

Porcelain Furnace

# PF PRESS

## INSTRUCTION MANUAL



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## 1 - GENERAL INFORMATION

### 1.1 - Purpose of the manual

This manual has been written by the manufacturer and is an integral part of the machine.

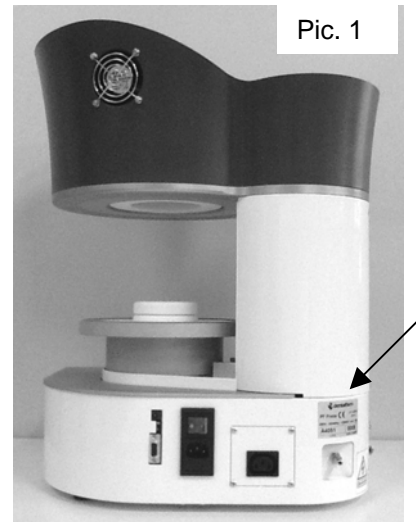
All herein contained information are addressed to the user and include relevant Safety Recommendations.

Before using this furnace, it is recommended to read this manual carefully, to ensure the operator knows all control devices, their function and position. It is also advisable to make tests before real use.

This manual must be stored in an accessible place for future reference.

### 1.2 - Identification of the machine manufacturer

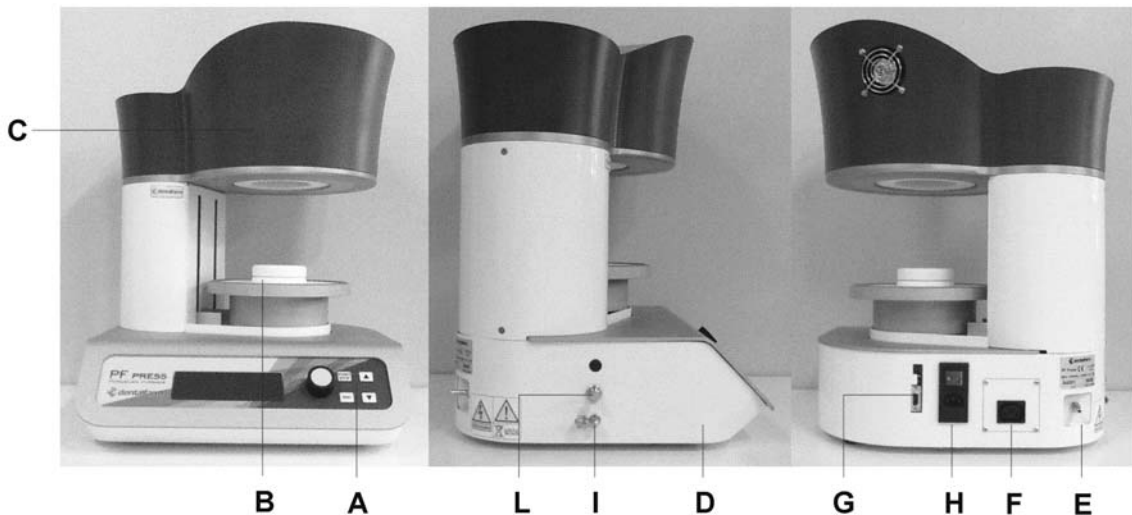
The machine is identified by a label as shown in Pic. 1.



### 1.3 - Technical information

The **PF Press** furnace has been designed and manufactured to fire ceramic products and to carry out thermal treatments on metals for dental use and laboratories. Both the firing and heating furnace cycles are managed by a microprocessor electronic control. The vacuum function can be activated to allow a vacuum firing phase. Therefore, the furnace is pre-fitted to be connected to a vacuum pump, whose functioning is handled by the electronic control.

This furnace is delivered in one version only and is compliant with applicable safety requirements.



A	Control Panel	F	Pump Power Supply
B	Plate	G	Computer and Printer connection
C	Muffle	H	Power Supply 220 V & General Switch
D	Case	I	Compressed air connection
E	Vacuum pump connection fitting	L	Pressure Reducer

### 1.4 - Safety precautions

Carefully read this manual before carrying out any operations on the machine. Safety of the operator depends on the ability, common sense and caution during use. It is therefore necessary to know all controls as well as their function and position. The machine is designed to be used by a well-trained professional, not by occasional users. Periodically check the parts subject to wear. Do not tamper or alter the electric installation of the unit. No safety devices installed on the machine should be removed or altered for any reason. Do not allow unauthorized users to maintain or repair the unit.

## 1.5 - Technical Data

Dimensions W x D x H	mm 390 x 440 x 490
Weight	Kg 30
Muffle dimensions	mm Ø90 x 55 H
Power Supply	220 - 230 V AC
Resistances Power	1050 W
Pump Power (Max)	500 W
Fuses	10A
Max Temperature	1200°C
Raising Speed	2 - 200 °C/Min
Available Free Programs for traditional ceramics	69
Available Free Programs for CAD/CAM lithuim disilcate	10
Available Free Programs for pressing techniques	20
Autocalibration Program	1

## 1.6 - Elimination and waste disposal

According to International regulations, this unit has been classified as AEE (electric and electronic device, whose correct operation depends on electric currents and electromagnetic fields) and as a consequence, at the end of its lifetime, it can not be treated as normal waste material but it must be disposed separately, complying with Directive 2002/96/EEC.



## 2 – HANDLING AND INSTALLING

### 2.1 - Packaging and unpacking operations

The packaging consists of:

Protective polyurethan foam performs. Hard cardboard cover. Strap.

Packaging waste disposal must be carried out respecting the environment and in compliance with the regulations in force.

### 2.2 - Handling and moving the machine

This machine must be moved by means of trolleys or manually by at least 2 people. While moving the machine avoid absolutely any kind of bumping, dropping or tilting: they could seriously damage it. Obviously, the manufacturer is not responsible for damages caused by droppings, improper use and maintenance which are not in strict accordance with the manufacturer's instructions contained in this manual.

### 2.3 - Installation instructions

The machine must be located on a safe place and in a horizontal position. It is up to the user to ensure that the electric network is in accordance with the safety regulations in force. It is particular important to make sure that the earthing works properly. Furthermore, it is important to verify the network voltage: in case the voltage is too low (lower than 210V), this could lead to inconveniences and it might be necessary to install a voltage stabilizer.

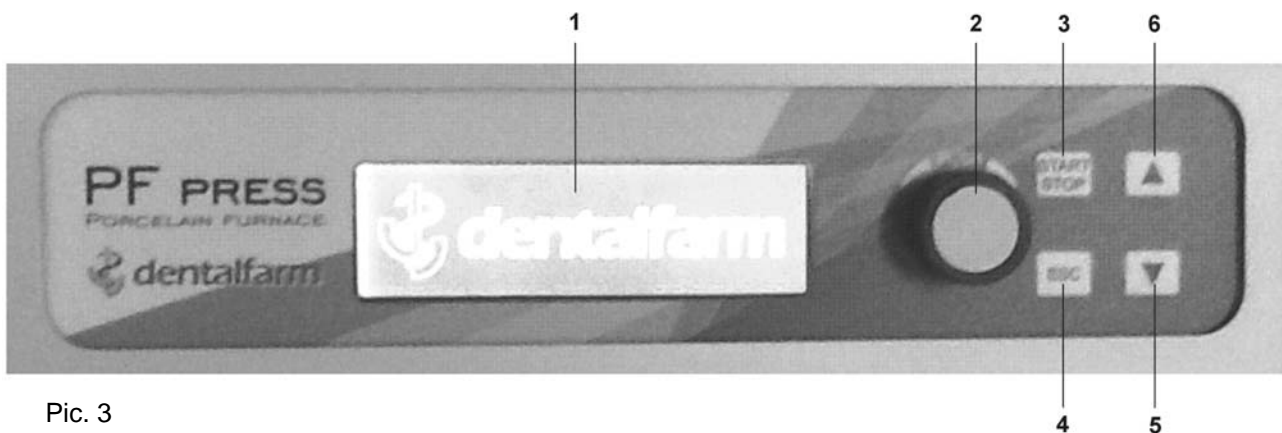
After having placed the furnace and gone through the above checklist, follow these instructions:

- The general switch must be in the OFF (0) position.
- Connect the power supply plug to a 220-230 V AC outlet, by using the given cable.
- Plug the vacuum pump cable into the corresponding socket.
- Connect the vacuum pump to the furnace by using the pipe delivered with the unit.

Connect the furnace to the compressed air system by means of the 8x6 mm cable. Unscrew the fixing nut from the fitting and position it on the pipe; insert the pipe into the fitting and tighten the fixing nut by means of a size 14 Allen key.

### 3 – INSTRUCTIONS FOR USE – TRADITIONAL CERAMICS

#### 3.1 - Panel - Operating controls description (Pic. 3)



Pic. 3

**1 - Blue light LED display**

**2 - Encoder** used for the input of operating data and selection of the functions. By rotating it to the right or to left you can choose the functions or modify the values of the ones already selected. By pushing it you will confirm the displayed information (ENTER). From now on we will call this knob “**EN**”.

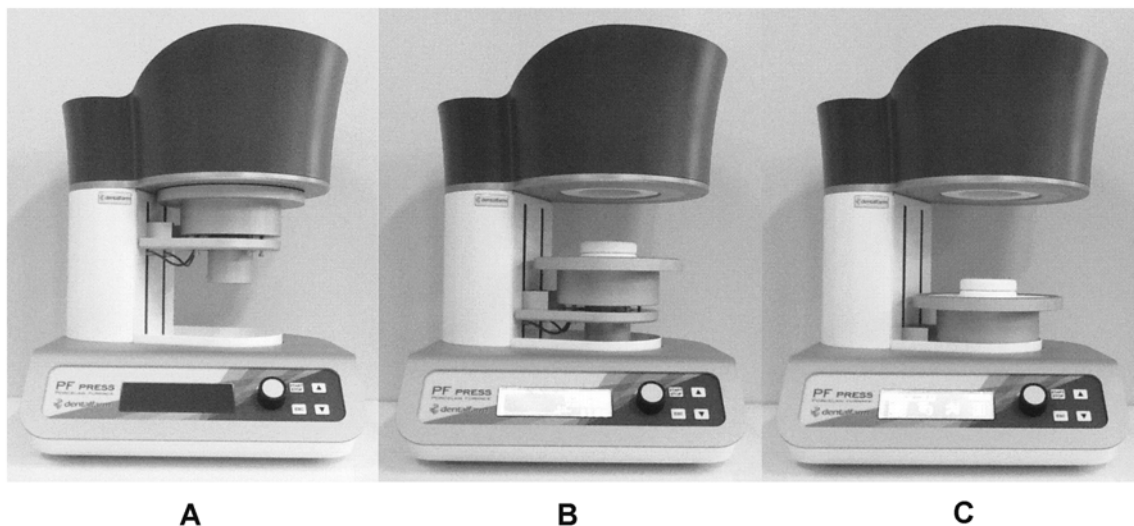
**3 - START/STOP button:** used to start a firing cycle or stop a cycle in progress.

**4 - ESC button:** used to exit from a folder or from a function during the programming or displaying phase.

**5 - ARROW DOWN button:** used to lower the plate when no program is in progress. During the programming stage, it is used to move the cursor leftwards when entering the name of a new program. During search of programs, this key allows to rapidly switch from one group of programs to another (downwards: for instance from position 80 to 70 or from 70 to 1). From now on we will call this key “**FB**”.

**6 - ARROW UP button:** used to lift the plate when no program is in progress. During the programming stage, it is used to move the selecting cursor rightwards when entering the name of a new program. During search of programs, this key allows to rapidly switch to upper positions, similarly as stated above. From now on we will call this key “**FA**”.

#### 3.2 - Muffle opening and closing (Pic. 4)



Pic. 4

In the **PF Press**, the opening and closing of the muffle are performed through upwards and downwards movement of the plate (Pic. 4 B). From the above pictures you can see the following positions: A (closed furnace), C (furnace completely open). When the furnace is not working on a firing program, to start the opening of the muffle push 5 FB. The plate will go down and stop at its lowest position. To lift the plate push the button 6 FA. To stop the plate during a movement push again either FA or FB.

### 3.3 – First Steps

After having turned the furnace on by means of the general switch located on the back of the device, the plate will go down till position C (Pic. 4) while the heading DENTALFARM will appear on the display. Push EN and the following screen will appear (Pic. 5). From now on, this screen will be called MAIN MENU.



Pic. 5

As you can see 4 icons are shown on the display, representing 4 folders containing all the elements necessary to work with the furnace.

By rotating the EN cursor you can choose one of the 4 folders. By positioning the EN cursor on one of the icons and by pushing it you have access to the chosen folder. The folders contain the following information:

- FOLDER “P”: all firing programs are contained in this folder. Choose this folder any time you want to create a new program, modify an existing one, copy a program or simply display the settings of a specific program.
- FOLDER “START”: use this folder when you want to start a program.
- FOLDER “SET”: it contains all the information to set the parameters of the furnace, which are common to all programs (calibration, preferences, etc...)
- FOLDER “i”: it contains all the information related to the manufacturer, information system and a few hidden service menus for repair and maintenance.

### 3.4 - Working Cycle – Traditional Ceramics

The working cycle of **PF Press** has been developed to work with the following 15 variables:

- **F1 - (TA): Drying Temperature** (or starting temperature) from 20° to 1200° Celsius. This temperature is obtained with a fixed temperature increase speed of 70°C/min.
- **F2 - (t1): Drying Time** or muffle closing time (minutes and seconds). Once the Drying Temperature TA is reached, the plate will lift and the muffle will close according to the set value of this variable.
- **F3 - (t2): Drying Time with closed muffle** before the firing begins (in minutes and seconds). This waiting time can be important to balance the inner muffle temperature after the chamber has closed. If you set 0, after having closed the muffle the furnace will start immediately the heating as per the following phase F4.
- **F4 - (TC): Firing Temperature** from 20° up to 1200°C.
- **F5 - (VC): Temperature increase speed** (in °C/min.) It varies from 2 to 200°C/min.
- **F6 - (tc): Firing time** (in minutes and seconds).
- **F7 - Vacuum** (1=YES, 0=NO)
- **F8 - (TV-ON): Switch-on temperature of the vacuum pump.** The vacuum can be set during the firing phase: therefore TV-ON must be higher or equal to TA.
- **F9 - (TV-OFF): Switch-off temperature of the vacuum pump.** It can be lower or equal to TC.
- **F10 - (tv-OFF): Vacuum duration time** at chosen TC. This value is set only if TV-OFF=TC.
- **F11 - (%V): Vacuum grade** expressed in % of the absolute vacuum. If 100% is set, the pump keeps working continuously; if lower values are set, the pump restarts whenever the vacuum grade decreases below the set value.
- **F12 - (TR): Guided cooling stage until the pre-set temperature.** The furnace will cool slowly with according to the cooling speed set in F13, before starting to open the muffle.
- **F13 - (VR): Cooling speed** in C°/min during slow cooling.
- **F14 - (t3): Muffle opening time** (in minutes and seconds). If you set the value 0 the muffle will instantly open.
- **F15 - (TF): Final Temperature:** it is the stand-by temperature the furnace will reach at the end of the cycle. This value will be set depending on the drying temperature of the next cycle.

### 3.5 - Programs

The furnace **PF Press** can store up to 100 programs (or cycles): 69 are programs for complete firing cycles for traditional ceramics, 10 are suited for CAD/CAM lithium disilicate and 20 are specific for press-ceramics. The program 0 is a test cycle which should not be used for firing.

#### 3.5 A – Create a new program

From the display of Pic. 5, rotate the Encoder EN to the left and access folder P (Programs by pushing EN: the following screen will appear:



Pic. 6

Rotate the Encoder EN to choose "create new" and enter by pushing EN. The following screen will appear:



Pic. 7

Rotate EN and choose the number you want to assign to the program.

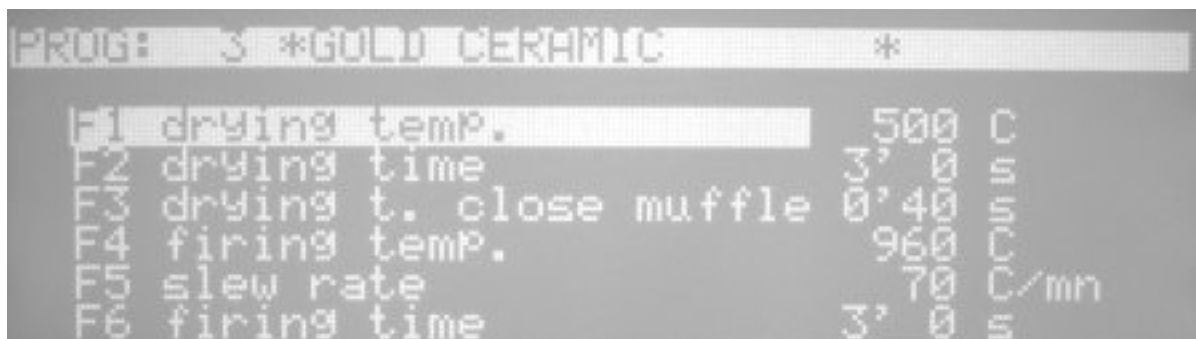
Confirm by pushing EN: you can select the name and all available characters.

Push FA and the letter D is selected.

Rotate EN: the cursor will move on the characters until the selected character or letter is backlit.

Push FA to move the cursor on the second character or letter, then rotate EN to choose the character or letter and proceed like this until you have written the entire name of the program (NB: note that the empty space is the first available character).

Push EN and you move onto the following display for the 15 functions of the program.



Pic. 8

The first selected function is: F1.

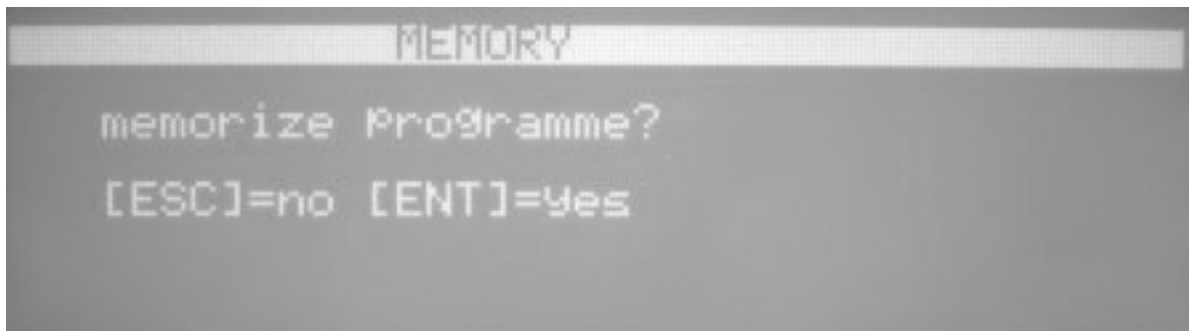
Push EN: the value will be selected (example 500 C°)

Rotate EN to modify this value until the desired value.

Push EN to move the cursor again on F1.

Rotate EN to select the next function F2.

Push EN to select the value (example 3).  
Rotate EN to modify it.  
Push EN twice to switch again to F2.  
Rotate EN to move to F3 and proceed like this until the last function F15.  
You can go back or skip the functions which don't need to be modified.  
After having set the complete program, push ESC and the following screen will appear:



Pic. 9

To save the program, push EN: the recently set program will be kept in memory until a further modification will take place. By pushing ESC, the last program you have been working on will be kept in memory.

### 3.5 B – Change a program

To modify a program, please switch to “change” of the display PROGRAM MANAGEMENT Pic. 6. On the following display Pic. 7, choose the number of the program and then, if you want you can modify the name as per the above described instructions; otherwise, by pushing EN, you can modify the values of the functions. Follow the same procedure as described in the previous point.

### 3.5 C – Create from program

This allow to create a program using an already pre-set program. The procedure and results are similar to the ones included in “change a program” point.

### 3.5 D – Eliminate program

If a program is no longer necessary, it can be eliminated by using this option: you will be asked to confirm or discard the elimination of the program.

### 3.5 E – Macro

The “Macro” function is not enabled in this model.

### 3.5 F – See last cycle

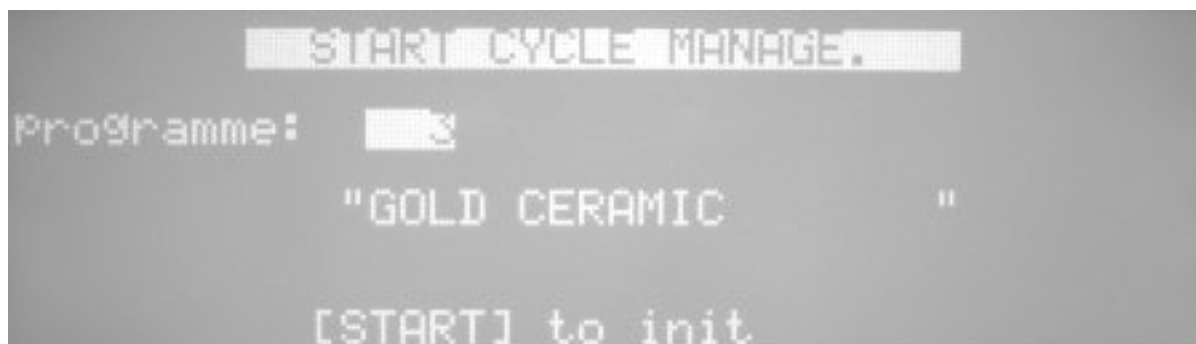
You can see the last performed cycle.

## 3.6 – Carrying out a firing cycle

To execute a program (that is to perform a firing cycle or a thermal treatment) proceed as follows:

Open the furnace and place the object on the ceramic support of the plate.

In the main menu, select the folder START by rotating EN – push ENTER and the following screen will appear:



Pic. 10

Rotate EN to select the program you want to perform.



**From this position you can view the program and, if you want, you can also change it.**

Once the program has been chosen, push ENTER: in this way you will access the display shown in Pic. 8. As described in 3.5A, you can see the program and even change it. At the end, by pushing ESC, you move to the save function display shown in Pic. 9, then by pushing ENTER or ESC, you go back to the previous display shown in Pic. 10.

**Push START/STOP:** the furnace will start to carry out the chosen program and by moving to position B of Pic. 4 and the muffle temperature will go up to the TA Drying Temperature. Once the TA has been reached, the plate will be lifted and the muffle will close. Muffle closing will be done according to the time value set in function F2 (Drying Time). The furnace will then perform all the necessary procedures included in the program up to its end. During the program, the display will shown with a chart the following parameters: T-t (Temperature – time: Temperature in C° vertically, and time expressed in minutes, horizontally) as shown in Pic. 11.



Pic. 11

Chart Explanation:

- Vertically : temperature. In this case each step indicates a variation of 200 °C and this value changes for each cycle.
- Horizontally : time expressed in minutes. In this case each step indicates 8 minutes and also this value changes for each cycle.
- The vacuum function is indicated by the title VAC: the number represents the vacuum grade expressed in mmHg. (The maximum vacuum grade is 760mmHg). The vacuum function is also shown by the scroll bar. Maximum vacuum grade is reached when the light bar has reached its left limit. The two little squares on the chart indicate the start and end point of the vacuum function.
- Below the vacuum bar, the current function in progress is shown. In this case the function F1 is shown, which is the "Drying Preparation". On the lower part of the bordered space the unit displays the temperature that must be reached during the current function (T: 500C), on the right the estimated time to process this function (in minutes and seconds).
- Below the panel you see the estimated remaining time to finish the program (ESTIMATED).
- In big lettering, the inner temperature inside the muffle is shown (299°C).
- Here, alarm or error messages that might intervene during the processing program, will be shown. The list and meanings of such messages are contained in paragraph 8.3

At the end of the cycle the plate will go back to position B: at this stage the program ends. The operator will manually open the furnace up to its maximum opening position.

**It is also possible to see and change a program already in progress.**

Push ENTER: you go to the display shown in Pic. 8. At this point you can see the program and change the functions which have not yet been performed, according to what described in 3.5A. At the end, by pushing ESC, you move onto the saving display shown in Pic. 9, then by pushing ENTER or ESC you go back to the previous display shown in Pic. 10.

### 3.7 – Interruption of a program in progress – STOP

To interrupt a program which is already in progress, do as follows:

- Push START/STOP: the furnace will ask you to confirm this order. If you do not confirm it within 5 seconds, by START/STOP, the furnace will ignore the order and will continue to perform the cycle. Instead, if you confirm the order by START/STOP within 5 seconds, the furnace will immediately interrupt the program. If vacuum is on, the furnace will let air in to restore normal conditions. During this stage, all controls are disabled.
- Once the vacuum has been released, push FA and the furnace will open and be ready for another operation. Press ESC to exit.
- If the furnace is hot, please let it cool down before opening it: let the temperature drop below 700° C.

## 4 – CRYSTALLIZATION OF CAD/CAM LITHIUM DISILICATE

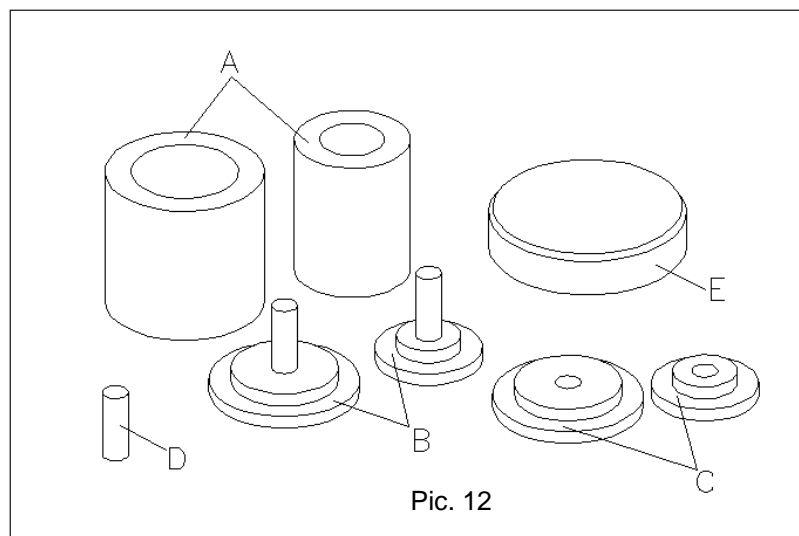
**PF Press** can treat CAD/CAM milled lithium disilicate. The corresponding cycles are included between position 70 and 79. These cycles are characterized by a high number of editable parameters (instead of only 15 parameters, here 23 parameters are present). This allows programming of double threshold cycles. Consequently, all parameters from F4 to F11 (referring to the first firing stage) are repeated – marked with suffix B – when referring to the second firing stage.

## 5 – PRESS-CERAMIC FIRING

This chapter contains the instructions related to the use of the furnace **PF Press** for “press-ceramics”, that is ceramic obtained through Press-injection of “cylinders” of pre-fired ceramic heated up to its plastic status and injected in shapes obtained with the “lost-wax” method.

### 5.1 - Furnace Accessories

The following accessories are supplied with the furnace: (Pic 12):



- 2 silicone cylinders approximately of dimensions 1X and 3X (Pos. A) that will be called from now on A1 e A3
- 2 teflon bases for the above cylinders (Pos. B) that will be called from now on B1 and B3
- 2 nylon lids for the above cylinders (Pos. C) that will be called from now on C1 and C3
- 1 small refractory piston to perform the injection (Pos. D)
- 1 additional refractory support to place on top of the standard support for “normal” ceramics firing (Pos. E).

## 5.2 - Working Cycle: Setting the variables

The working cycle of the **PF Press** is built to work with the following 14 variables:

- **F1 : T1 Start Temperature:** it is the starting temperature from which a press-injection cycle starts. When you start the program the furnace raises temperature up to the T1. When such temperature is reached the furnace will give an acoustic signal to indicate that it is ready for the cylinder. The user must open manually the furnace, place the cylinder, close again the furnace with the arrows and the cycle will continue.
- **F2 : T2 Injection temperature:** it is the Temperature the furnace will reach to obtain the softening of the "rough" and proceed with the injection.
- **F3 : Vs Temperature increase speed** expressed in °C/min: it indicates the increase of temperature the furnace uses during heating from T1 to T2.
- **F4 : tm Holding Time:** it indicates the time the furnace keeps the temperature T2 before the injection. This time varies from 10 to 20 minutes depending on the type of ceramic and the selected T2 temperature.
- **Fp : Injection Pressure.** It represents the compressed air the technician wants to use during the injection. By increasing the pressure also the driving force on the material to be pressed will increase according to the following table:

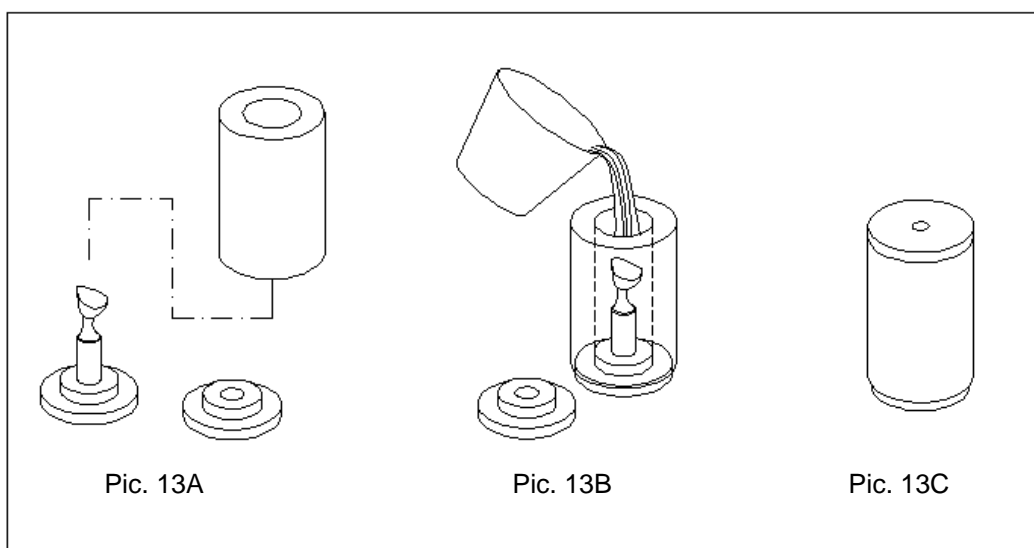
Pression - Bar	Drive - Kg
1	12.5
2	25
3	37.5
4	50
5	62,5
6	75

In order to press with one single piston up to 4-5 elements we suggest to use a pressure of 2-3 bar. We also suggest to perform cycles-proof in order to choose the correct pressure according to the single case.

- **Ft : Pressure Ramp.** It represents the time used to reach the chosen pressure. The pressure is not reached all at once but slowly according to the time chosen in this variable. We suggest to set a ramp of 1 or 2 minutes in order to avoid that too much pressure is given at once on the cylinder which might consequently break.
- **F5 : ti injection time:** it indicates the time, after the injection, that the furnace will keep the pressure on the ceramic in order to obtain the completion of the pressure firing. This time is of about few minutes (normally about 5 minutes).
- **F6 : tp post - injection time:** it indicates the time the furnace will maintain the temperature T2 after having released the pressure. This function is not used for many types of ceramics, if this is the case set the value F6 = 0.
- **F7 : Vacuum YES (SI)** (It is impossible to set cycles without vacuum).
- **F8 :Tv starting vacuum Temperature:** it indicates the temperature at which the pump switches On. The vacuum stops at the end of phase F4, that is when the pressure is released, unless a different value from 0 is set for the variable F10.
- **F9 : Vacuum grade:** vacuum grade in percentage to the absolute level can be set. It is suggested to set the value at 95%.
- **F10 : tpv post-injection vacuum time:** if a different value from 0 has been set at the variable F6, the vacuum can be maintained during this time. For most ceramics this value must be 0.
- **F11 : Tr guided cooling up to target temperature:** it indicates the temperature the furnace will reach during the cooling with a closed muffle.
- **F12 : Vd Temperature decrease speed:** during the cooling set in variable F11, also the cooling speed in °C/min can be set.
- **F13 : ta muffle opening time:** the muffle will slowly open in steps according to the time set in this function.
- **F14 : Tf Final Temperature:** it indicates the temperature the furnace will maintain once completed the cycle. This temperature is set according to the following cycle.

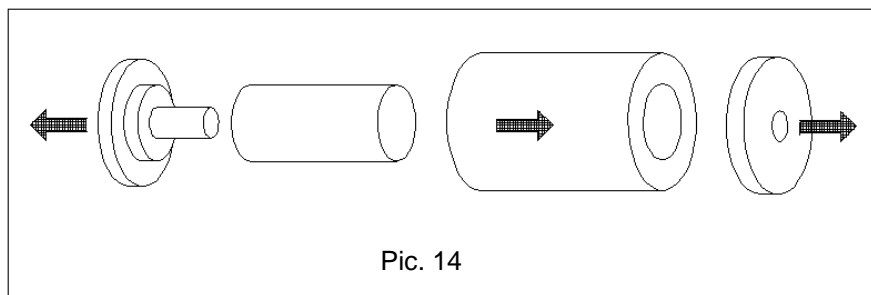
### 5.3 – Press-injection method

In order to obtain a ceramic element with the press-injection method, the starting point will be a wax model. If for example only one element is needed, the small cylinder 1X can be used; then the wax model must be positioned on the base B1 (Base of cylinder 1X) as shown in Pic.13A.



Once the shaping is done, place the cylinder on the base on its proper location. Prepare the coating and pour it inside the cylinder as shown in Pic. 13B. The cylinder must not be completely filled up but only up to 2 mm from the upper edge. Put the lid in its proper location (Pic. 13C). Once the lid is carefully placed, pushed all the way down and turned a bit on the left and right, the excessive investment material must come out of the hole located in the centre of the lid. This guarantees the complete filling of the cylinder. This processing step is extremely important to ensure the complete filling of the coating and avoid air bubbles that might have been formed inside the cylinder itself.

Let the coating coagulate according to the times indicated on the technical manual, then remove with a cutter the excessive coating that came out from the upper hole and take the coating cylinder from its base and the rubber cylinder as shown in Pic. 14.



Make sure that the two flat surfaces of the cylinder (above and below) are perfectly parallel one to the other and perpendicular to the side surface of the cylinder.

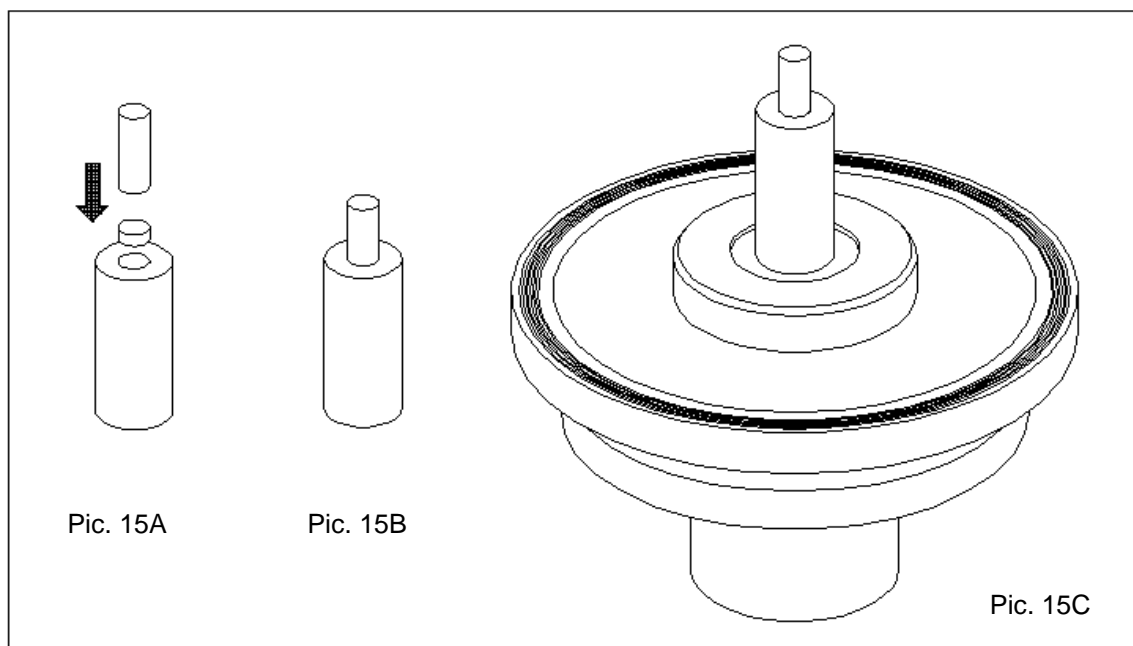
Now place the cylinder in the pre-heating furnace and perform the coating firing cycle following strictly all the indications given in the technical manual of the coating.

It is essential that the cylinder is fired correctly and following strictly all the indications in order to obtain a perfect cylinder void of cracks or micro-fissures at the moment of the ceramic injection.

A little before the end of the firing cycle start the cycle of the press-injection firing in the furnace SR860 (the cycles for the press-injection are from number 80 to 99) to set it so as to receive the cylinder once its firing cycle is over.

When the cylinder has finished its firing cycle, take the cylinder with its proper pincers (pay attention to the high temperature of the cylinder about 700°C) and place it on the refractory support, insert in the hole of the cylinder 1 or 2 the ceramic cylinders and then insert the pressure piston as shown in PIC. 15A and PIC 15B.

Now open the furnace using the button ARROW DOWN, take the cylinder with the pincers and place it on the lowered plate, making sure that it is placed in the proper position cylinder 1X as shown in PIC. 15C. Please note that on the refractory plate there are two positions, one for the cylinder 1X and another for the cylinder 3X. Press the button ARROW UP and close the furnace which will perform the complete firing and injection cycle.



#### 5.4 – Press cycle programming

The furnace **PF Press** offers 100 programs, the first 80 for normal ceramics and the last 20 (from number 80 to number 99) for press-ceramic. Programming steps are the same as described in paragraph 3.5. Enter the folder of the MAIN MENU programs and select the number of the program that you want to set. To move rapidly from the normal programs to the press-ceramic group of programs, press the button **ARROW DOWN** and you'll move directly to the first press-ceramic program, that is No. 80. Continue with the programming by giving a name to the program and setting all the related variables. To go back to the normal ceramic programs you can use again the button **ARROW UP**.

#### 5.5 – Carrying out a press – injection cycle

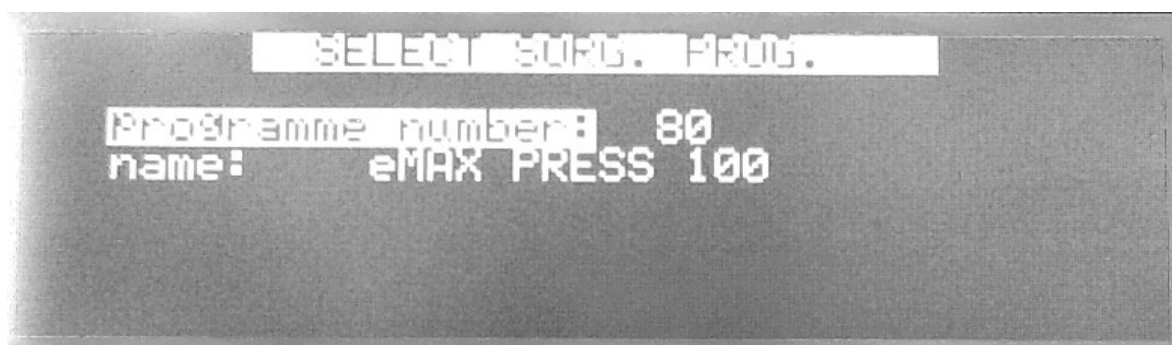
To perform a press-injection cycle follow the steps hereafter described:

Make sure that the furnace is connected to the compressed air.

Set the manometer at about 3 bar. The exact value of the injection must be carefully evaluated and exactly chosen after having performed a few sample tests.

Open the furnace and select the folder **START** by rotating **EN**. (Pic. 5)

Press **EN** and the following display will appear:



Pic. 16

Rotate **EN** to select the program you want to start.

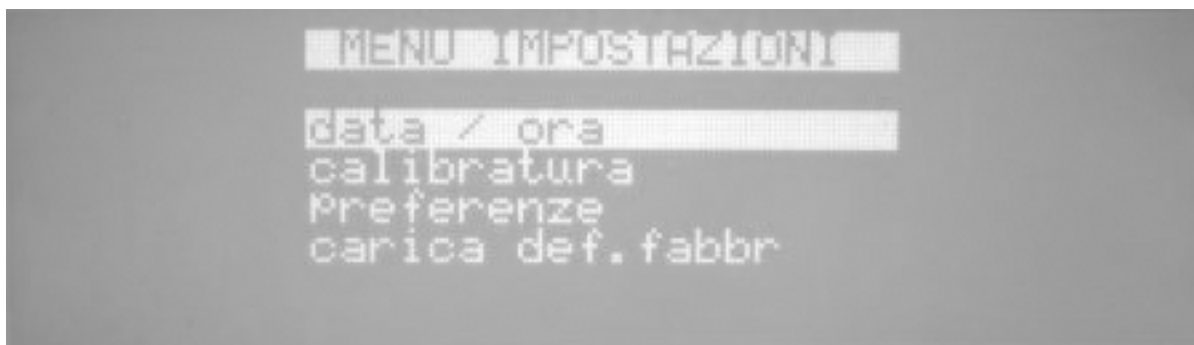
**From this position you can view the program, and if you want, change it.**

In order to do this, once the program has been selected, press ENTER: now you can see the program and if you want, you can change it. At the end by pressing ESC you go to the saving display and by pressing ENTER or ESC, depending if you want to save or not the changes made, you go back to the starting display in Pic. 16.

**Press: START/STOP:** the furnace starts to perform the selected program. The plate will go down to the lower point and then up just of a few millimetres. The first operation is an efficiency test of the injection (on the display the writing "Injection Test" will appear): the plate support will go up and then down so that the machine will ensure the presence of compressed air and the functioning of the mechanism. Then the muffle will close and the furnace will start increasing the inner temperature up to the value given in T1 (starting temperature). Once the T1 is reached the furnace gives an acoustic signal to indicate that it is ready to receive the cylinder and on the display the following will appear "WAITING FOR OPENING". The furnace keeps the temperature T1 until the user intervenes. When the cylinder is ready, open the furnace using the ARROW DOWN and on the display the following heading will appear: "WAITING FOR CLOSING". Place the cylinder on the plate, paying extreme attention to its position and making sure that it is perfectly vertical, then press ARROW UP: the furnace will close and proceed with the program, creating the vacuum, reaching the temperature up to the T2 (on the display the writing "Prep T. inj. will appear with the indication of the Temperature to be reached and the estimated time). Once the injection temperature has been reached the Temperature stabilization will start and on the display "holding" will appear with the indication of the temperature and the remaining stabilization time. The following phase is injection and on the display "Injection" will appear. Then the vacuum will be taken away and the muffle will open according to the set procedure. At the end the furnace will open; so take the cylinder out, let it cool and remove investment.

## 6 - FOLDER "SET"

By placing the cursor on "SET" folder as in Pic. 5, the follow screen will appear:



Pic. 17

### 6.1 – Day and Time

In this folder you can update day and time: this is necessary if the furnace remains non-operative for a long time.

### 6.2 – Calibration

The following two calibration modes are possible:

**A - Automatic Calibration:** it is carried out using 100% pure Silver thread - this calibration is possible with a Kit provided by our company on request. First assemble the Calibration Kit, verify that the calibration temperature is the same as that of Silver (namely 960 °C) and then press START. As for all calibration systems including this one, it is necessary to pay extreme attention and accuracy in its execution and it is strongly suggested not to be done by not trained personnel. In any case 2 calibrations are done during the test phase at our premises: one electronic calibration and one with the silver thread. Therefore since the furnace doesn't lose its calibration settings, it is not necessary to repeat it.

**Such calibration must be done only in case the thermocouple or the electronic card are replaced**

**B – Manual Calibration:** it is useful when the dental technician has to perform small changes depending on the verification of the ceramic after firing it. It is clear that each furnace must be customised according to the user and therefore it is possible to introduce small manual changes as for the furnace calibration: To modify manually the calibration please follow the hereafter instructions:

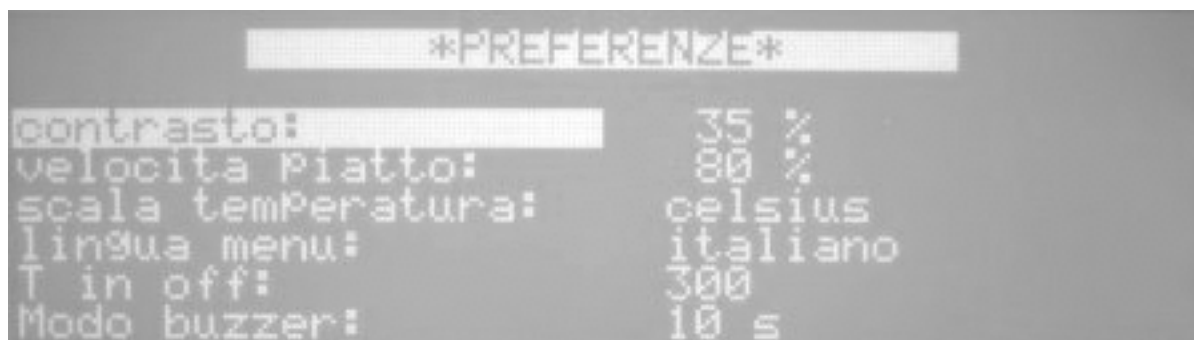
- enter the Calibration menu
- select the function OFFSET by rotating EN and then press ENTER
- modify the related value by rotating EN: if the furnace fires unsufficiently, then increase the value, otherwise if it overfires, lower it. For instance, if the ceramic was underfired and 8 degrees more are necessary to obtain a perfect firing: the OFFSET value must be changed from 0 to 8. From now on all the applied temperatures will be increased of 8 degrees.
- Push ESC twice to exit.

**WARNING:** if the automatic calibration cycle is turned On before having assembled the calibration Kit, the furnace will show ERROR 11. To skip this error you must press STOP twice, then press ESC, turn Off the furnace and turn it On again after 5 seconds.

### 6.3 – Preferences

Inside the Preferences folder you can set some general parameters, good for the performance of the furnace and all the programs. By selecting “Preferences” and pushing EN the following screen will appear:

- **contrast:** this parameter controls the brightness of the display. Please do not change it.
- **plate speed:** it indicates the maximum speed of the plate. Please do not change it.
- **temperature:** you can choose between Celsius & Fahrenheit.

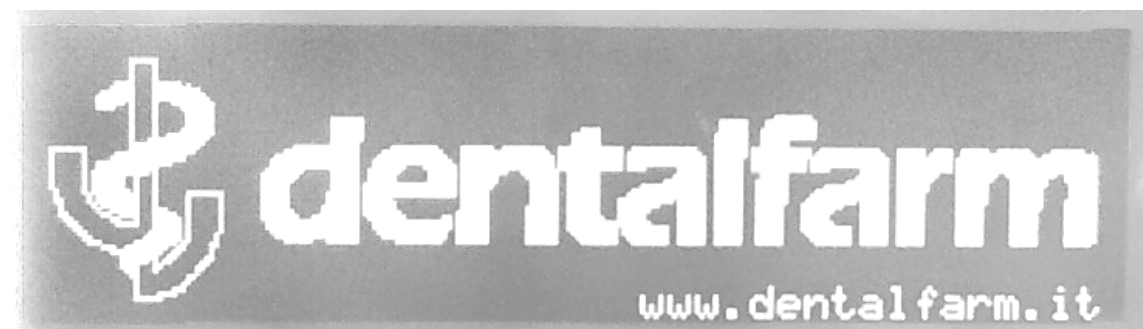


Pic. 18

- **menu language :** you can choose Italian, English, French, German or Spanish.
- **T in off :** it indicates the temperature the furnace will reach when it is turned On. Default value is 200°C. In a word, this is considered a stand-by temperature. This value can be modified according to the type of ceramics to handle: for instance, if you use a ceramic with a drying temperature of 480°C, T in off can be set at 470°C (so a slightly lower value than TA).
- **buzzer mode:** it indicates how long the Beep at the end of the cycle will sound. The following options can be chosen: Off (no Beep), 10s, 20s, 30s, 40s.

## 7 - FOLDER " I "

This folder contains all the protected menus that are used for the set-up of the furnace and repairs. Herein we describe the procedure to enter the first menu of this folder. By placing the cursor on the folder “i” in PIC 5 the following display will appear (Pic. 19):

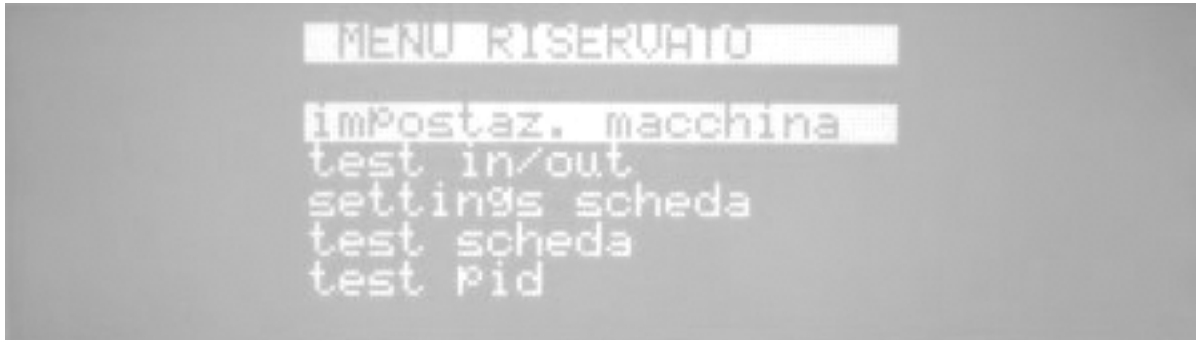


Pic. 19

In order to enter the first menu press simultaneously and keep pressed buttons 5 and 6 for at least 2 seconds shown in Pic. 3 (ARROW UP and ARROW DOWN): the following screen will appear:

**code: 0** (another number than 0 could appear). Enter the code **1234** as follows:

- rotate the Encoder EN and change the number visualised until number 1 is shown.
- press ENTER and a second number will appear. Rotate EN until number 2 is shown.
- press ENTER and a third number will appear. Rotate EN until number 3 is shown.
- press ENTER and a fourth number will appear. Rotate EN until number 4 is shown.
- press ENTER and you will have access to the following menu:



Pic. 20

From this protected menu you will have access to the first 2 sub-menus: Machine set-up and in/out Test.

### 7.1 - Machine Settings Menu

By selecting MACHINE SETTINGS from the display in Pic. 20 and pressing ENTER you will have access to the following sub-menu:



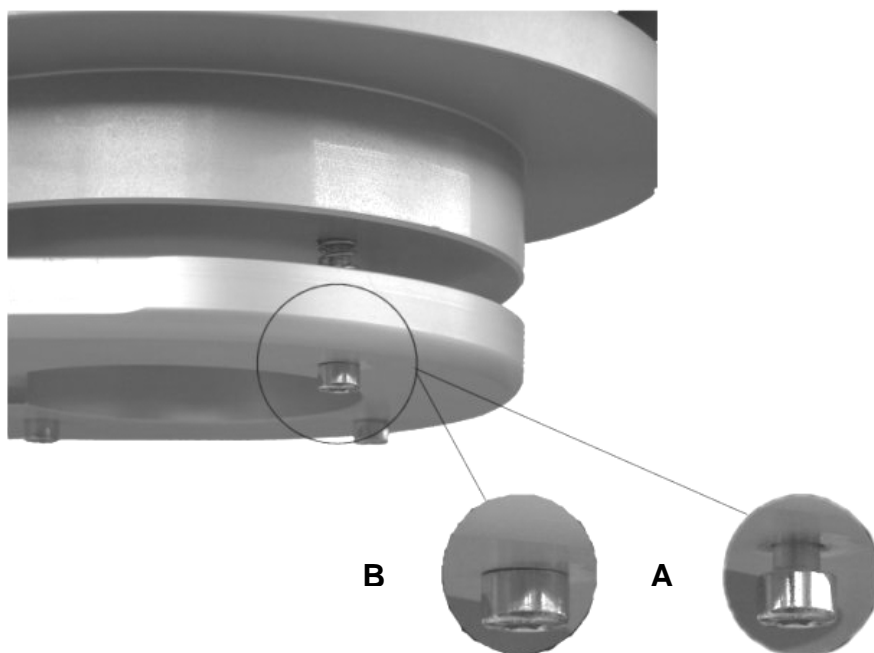
Pic. 21

In this menu, on the left column you will see some parameters which are the ones regulating the furnace whose meaning is explained hereafter. To change the value of the parameters follows the same procedure as before: select the parameter you want to change by rotating EN, press ENTER to select its numeric value and modify it by rotating EN, press ESC then select another parameter or exit with ESC.

**Start Pos** : this parameter regulates the position of the plate from where the drying process starts (pos B in Pic.4). To lower this position (meaning you want the plate to start from a lower position) you must select a lower value than the viewed number. To increase the drying position you must select a higher value. The Default set value is 1800.

**Limit Pos** : this parameter indicates the highest position reached by the plate at the end of the run. Normally this parameter shouldn't be changed. It can happen that you need to change if the position of the micro-switch has been moved (for example if the micro-switch itself has been replaced) or if, for any other reason, the furnace doesn't close the muffle well. In order for the muffle to be well closed, it is necessary that the plate pushes on the muffle plate to ensure a firm tightness with the green OR. If this is correct the 4 lower screws must come out of about 2.5 mm from the contact position with the flask. In the following Pic. 16 you will see the correct position of the screws, after the plate has been lifted, in **pos. A**. If the screws are as in **pos. B**, you must lift a little the plate position and therefore increase the value of the parameter "limit pos". An increase of 15 represents a lift of about 1 mm of the plate. Avoid selecting too high values, which will cause error signals.





Pic. 22

**CUR Li UP** : this parameter is proportional to the max torque the engine can use for the lifting of the plate. Its default value is 850 and it is recommended not to change it.

**CUR Li DO** : this parameter is proportional to the max torque the engine can use for the lowering of the plate. Its default value is 650 and it is recommended not to change it.

**Type Thermo**: to set the type of thermocouple in use. Two types of thermocouples can be used: type K and type N. NEVER change the pre-set type.

**Pump ist**: Pump hysteresis. It defines the interval between the vacuum pump turning On and turning Off points. If the pump turns On too often, the value of this parameter must be increased.

## 7.2 - Menu Test

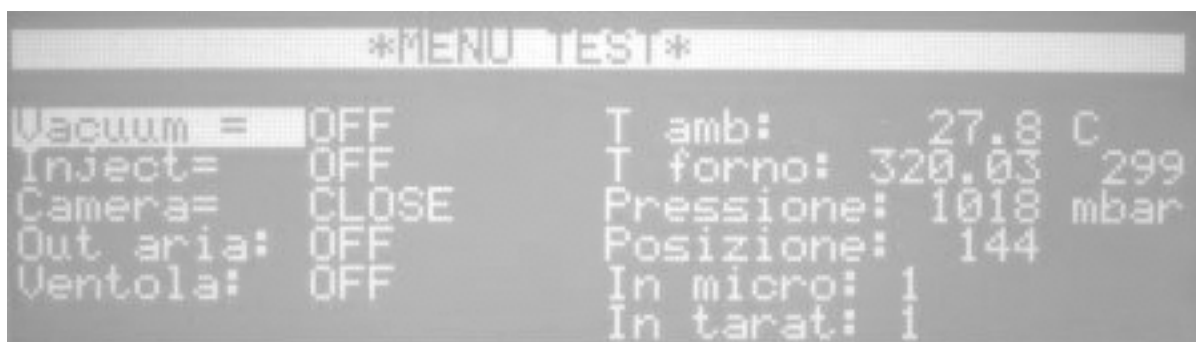
By selecting "In/Out Test" from the display in Pic. 20 and by pressing ENTER you will have access to the following sub-menu:

**Vacuum = OFF/ON** : by choosing the ON position the vacuum pump turns On.

**Inject = OFF/ON** : by choosing the ON position you lift the press-injection piston in the furnace PF Press.

**Muffle = OPEN/CLOSE** : open and close the muffle. It is the same as using arrows UP and DOWN.

**Air Out = OFF/ON** : by choosing the ON position you close the electro-valve NA for the emission of air inside the furnace. You can test the vacuum-tight



Pic. 23

This menu is used for the following tests on the furnace:

- **Pump performance and vacuum-tightness.** By choosing Air Out=ON and Vacuum=ON (after of course having closed the muffle) you turn On the pump and you check what level of vacuum is able to produce. Check the value from the third line of the right column: the pressure indicated is the absolute pressure, therefore the atmospheric pressure (1013 mbar) represents lack of vacuum (no vacuum), absolute vacuum is indicated with zero pressure. The pump is unable to produce absolute vacuum but it can reach a vacuum of about 98-99% of the absolute vacuum, therefore the pressure indicated will be about 10 – 20 mbar. If the pressure is higher it means that the pump has lost some efficiency or there is a small loss in the vacuum circuit. To verify if there is a loss, turn Off the pump (Vacuum = OFF) and check that the value of the pressure doesn't go up for about 15 seconds. Normally when you turn Off the pump the pressure goes up of some values immediately (this is due to the delay of the closing of the EV of the pump) but then it should stay stable (or decrease of 1 point maximum) for about 15 seconds. At the end of the test turn Off the pump (Vacuum = OFF) and release the vacuum (Air Out = OFF). If a consistent loss in the vacuum circuit has been found (a pressure increase higher than 10 in 15 seconds) the loss must be checked and located in the various elements of the vacuum circuit: Or of the plate, Electro-valve, cables, inner distribution pillar). Instead if no losses are found but the pressure remains too high, it means that the problem is due to the pump.
- **Efficiency of the opening and closing muffle system.** This function is not active since the performance can easily be checked using the arrows UP and DOWN (pos. 5 and 6 in Pic. 3).
- **Efficiency of the injection system.** This test must be done only for the furnace PF Press. After having connected the furnace to the compressed air and regulated the entrance pressure (about 3 bar), open the furnace and select Inject = ON: the ceramic support located on the plate goes slowly up until the end of its run (about 25mm). To lower the plate select Inject = OFF.

To exit the TEST MENU press ESC: you will find yourself in RESERVED MENU in Pic. 14, press again ESC to go back to the MAIN MENU.

## 8 - RECOMMENDATIONS FOR USE

An oil less vacuum pump is delivered with the unit. It is recommended to use only this pump; moreover, periodically check the efficiency and the wear conditions of the connecting pipe.

## 9 - MAINTENANCE INFORMATION

### 9.1 Ordinary maintenance

This machine doesn't need any maintenance.  
Keep it clean from any firing residues and dust.

### 9.2 - Extraordinary maintenance

To repair the machine or replace some of its parts, the user should consult directly the manufacturer or only specialized technicians.

Absolutely avoid opening any of the fixed guards without proper precautions.

Disconnect the power supply plug from the outlet before any extraordinary maintenance operations.

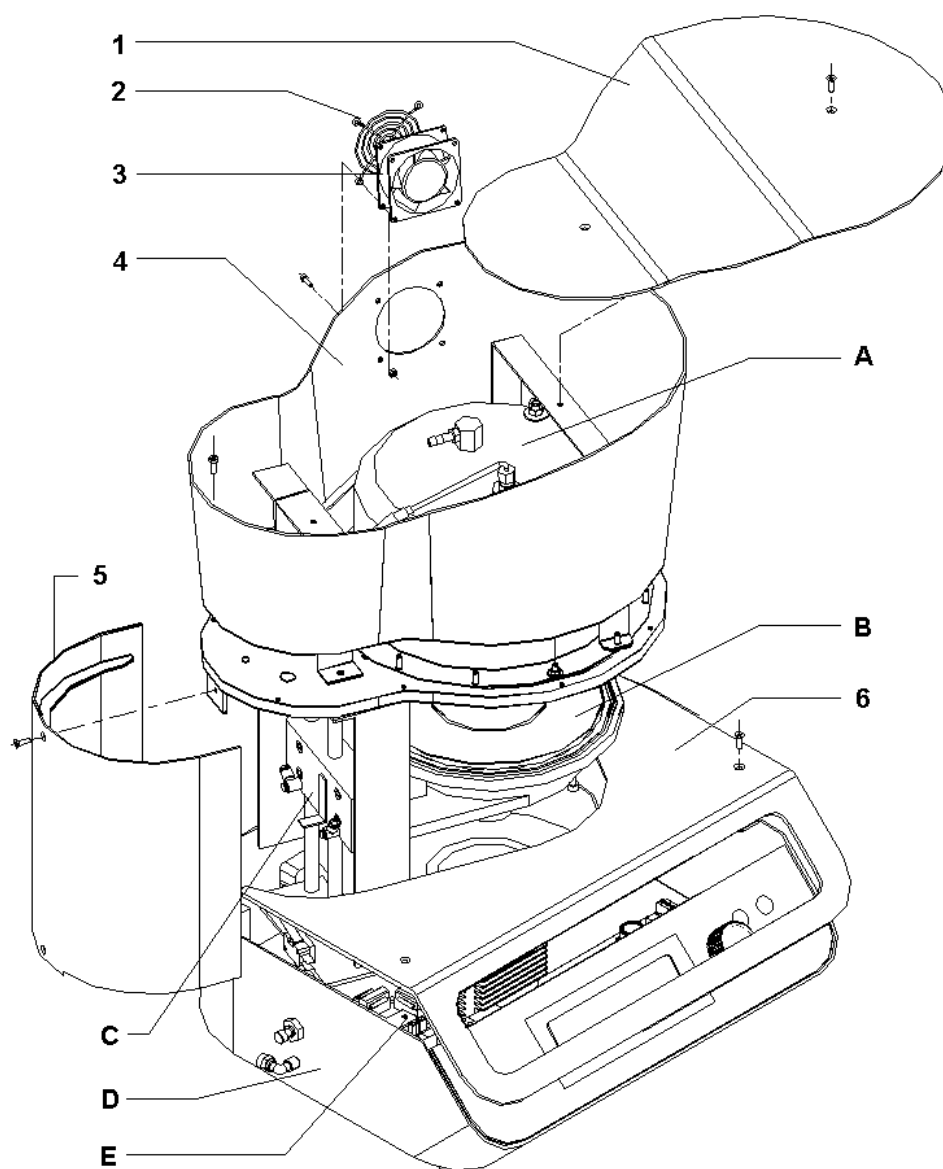
### 9.3 - Error messages

When an error intervenes, the furnace emits an intermittent sound signal and on the main display the heading "Problem" followed by a number will appear.

The numbers correspond to the following inconveniences:

Problem	Description
1	Reading / writing problem of the EEPROM. The electronic card doesn't work! Contact the manufacturer.
2	There is no In tension signal used to pilot the static relays. The problem is signalled for a moment when there is a tension failure and the card is working on a cycle performance. If alternating power tension is Ok it means that the electronic card is broken.
3	The checksum of the memorized electronic card parameters is not the same as the one memorized and therefore the electronic card has loaded the default parameters.
4	The vacuum pump is unable to make the vacuum.
5	Encoder engine problem: the engine is on but the encoder doesn't move (the problems is signalled if the engine doesn't start within 2 seconds). Verify all connections, the position of the encoder and the correct engine movement.
6	In the starting phase of the plate the micro of engine end-run has not been heard. Verify the connections and position of the end-run micro.
7	Problem on starting of the firing cycle. A parameter is not in accordance to the given instructions.
8	Problem related to calling back the previous status parameters. When performing a firing cycle and there is a power tension failure the electronic card saves the status to be able to go on with the cycle as soon as the tension is resumed. If this problem intervenes, it means that the electronic card has not been able, for some reasons, to save all the information. The cycle cannot be resumed. Forward the problem to the software manufacturer.
9	Error in the definition of the calibration temperature.
10	Problem in resuming the previous position. The procedure of the starting of the plate must be done again.
11	The Auto-calibration procedure has been started but the thread is missing or the contact unstable.
12	Loss in the control furnace stability. The control will be restarted and the status tried to be resumed.
13	Calibration procedure end without the thread breaking.
14	The tension read by the thermocouple is over the allowed limit. Verify the thermocouple connection.
15	Engine overload current (the signalling of the problem is not qualified but only the control is).
16	Error in the loading of the calibration parameters: the default setting is done.
17	Error in the loading of the protected parameters: default values set.
18	Error in the loading of preferences parameters.
19	Error in the problem saved list: zero-setting procedure.
20	During the RAM reset procedure (inside the protected menu) a reading/writing error has been detected.
21	Error in the analogue converter for the reading of the furnace temperature: blocked.
22	Error in the serial test (procedure from the protected menu).
23	Incorrect reading in the serial channel.
24	Clock problem: it seems blocked. Turn it off and on again to verify the correct functioning.
25	Furnace temperature maximum limit reached (T-limit value set in the protected menu).
26	Error in the setting of the factory data: terminator block data not found.
27	Wrong Checksum in the setting of the machine data set for this device, setting procedure from general data set up.
28	Problem in the pressure reading system: value < 500 mbar or higher than 1100 mbar with open muffle.
29	Problem in maintaining vacuum during the cycle. This happens during the cycle, namely after having created the vacuum at the first start, if the set vacuum value cannot be maintained.

## 10 - EXPLODED DRAWING AND SPARE PART LIST

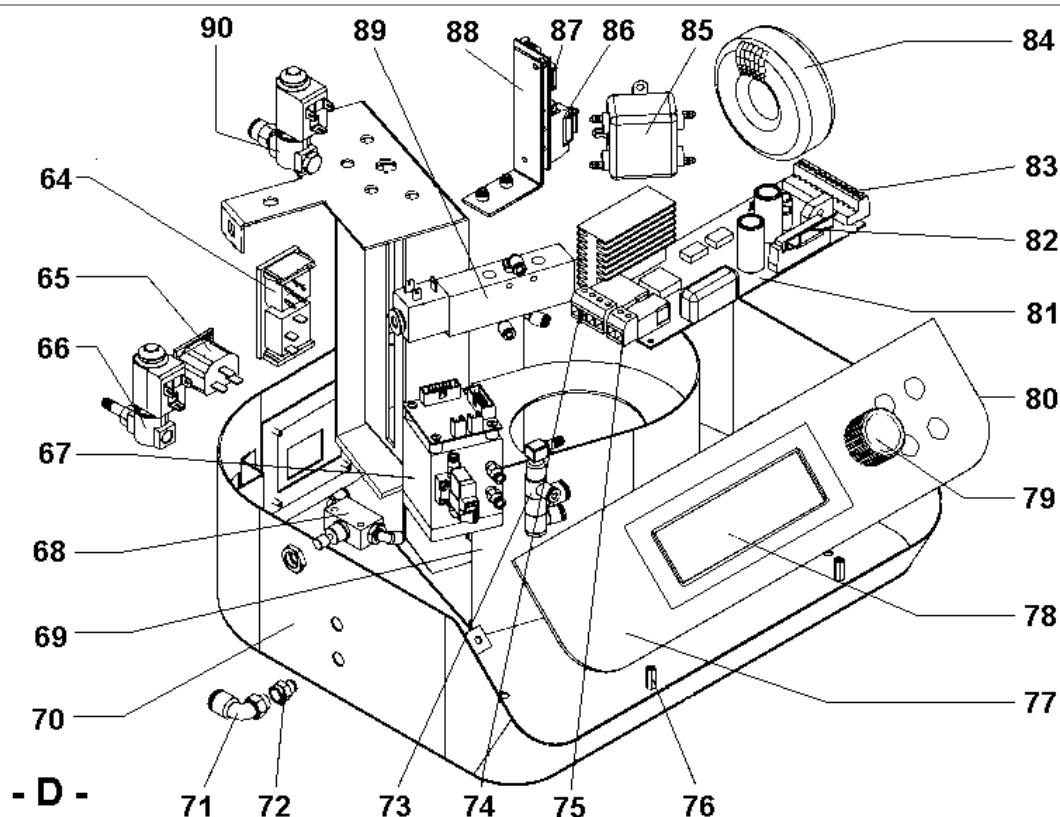


No.	CODE	DESCRIPTION
1	<b>4051004</b>	Muffle compartment cover
2	<b>4051144</b>	Grid on fan
3	<b>4051143</b>	Fan
4	<b>4051100</b>	Muffle compartment shell
5	<b>4051013</b>	Side panel
6	<b>4051003</b>	Assembly compartment cover
A	<b>4051101</b>	Complete muffle unit
B	---	Sliding plate unit
C	---	Plate movement unit
D	---	Assembly compartment unit
E	---	Injection control unit





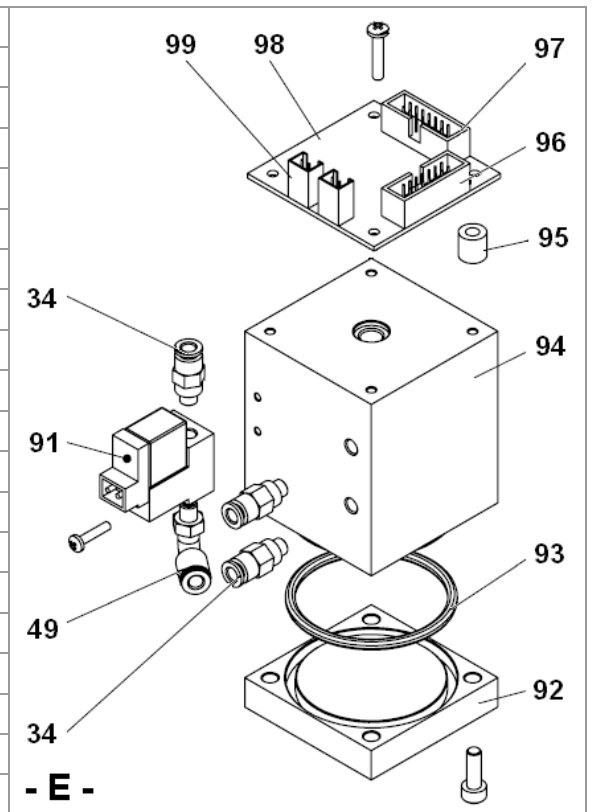




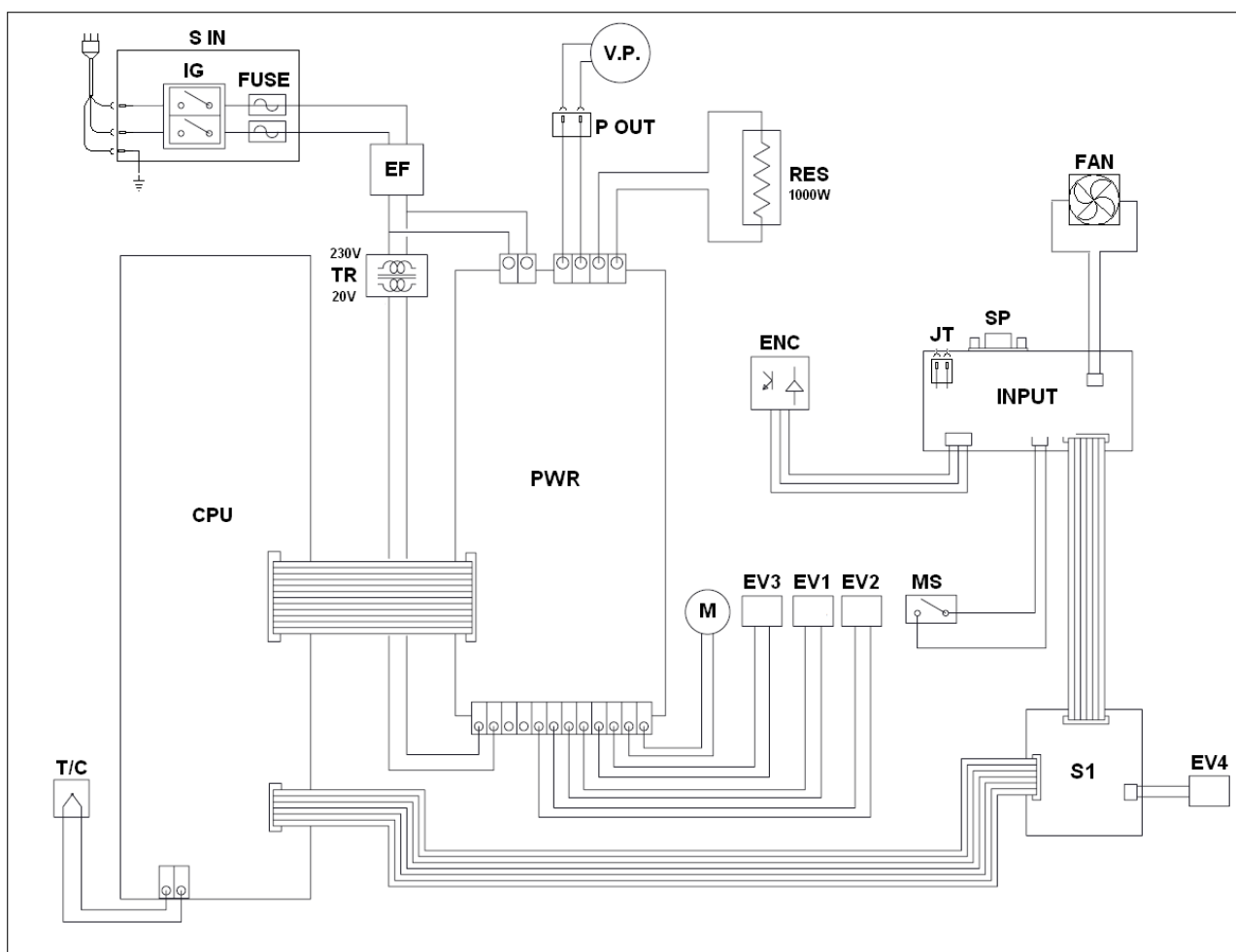
No.	CODE	DESCRIPTION
64	<b>4051129</b>	Power supply and switch unit
65	<b>4051130</b>	Pump connection socket
66	<b>4051131</b>	Vacuum insertion solenoid valve (EV3)
67	<b>4051501</b>	Injection control group complete
68	<b>4051135</b>	Air flow regulator
69	<b>4051012</b>	Upright support
70	<b>4051002</b>	Metallic body
71	<b>4051136</b>	90° 8-1/8" pipe-fitting
72	<b>4051137</b>	4-1/8" female pipe-fitting
73	<b>4051138</b>	Vacuum distribution column complete
74	---	4P OUT 220V terminal
75	---	2P IN 220V terminal
76	---	Spacer for board
77	<b>4051001</b>	Brand label + AL panel
78	<b>4051108</b>	CPU board with display
79	<b>4051139</b>	Potentiometer knob
80	<b>4051500</b>	Complete control panel (panel + CPU board)
81	<b>4051109</b>	Power board
82	---	PWR-CPU flat cable
83	---	PWR terminal block
84	<b>4051140</b>	Toroidal transformer
85	<b>4051141</b>	EMI filter
86	---	INPUT-S1 flat cable
87	<b>4051107</b>	INPUT card
88	<b>4051016</b>	INPUT card bracket
89	<b>4051132</b>	5 ways solenoid valve (EV1)
90	<b>4051133</b>	Vacuum release solenoid valve (EV2)



No.	CODE	DESCRIPTION
34	<b>4051117</b>	4-M5 pipe-fitting
49	<b>4051124</b>	90° 4-M5 pipe-fitting
91	<b>4051134</b>	Mini air solenoid valve (EV4)
92	<b>4051028</b>	Air tank base
93	<b>4051142</b>	OR joint on air tank base
94	<b>4051027</b>	Air tank body
95	---	Spacer
96	---	INPUT flat cable
97	---	CPU flat cable
98	<b>4051106</b>	Injection control card (S1)
99	---	EV4 power connector

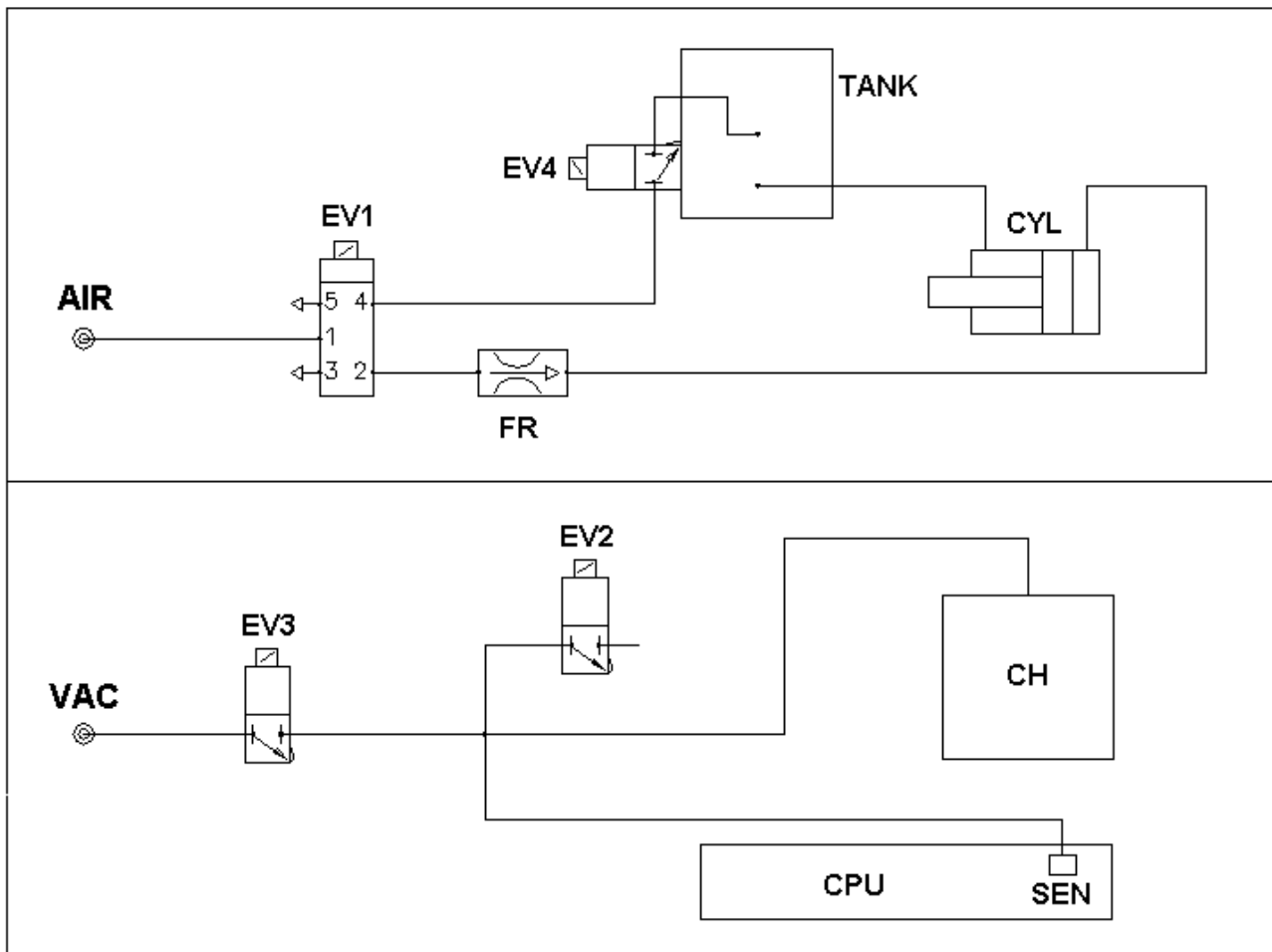


## 11 – WIRING DIAGRAM



REF.	DESCRIPTION	REF.	DESCRIPTION
<b>S IN</b>	Power plug unit	<b>T/C</b>	Type N / K thermocouple
<b>IG</b>	Main switch	<b>M</b>	Plate motion motor
<b>FUSE</b>	Fuses	<b>EV1</b>	5-way air solenoid valve
<b>EF</b>	EMI filter	<b>EV2</b>	Vacuum release solenoid valve
<b>TR</b>	Toroidal transformer	<b>EV3</b>	Vacuum insertion solenoid valve
<b>PWR</b>	Power board	<b>EV4</b>	Air adjustment solenoid valve
<b>CPU</b>	CPU card	<b>FAN</b>	Cooling fan
<b>INPUT</b>	Interface card	<b>ENC</b>	Plate motion encoder
<b>SP</b>	Serial socket	<b>JT</b>	Calibration connector
<b>MS</b>	Microswitch	<b>P OUT</b>	Pump connection socket
<b>S1</b>	Injection control card	<b>V.P.</b>	Vacuum pump
<b>RES</b>	Heating resistance		

## 12 – PMEUMATIC / VACUUM CIRCUITS



REF.	DESCRIPTION
<b>EV1</b>	5-way solenoid valve
<b>EV4</b>	Solenoid valve (air adjustment)
<b>TANK</b>	Air tank
<b>FR</b>	Air flow reducer
<b>CYL</b>	Double acting cylinder

REF.	DESCRIPTION
<b>EV3</b>	Solenoid valve (vacuum IN)
<b>EV2</b>	Solenoid valve (vacuum OUT)
<b>CH</b>	Working chamber
<b>SEN</b>	Sensor on CPU

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