a	1
2	Center (flat)	OM1-0203-09	1
3	Center(cut)	OM1-0203-10	1
4	Canal pieces	OM1-0203-15	31
5	Bearing group	OM1-0202-04	1
6	Movement arm	OM1-0202-05	1
7	Compass group	OM1-03	1
8	Adjustment piece	OM1-0301	1
9	Compass arm	OM1-0302	1
10	Bearing group	OM1-0303	1
11	Shaft	OM1-0304	1
12	Upper cover	OM1-0305	1
13	Wing nut	OM1-0306	1
14	Square bolt	OM1-0307	1
15	Drawing apparatus	OM1-04	1
16	Pin bearing	OM1-0402	1
17	Drawing arm	OM1-0403	1
18	Drawing arm shaft	OM1-0404	1
19	Drawing arm body	OM1-0405	1
20	Mould holder group	OM1-05	32