USER MANUAL

Touch Command EVO

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evoENG1.0.18

INDICE

Touch Command EVO

1.0 INTRODUCTION

The purpose of this chapter is to guide you in a sort of tour through the several windows of the Touch Command EVO software. This preliminary visit will facilitate the understanding of several topics that are discussed in the following chapters

1.1 SOFTWARE PRESENTATION

Congratulations on the purchase of your new MG bending machine. The manual you are about to read will guide you through all the features and functionality of the software installed on the Touch Command EVO CNC of your new MG bending machine. Thanks to the touch screen, all of the functions are extremely clear and simple. The screen can be touched with bare fingers or while wearing any type of gloves. Sharp objects should never be used to touch the screen; they could damage or puncture the sensitive film applied to the screen. It is enough to use a little pressure on the screen with your finger or a blunt object. To access certain areas of the screen it may be necessary to use a double touch. Double touch is two touches in rapid succession, these usually be used to open a folder or a keypad that allows you to enter data directly on screen without the need for an external keyboard. Cleaning the screen should be done using a damp cloth

Detergents or solvents may damage or render the screen opaque or unusable.

1.2 WARNINGS

The user must read carefully and follow the information in this manual, for proper preparation, installation and operation of the machine. Not following the instructions could lead to dangerous situations. You are strongly advised to consult all the documentation that accompanies the product you purchased (wiring diagrams, hydraulic, etc.).

ATTENTION!
ONLY QUALIFIED TRAINED PERSONAL SHOULD OPERATE THIS MACHINE.

THE MACHINE SHOULD BE USED BY ONLY ONE OPERATOR! Before using the machine the operator is required to verify the absence of other personal in the working area.

IT IS PROHIBITED TO WELD PARTS WHILE THEY ARE STILL IN THE MACHINE.

The machine is designed with a degree of isolation that allows IP 54 protection against of dust and water. However, The machine should be protected from rainfall!

1.2.1 ELECTROMAGNITIC ENVIRONMENT

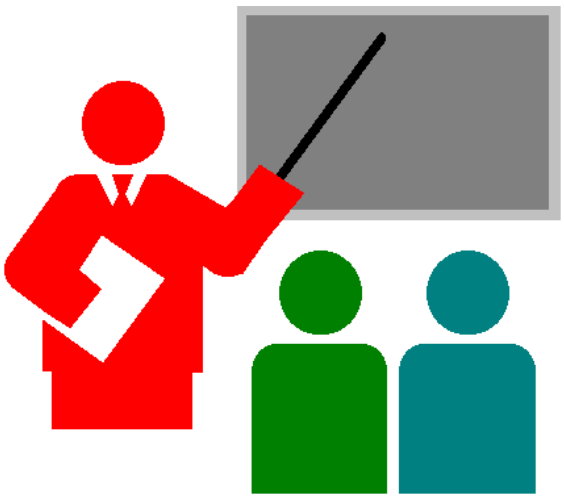
The machine is designed to work properly in the electromagnetic environment, both industrial and residential. Compliance is demonstrated by applying the principles of harmonized standards of product.

Electronic equipment used is installed according to instructions supplied with them and given the general criteria for reducing EMC phenomena.

ATTENTION!

Verify the absence within 3 meters of the perimeter of the machine any of the following. ups, general electric (other than to service the plant itself), transformer rooms, electrical power (both air underground), emitting X-rays, radio repeaters - television - telephone systems, induction, microwave systems, which according to the level of field emitted could interfere with the proper functioning of the machine.

1.2.3 TRAINING OF PERSONAL



Using this type of machine requires training of operational personnel and management. Training is required to provide a working knowledge of regulations and operating procedures related to using the equipment and the residual risks involved.

After reaching a sufficient level of confidence and knowledge of control, the operator will be able to apply operation and safety procedures that will allow for a productive yet safe use of the equipment. The training is done from MG Srl staff and should be supported by staff to be trained and will cover the following points:

a) Adjustments and controls to start the machine

b) Use of the control devices

c) Policy run

d) Knowledge of the operation of safety devices

e) Using the manual

f) maintenance

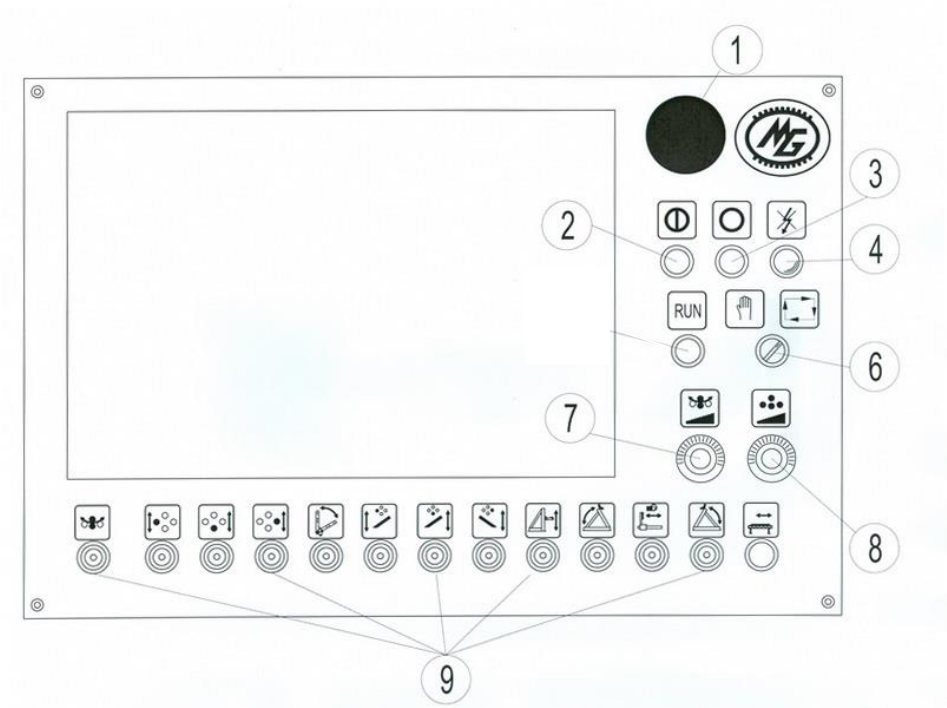
ATTENTION

MG S.r.l. disclaims any liability for property damage and injury resulting from use other than that mentioned in this manual and maintenance.

In any case, any work performed on the machine must be undertaken with diligence, common sense and attention.

1.3 MAIN CONTROL UNIT

The main control console on wheels contains the controls used to operate the machine manually in addition to the Touch Command EVO control unit.



In addition to all control movements of the rollers and accessories shown with the number **9** are the other switches and buttons that will use during programming and automatic use assisted by the controller. Here is a brief description of the commands.
We will not describe in detail the functions of the joysticks number **9** as they can vary depending on the type of machine and the accessories that have been installed. Each joystick contains a symbol that describes its use.

1. Emergency stop button(push to engage, turn to right to release)
2. Start button for hydraulic pumps
3. Stop button for hydraulic pumps
4. Reset button with LED for emergency stops
6. Selector switch for manual/automatic modes
7. Potentiometer to control speed of the rolls rotation
8. Potentiometer to control speed of all other movements (excluding rotation).

The two potentiometers regulate the flow of the oil pumps during manual use of the machine. The maximum speed of the various movements is achieved when potentiometers are turned fully right, to decrease the speed of the movements turn the potentiometers to the left.

1.4 MAIN MENU

When the machine is switched on the CNC automatically loads the operating system and the MG Touch Command software. After the boot procedure the following window appears on the main screen as shown in Figure 1.1

FIGURE 1.1 Main Menu

To have access to the various areas described in the main menu requires just a touch of the buttons on the screen

Remember that before you turn the machines main power off, you must exit the system by touching the red button EXIT. This will begin the correct shut down process. After a few seconds on the monitor shows the "Turning off" at this point we can remove turn off the main power switch on the electrical cabinet.

Exercise: try to touch all the keys to start navigating within the software. Continue reading this chapter and you will learn all the main pages of the software. At this stage it is not important to understand the details, as they will explained in detail in the various chapters, but simply to know the position of the various buttons and graphics pages. This will facilitate a better understanding of the subsequent information.

To return to the main menu touch the **MENU** button that you will see on every page.

1.4.1 Manual

Touch the manual button located in the upper left of the screen. The manual page displays in real time the position of all axes available. X and Y indicating the angular position in degrees of the side bending rolls, Z indicates the rotation of material in millimeters. For plate bending machine types you will see axis P which controls the pressure of pinching between the upper roller and lower roller. The view of the other axes changes according to the accessories installed on the machine.

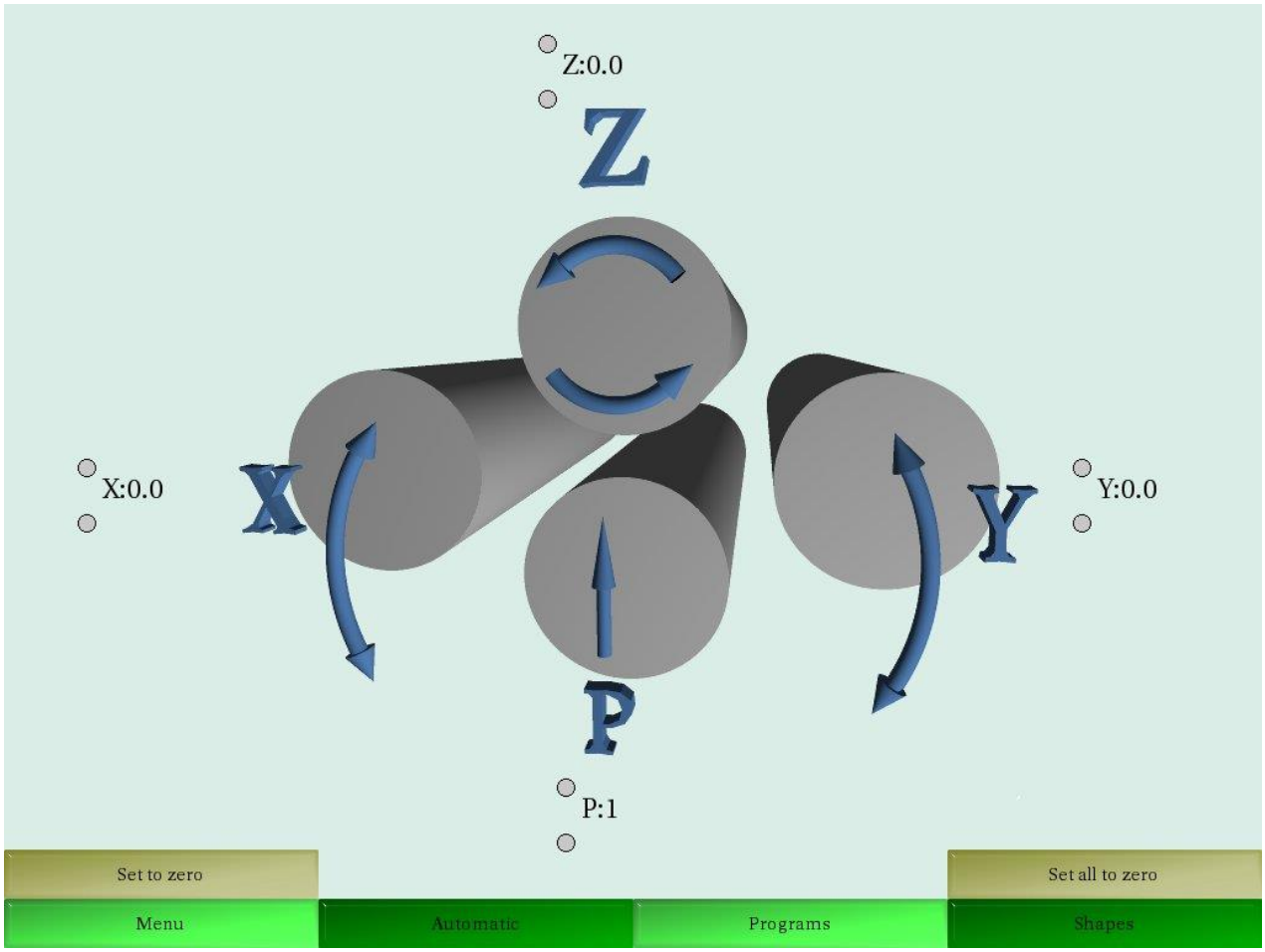


FIGURE 1.2 Manual page display for plate roll machine. The display may be different from what you see on your machine depending on the accessories installed.

Try moving the manual control levers located on the control panel. You can verify the different values of each axis.

Try resetting all the axes and then one axis at a time to familiarize yourself with the controls on this page.

Return to the main menu by pressing the **Menu** button located at the lower left of the screen

1.4.2 Programs

On the programs page on the left side, we can explore the archive of all the programs stored on internal hard drive of the CNC, or by tapping an icon at the top, we can examine the contents of a USB memory stick (Pen-drive). The top center of the screen shows the name of the program that is loaded as well as the folder it is located in. The main window shows all the steps that are in the program. It is possible to modify data in any of the steps by simply double touching in the box that you want to change.

FIGURE 1.4 Programs page

The colors you see in the step and tipo columns tell which kind of step is being performed by the machine. Red boxes are instructions that are not related to actually moving an axis. Green boxes are used when the computer is moving only one axis at a time. Yellow boxes designate the interpolation of 2 axis that have been auto generated by the computer. Each of these yellow steps has multiple steps built into them. Blue boxes designate the interpolation that was created manually by the operator. The colors are all generated by the computer.

STEP: The first column of the grid indicates the sequence number of program steps. This number is written automatically by the software as you add or delete steps.

Indic: You will only see a value here if it is a computer generated yellow step. The value you see indicates how many steps are located inside of each step. It is possible to double click on one of these yellow steps to open it and see all the steps that are located inside however this is only recommended for advanced users of the software.

Axes: The column axes indicate which axis or what function is to be moved or set in the same step. In Figure 2.1 we can see the instructions X and Y refer to the bending rolls. For special functions such as C, D and Setz refer to Appendix A of this manual. There you will find a complete list of all the operating instructions that are available.

Target: In this column the final value of the axis is written. For example if we want to move Y to position of 30 we would enter 30 in this box.

Speed: The column speed is set by default to 100%. Indicates that the axis will move to its target position at its maximum speed. If we want this movement to occur at half the speed is sufficient to indicate 50% in this column.

The other three columns are repeated again and AXES, TARGET, and SPEED. They are used for interpolation of two axes. We will address this issue in further detail when we learn to write programs.

The buttons on the right side of the navigation screen:

Run: leads directly to the page of program execution
Delete: This deletes the program that you currently see in the main body from the hard drive or USB stick.
New: Allows you to create a new program
Save: Saves the program to the hard drive or USB stick.
Shapes: Takes you to the shapes page
Menu: Takes you back to the main menu

The buttons on the bottom of the navigation screen:

Input: inserts a blank step at the highlighted step of the current program
Squaring: writes a squaring program which sets the rolls in a position to load your material
Delete: Deletes the highlighted step from the current program

.
Return to the main menu by pressing the **Menu** button located at the lower right of the screen

1.4.3 Shapes

The software offers some of the most commonly used shapes made on plate rolling machines. This makes it very easy to create a program even by inexperienced roll operators. Of course all the shape parameters can be modified and customized according to the desired specifications. Touching one of the shapes to the left of the screen will open a chart were you can customize the shape and size. In programming chapters we will explore this in detail.

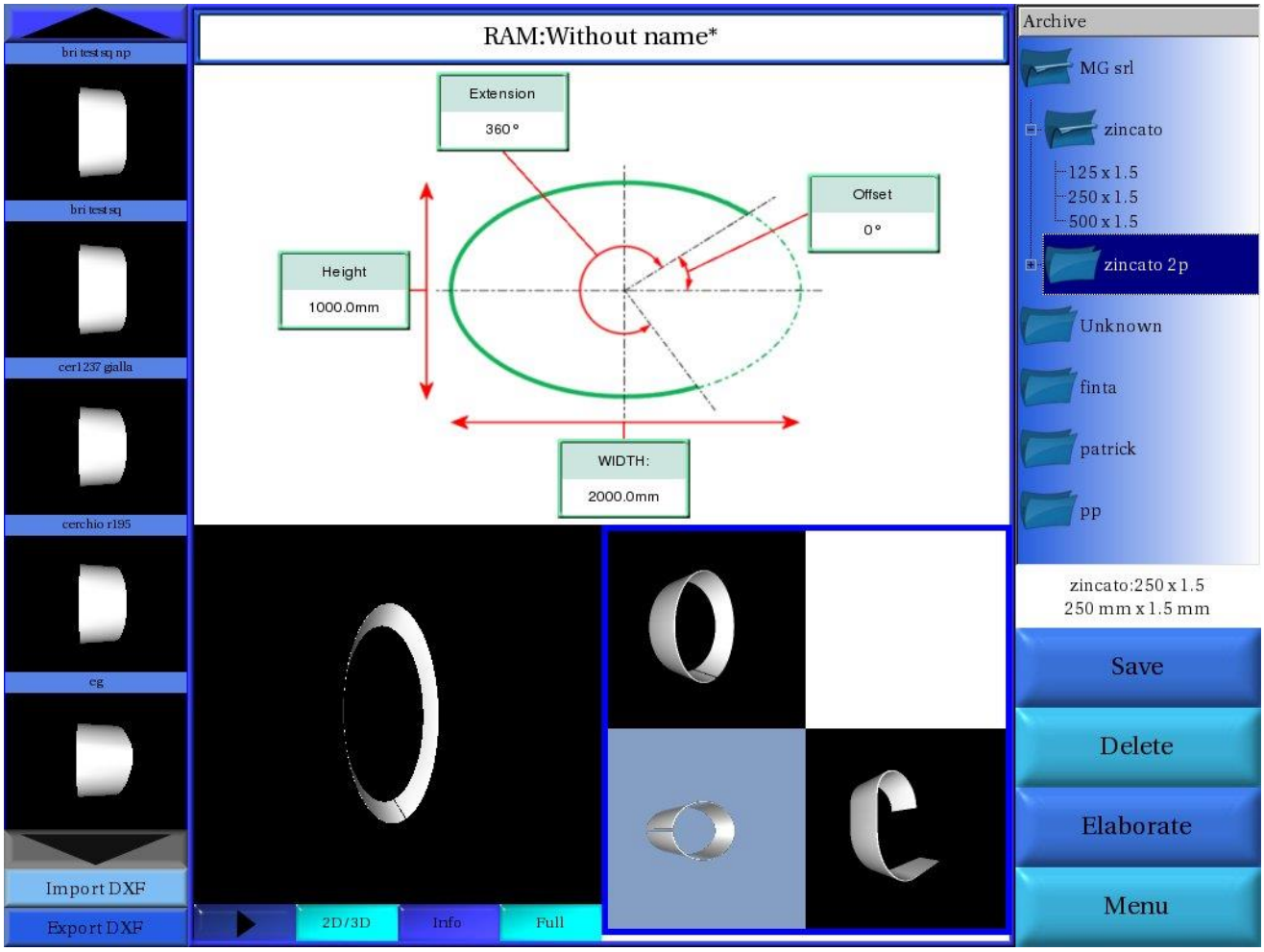


FIGURE 1.5 Archive page templates

Try to enter into some of the various shapes to become familiar with the data entry and editing windows.

Return to the main menu by pressing the **Menu** button located at the lower right of the screen

1.4.4 Plates

The plates page contains some preloaded material libraries and allows you to enter new libraries created specifically for the material that you have purchased. You can create new types of materials and their subtypes from scratch or add them to the existing standard libraries. In the MATERIAL box we can write the name of the folder for the material we are using. If we enter zincato into the material box and there is already a folder with this name it will be placed into the folder that was created previously. Below this it's possible to enter the material thickness and width.

Take great care when building or modifying data on this page because they are the main parameters that the software uses to compile the programs requested by the operator. The quality of result is of course linked to the quality of material, but also to the care used in creating the libraries.

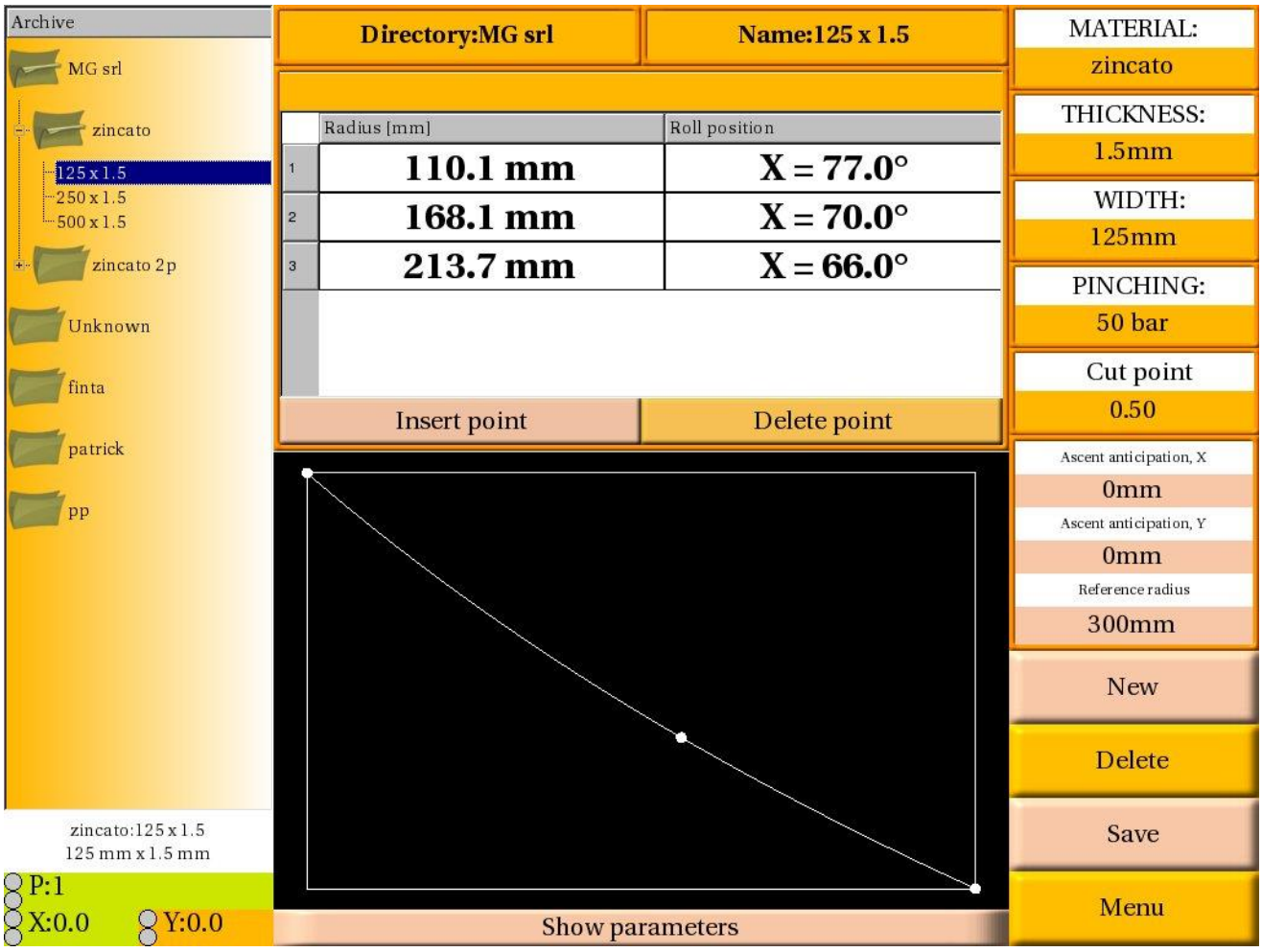


FIGURE 1.6 Library page

We will go into further details when we visit this chapter.

Return to the main menu by pressing the **Menu** button located at the lower right of the screen

1.4.5 Extra

Here you see the extra main page. The sections of the page are described below.

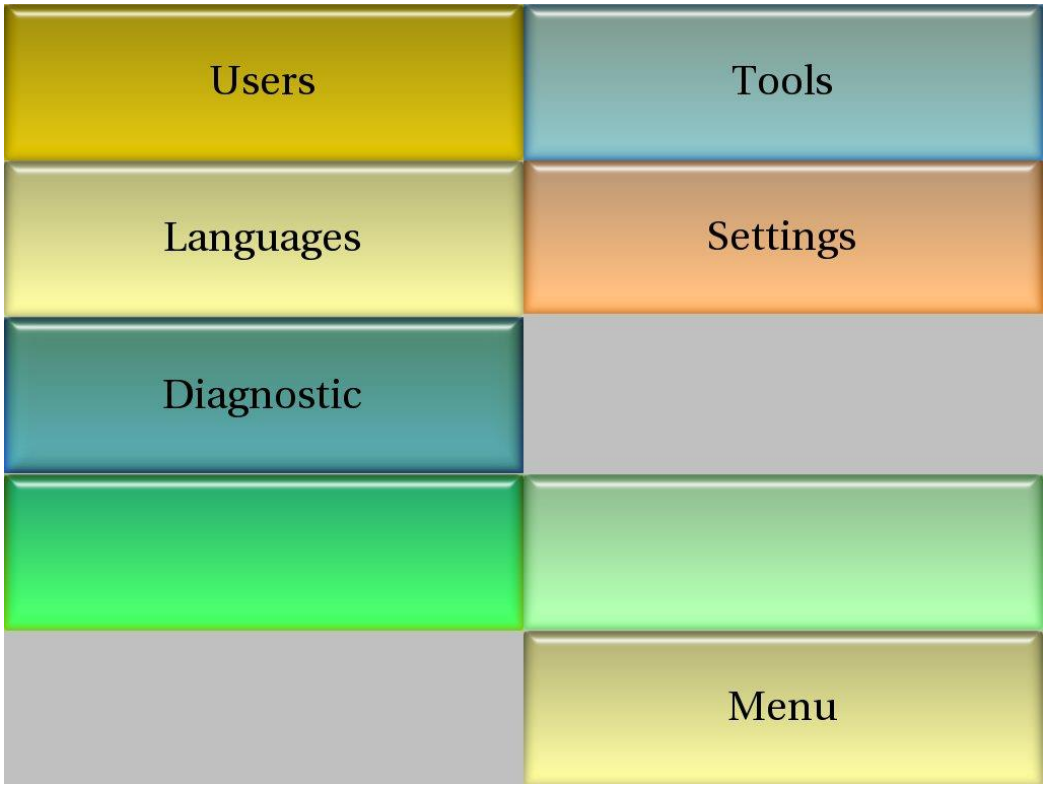


FIGURE 1.7 Extra menu page

Users: The software provides several levels of protection that are identified as users (see fig.1.8). The red border around the button indicates the current level of access.

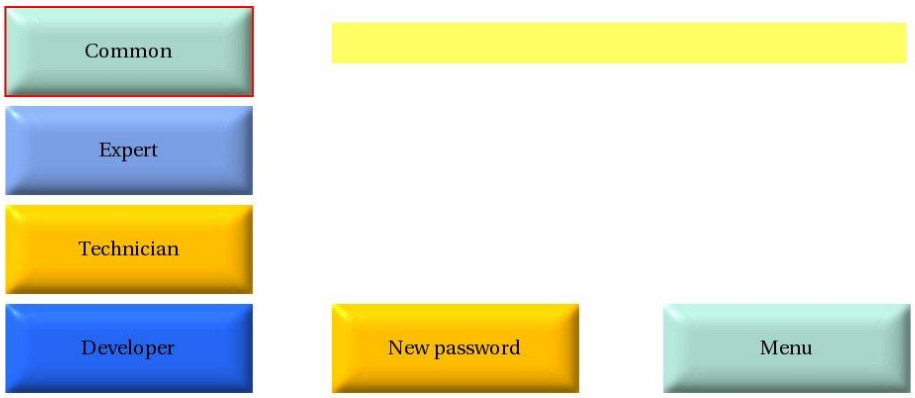


FIGURE 1.8 Select user page

COMMON: The default user is set to common every time the CNC control is switched on. This level of user can read the archived programs and run them. They are allowed to edit the program if needed however; they may not create new programs, delete or save them. This is to safeguard the original programs from being tampered with by unqualified personal. There is not a password required to access this level, just press the **Common** button.

EXPERT: To access the Expert level touch the **Expert** button, you will be asked to type in a password which is set by default to 0000 (four zeros). It is possible to change this password after you are registered as expert by pressing the **New password** button. You will be prompted to enter a new password and confirm it. From this point on you can access the expert level with this password only. If the password is lost the MG service will be able to provide instructions to retrieve it. All expert users must use the same password. It is not possible to have different expert passwords for different users. The expert user can access all files with the ability to create new programs, save and edit or delete them. As an expert you will have access to other areas of the extras menu that will described below.

The **Technician** & **Developer** areas are reserved for authorized MG personal only.

Return to the main menu by pressing the **Menu** button located at the lower right of the screen. Press the **Extra** button to return to the extra menu.

TOOLS: (Experts only) This page has some useful functions to calibrate the touch screen. It also allows you to save all the cnc files and machine configurations for backup to a pen-drive (USB stick). The buttons are clearly identified as to their specific functions.

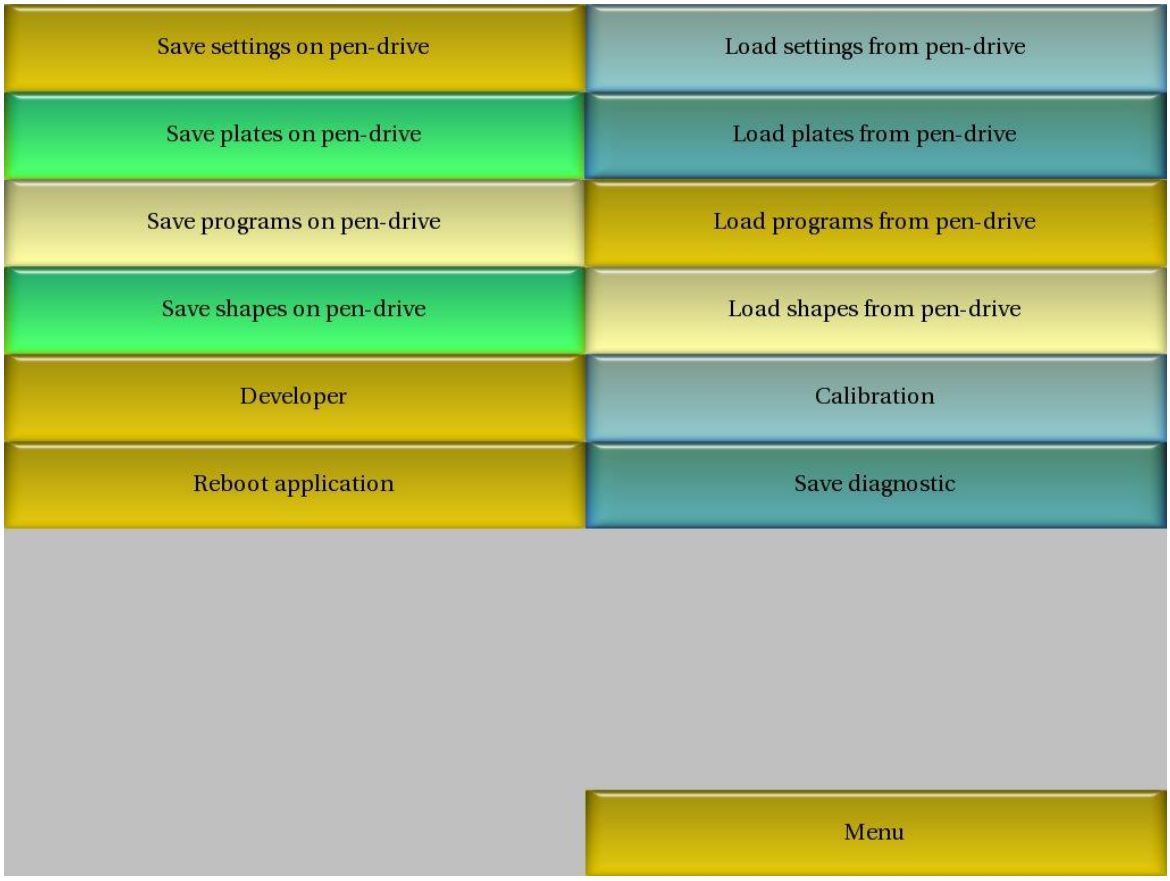


FIGURE 1.9 Tools page

Return to the main menu by pressing the **Menu** button located at the lower right of the screen. Press the **Extra** button to return to the extra menu.

LANGUAGES: The Language page lets you select your language of choice to be used on CNC. The green boarder around the flag indicates the current active language. To change the language just touch the flag of your choice and the software is restarted immediately with the language selected.

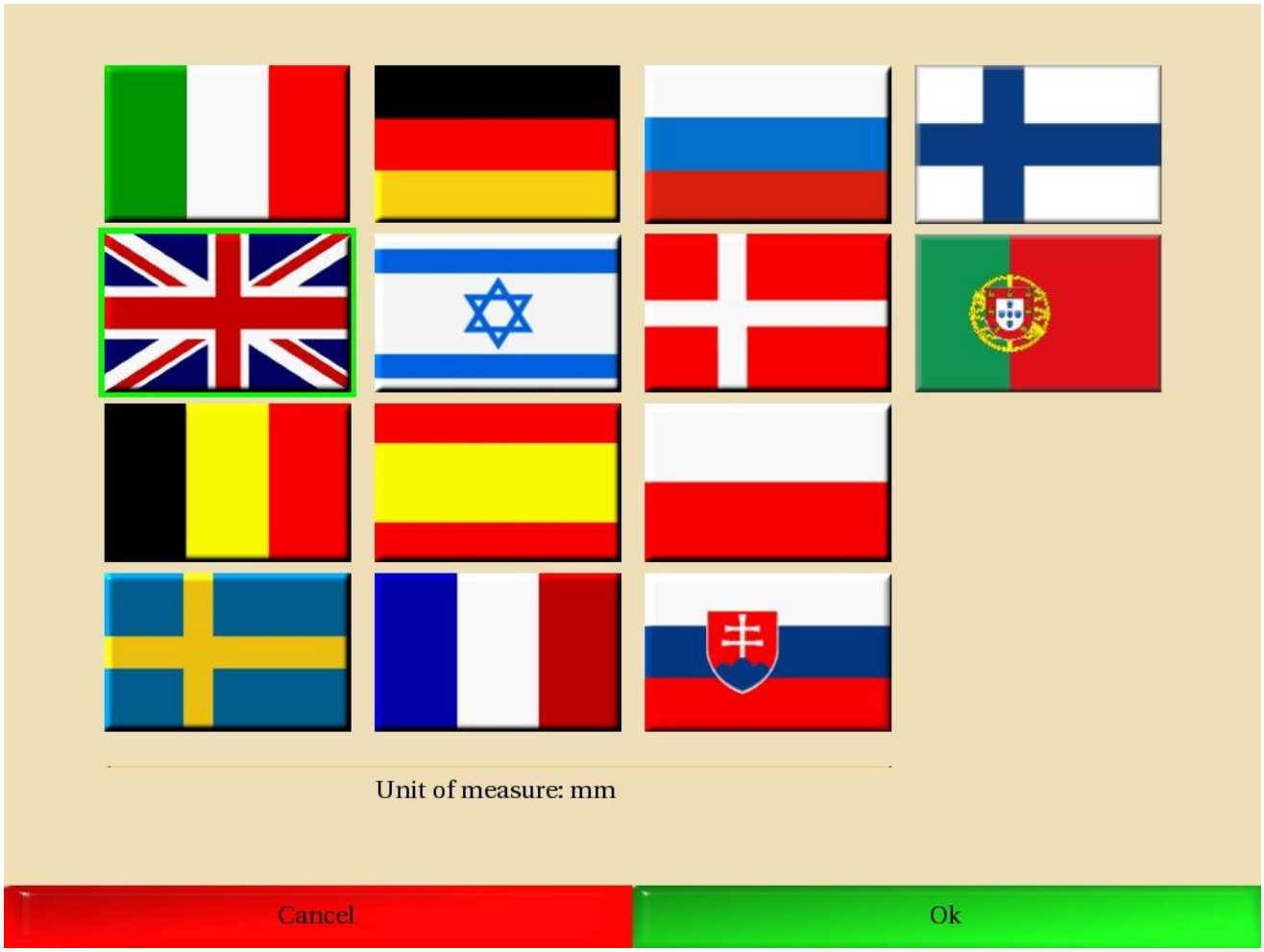
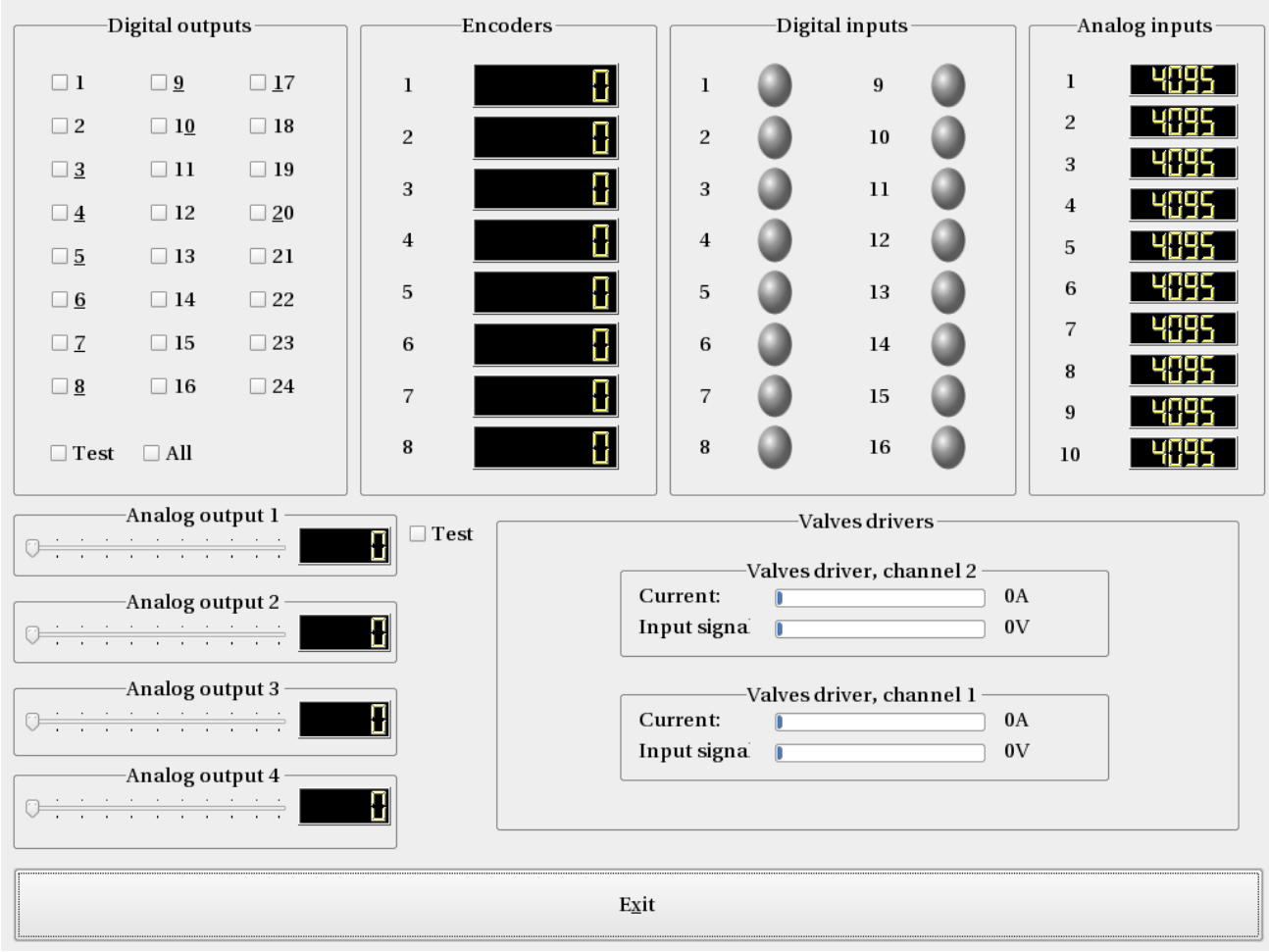


FIGURE 1.10 Language selection page

Return to the main menu by pressing the **Cancel** button located at the lower left of the screen. Press the **Extra** button to return to the extra menu.

SETTINGS: This area is reserved for authorized MG personal.

DIAGNOTIC: This closes the Touch Command software and opens up a page where all of the input/output signals to the CNC control unit can be checked. For example if you press the RUN button to start a CNC program but the program will not start. It's possible to go to this page and see if the signal from the run button is actually arriving to the CNC control or not. It is a helpful tool to determine if there is a problem on the machine side or the computer side and in what section you will find the problem.



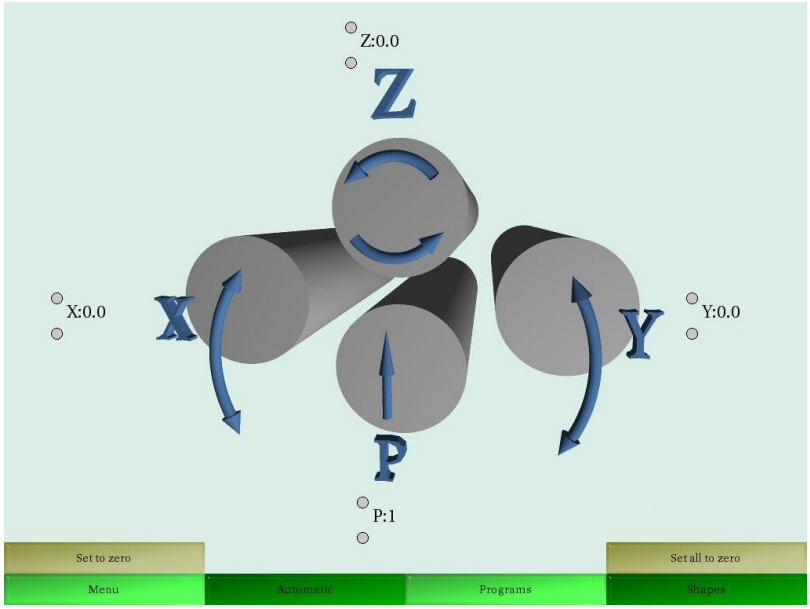
2.0 WRITING AND RUNNING PROGRAMS

This chapter describes how to write and use a program created it in teach-in method using the manual page of the NCC

2.1 CREATING A PROGRAM USING TEACH-IN METHOOD

The teach-in method of creating a NCC program is normally only used by experienced operators. It is useful when you have a small number of parts to roll using material that you do not already have a material library for. The program is created by manually rolling a part while simply confirming each step or movement made by the operator. The NCC is able to record each movement and then to repeat them exactly. The quality of the program that is written with this method is directly related to the skill of the operator.

From the main menu select the **MANUAL** button to open the manual display page. On this page you will see all the axes available on your machine. (the figure shows an example). The first thing that we always have to do before creating any NCC program is to set the correct zero position for all axes displayed. To do this you simply manually move all axes using the control joysticks on the control console to their lowest point. At this point press the **Set all to zero** button located on the lower right side of the screen to set all values to zero or the preset value that was set at the factory. All axes may not indicate a zero value; some according to their function may have a minimum value (preset) that is not zero. Now that we are sure that you have set the all the axis at their mechanical bottom we can begin to write our program. Press the **Programs** button located at the bottom of the screen to open the programs page. Then press the top right **Run** button. A new window will



open up that is shown below in Figure 2.1. This page shows an empty program in the center of the screen while still allowing us to see the entire axis on the screen.

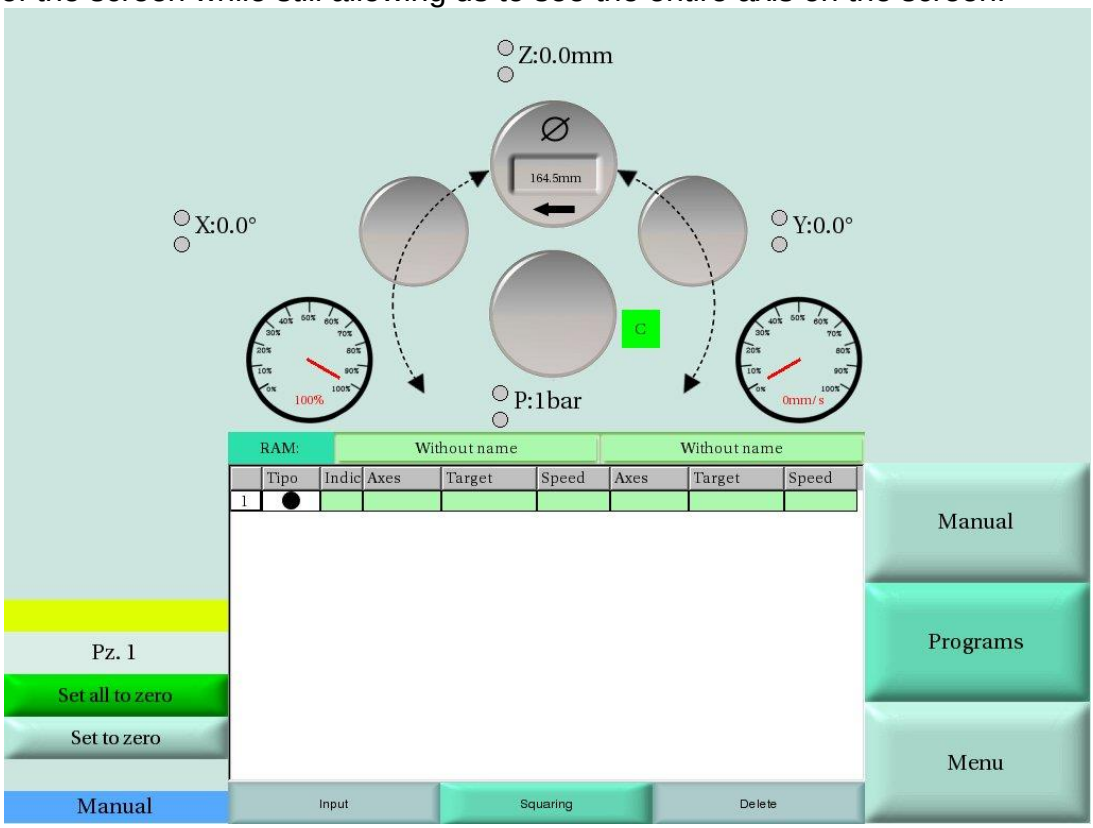


FIGURE 2.1 Run program page

With this page open it is possible to write a program while you are actually rolling a part manually in the machine. For example if we want to set up our X axis to use as a squaring arm when we put the plate in the machine we would hold the joystick up for the left roll (X axis). You will see the value of the X axis start to rise along with the side roll itself. When you have reached the position that you want to use for the axis touch the value for X displayed on the screen. Immediately a window opens asking us if to insert the value into the program. By responding yes the first step will be immediately written in the first line of the program, Axis X along with the value reached in the Target column. The step is set at 100% that is maximum speed available. Gradually, with the same procedure we can continue to write the rest of the program steps as we are actually rolling a part. Move an axis and touch the axis on the screen to enter it into the program and confirm. Of course you can modify any of the data that was inserted into your program later if you need to. Just double tap on a box with the value you want to change and a keypad will open that allows you to modify the data within the same box. For example if we used the Y axis to do our prebend and the value used was 25.7 but the diameter achieved was slightly open. We would double tap the screen on the box where we see the 25.7 and type in a higher value (26 for example) so the roll would move higher resulting in a tighter diameter. There are some commands, such as closing and opening the yoke or adding in temporary stops that cannot be added by touching an axis on the screen because they are not visualized on the screen. They must be added by double tapping an empty step of the column labeled AXIS. The double tap will open a keypad that allows us to enter only the letters relating to the programmable axis that have been configured for your machine. If the letter is a white background it means that the axis relative to that letter is not configured on your machine so it cannot be inserted it into the program. This prevents the inclusion of data that the control cannot carry out due to the absence of the axis. The axes that can be controlled by your machine will have a blue

background. You will find a complete listing of all axes that can be programmed in appendix A at the end of this manual. Similarly, the target column will not accepted values that go beyond the actual mechanical range of the axis movement itself. For example if you try to edit Y to move to a target position of 100 it is not possible as it is beyond the mechanical range of the axis. You will be warned with a popup that the target value is not valid and you will have to enter one that is within the range of the axis. If the program contains more than 14 steps they cannot all be displayed on the screen at the same time. If you need to view a section of the program that is not displayed you simply touch the screen in the section that you want to scroll and without lifting your finger drag it up or down to scroll through the content until the section you wish to view or modify is visible. It is possible to delete or insert an entire row using keys and Insert or Delete**.** To delete a step touch the step number you want to delete. The line will be highlighted blue. Now touch the Delete key located at the bottom of the screen, a dialog will ask you to confirm that you want to delete this step. Confirm with Yes and the step is cleared, all the instructions below will automatically move up to fill the spot left by the cleared step. If while writing your program you forgot a step you may insert a step wherever you need to. Touch the step number where you want to insert the new instruction, for example, you need to add a step on line 5 you would touch line 5. The step will now be highlighted, now touch the Insert button located at the bottom of the screen and all instructions, including line 5 will move down creating an empty step at line number 5. At this point you can type the new instruction directly in the boxes or by using the auto teach-in by touching the window of the axis you want to insert into the new step. Once you have finished rolling your part and adding or editing any steps that you need to change it is possible for the computer to take over and run your program.

2.2 RUNNING A PROGRAM CREATED USING TEACH-IN METHOOD

Once the newly created program is ready to run you need to highlight the first step at the top of the program. The reason for this is the computer will start to execute the program from whatever step is highlighted. For example if step 10 is highlighted it will start by moving the axis called for in step 10 and then continue on through the following steps until it reaches the end of the program. To highlight the first step simply touch the step on the screen. If the first step is not visible you must scroll up in the program as described above until you can touch it. Once it is highlighted you can turn the manual/automatic switch to automatic. Notice when you turn the selector back and forth that the button at the bottom left of the screen changes from manual to automatic informing you of the mode of the control. Programs can only be run while the computer is set in AUTOMATIC. Pressing the two hand control button on the console sends the command to start the cycle of the program. The CNC will carry on all the steps in the order they are stored in the program. After the last step is finished the control stops on the label indicating the number of completed pieces (you must maintain pressed the two hand controls to carry on the program).

2.2.1 Parts counter

There is a parts or cycle counter located on the left side of the screen. Touching the label above the counter Pz 1 will open a numeric keypad. Type in the number of pieces that you want to produce. After confirming with OK, the number appears in the box Pz. Start the program, you will notice that after the last step is performed the program automatically starts again and the counter has decreased by 1 number. When the counter reaches 0 the machine will stop executing parts and the program ends. To start the cycle again you need to put the default of 1 or however many parts you want to run with the next cycle back into the counter.

2.2.2 Pausing and restarting the program

It is possible to pause and restart the automatic working cycle at any time leaving the rwo hand control buttons on the control panel. For example if you want to pause the program so you can check that the diameter being rolled is correct you only need to leave the two hand control buttons. The program will be suspended indefinitely allowing you to safely check the diameter of the part being rolled. To start the program again you only need to press the two hand control buttons again and the program will resume from wherever you stopped it. It is also possible to resume the program from a location other than where is has been suspended by just highlighting the step you want to resume from.

2.3 SAVING A PROGRAM

At this point the program has been written and tested. Now we need to save it in memory of the CNC so we can recall it and run it the future when it is needed. To do this we must open the Program Files page by touching the Programs button on the right side of the screen.

FIGURE 2.2 Programs page

The first thing we must do is to name the new program. At the top of the page under name it will say "Untitled *". Notice the presence of the asterisk at the end of the name. It is there to indicate that the program is new and has not been saved or that changes have been made to the program and they have not been saved yet. Touch the top bar where it says name and a keyboard appears. You can type any name you want and it can be as long as you

want. The name of a program can contain letters in lowercase, uppercase and numbers. Now we must type in the directory (folder) that we want to save the program in. The process is the same as naming the program. Just touch the screen at the top where you see the name of the directory and a keyboard appears. We can either type in the name of an existing directory from the list on the left side of the screen or we can type in a new one that will be created automatically. The directory is very helpful if you want to group jobs by clients or material types.

Touch the **Save** button on the right side of the screen. If the whole procedure has been successful you will see the message "program saved". If there was another program already saved in the directory you choose you will get a message saying the program already exists do you want to overwrite it. This can happen if the program was already saved and you were just editing some steps or if you wrote a new program and tried to name it the same as an existing program. You can choose yes to overwrite it or no if you want to go back and save it with a different name. The new program is inserted into the new or existing folder alphabetically in the list on the left of the screen. You will notice that after the program has be saved successfully that the asterisk at the end of the program name is now gone. It will however appear again if you make any changes to the program. Once you save it again the asterisk will disappear again.

You can choose to save the programs directly onto the hard drive of the computer or you can save them onto a USB stick (pen-drive). You can touch the button above the directory with the symbol of the media you wish to use. Before touching the button for the USB stick make sure you insert your media into the USB slot located on the front panel of the control unit.

2.4 DELETING A PROGRAM

To delete a program from either the hard drive or USB stick (pen-drive) open the folder by double tapping it and then load the program you want to delete by touching on the name. Once the program is loaded into the main window just touch the Delete button on the right side of the screen. A message box asks to confirm the deletion. Touch yes and the program is deleted from the selected media.

2.5 COPY AND RENAMING A PROGRAM

To copy a program from one media to another (e.g. USB stick to hard drive) Insert your USB stick into the USB port and open the program you want to copy. Now touch the hard drive button to make it the active media and touch the save button on the right of the screen. Now the program is located on both the USB stick and the hard drive. If you like, you can change the name of the program by touching the name of the bar and then typing the new name and if necessary folder. Similarly we can create a copy of the program on the same media. It is sufficient in this case to replace only the name. This is helpful if you want to make some changes to a program but don't want to destroy or lose the original. You could name one of them 600 mm diameter 1 and a copy called 600 mm diameter 2. You cannot save two programs with the same name in the same media.

3.0 CREATING MATERIAL LIBRARIES

This chapter describes how to create libraries of material essential to a proper self-calculation by the CNC control.

3.1 MATERIAL LIBRARY OVERVIEW

Creating a bending program consists primarily of finding the right position of bending axes (X and Y) to produce the desired radius. To make sure that the software can calculate the correct positions it requires precise information on the behavior of the material you are using. This information is provided by the material library. In the next chapter we will see how you can easily create shapes such as cylinders, ellipses, tanks etc. Using material libraries. The software already has some libraries on standard materials included. Of course we can easily edit these or create entirely new libraries. The reason we would want to edit the existing material libraries or create new ones is due to the fact that material purchased from one supplier can be different from material purchased from another supplier. It is always recommended that you create a material library for the material that you are purchasing. The purpose of this chapter is precisely to illustrate the process of creating a new library.

From the main menu select Plates You will see a page similar to the one in Fig.3.1. In the left column you can see some directories containing the material libraries. What you name these folders is entirely up to you. They could be named according to the supplier where the material was purchased or you could put the name of the individual who created the material library. A double tap on the folder will open the directory allowing you to view the sub-folders located inside. These sub-folders will be the named by the type of material that is located inside. In the example shown in Fig.3.1. The material being used is Zincato. Another double tap on this folder opens the list of material libraries that have been created and stored in the directory. If you touch one of the libraries it will load the information that is stored in that library.

The column to the right of the screen shows the material type (or sub-folder) of the selected material then the thickness, width and pinching pressure recommended for the thickness of the material. At the top of the screen you can read the name of the main directory (material supplier or who created the library...) along with the actual name of the material library. The name of the library should be the width and thickness of the material. This makes it easy to identify later. Immediately below this is the section where you can enter the data collected from tests on your material. Under this you see a graph with the results of the information that was input above. The visible red line indicates what the software expects from this type of material. The points that appear are placed on the graph according to the information input above. If the data input above is correct the points should be located on the hypothetical line calculated by the software. If a point is too far removed from the hypothetical line it is likely due to incorrect information input into the chart above. All of the information above should be rechecked to find the error. It is important that this information is as accurate as possible as the software makes all of its calculations based on this

information. On the lower left section of the screen you have the ability to see the position of the side rolls and pinching pressure. It is important to know the positions of these while we are inputting the data to create the library.

Below the chart is visible button Show parameters. By touching this button the chart will disappear and a window for data entry takes its place. (Fig 3.2)

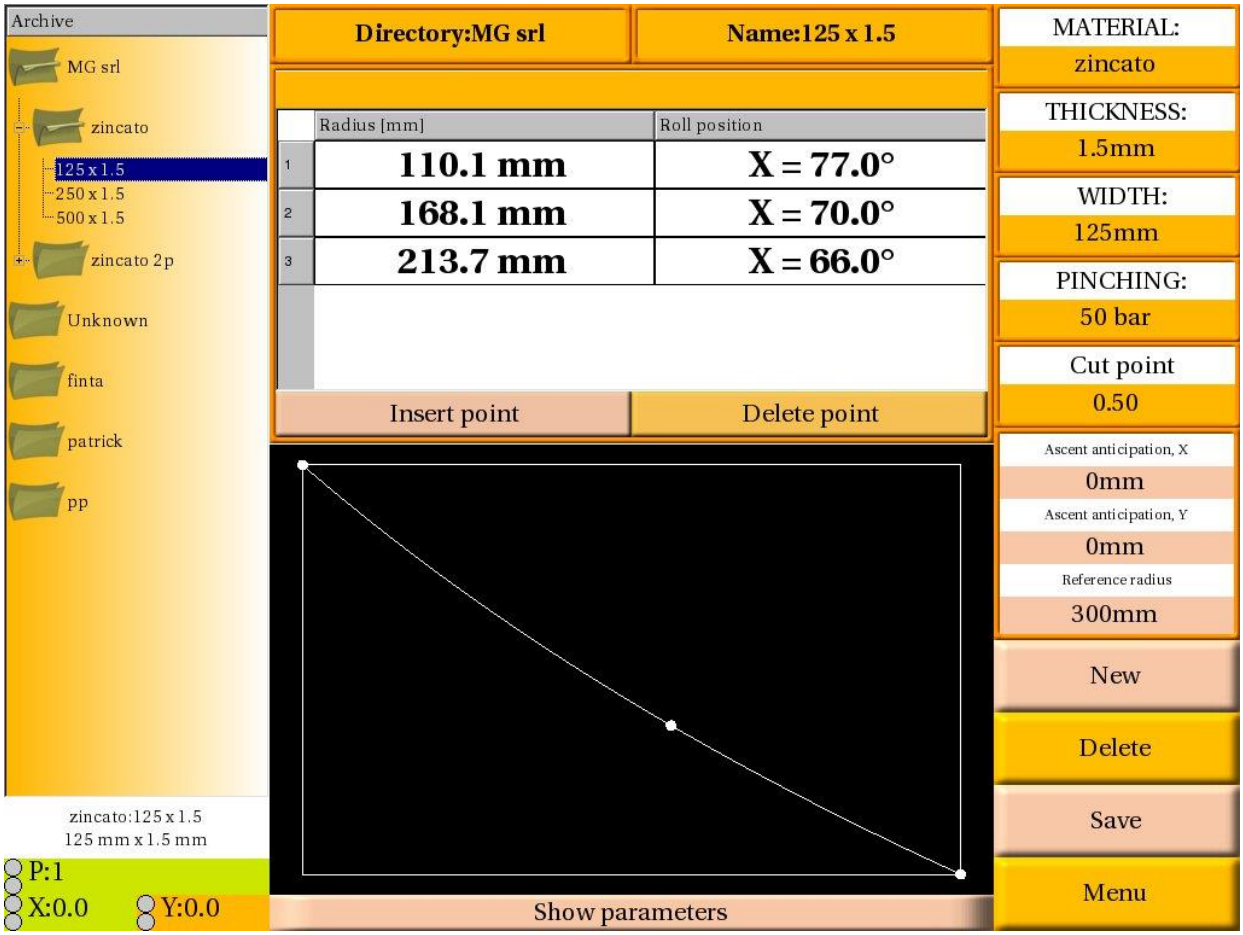


FIGURE 3.1 Page archives libraries sheets or profiles

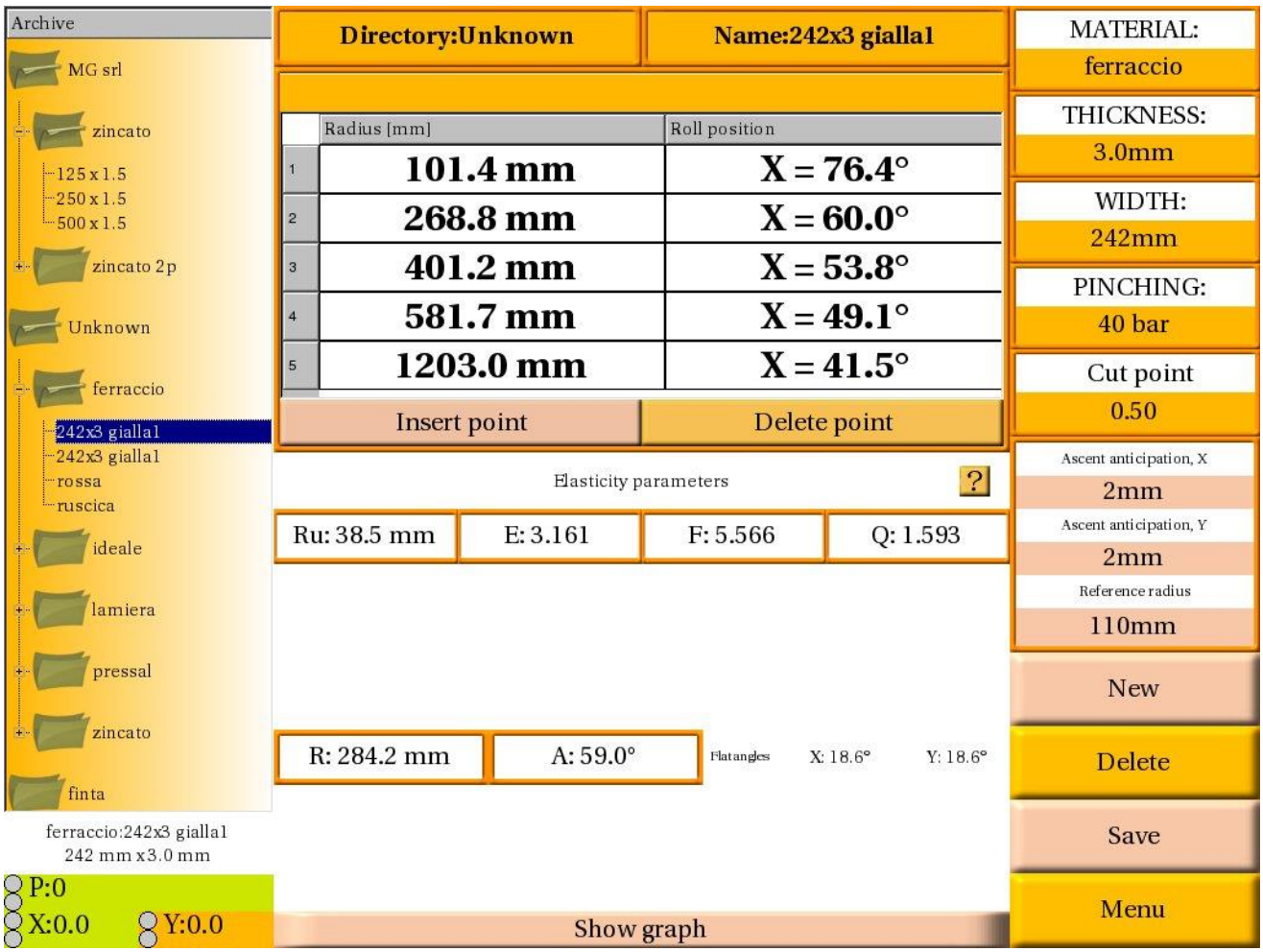


FIGURE 3.2 parameter page

3.2 PROCEEDURE FOR CREATING THE MATERIAL LIBRARY

Touch the New button located on the right side of the screen to create a new library. Let's suppose that we purchased an A516 GR70 sheet that is 6 mm thick and 1000 mm from ACME steel. Touch the screen at the top where it says Directory. A key board will open to allow us to put in the name of the directory we want to use. We will put in the name of the supplier which is ACME steel and then touch the OK button. Anytime we purchase steel from this supplier we will create the library in this directory. Now touch the screen to open the keyboard for the name of the material. Here we are going to enter 1000x6 which is the width and thickness of the plate and confirm by touching OK. Next we will touch the material button on the top right of the screen and type in the material we are using which is A516 GR70. This will become the sub-folder that is located in the supplier's directory. Anytime we create a library for A516 GR70 from this supplier we will save it in this directory. Now touch the boxes for the thickness and width and input the 6 and 1000 that we are using for this example. You will notice that after you input the thickness the software automatically suggests what pinch pressure you should use for this plate. Most times it is ok to use this but there can be times where you need to put in a different value. If you want to edit the pressure being used just touch the box and enter the new value as we have done with all the other information. It important to remember that the name of the material, thickness, and width do not affect the calculations that the computer will perform, but are used in the future to recognize the type of plate used . If you look at the top of the screen where we have written the directory and library names that there is an asterisk next to the names. This means there file has never been saved or that changes have been made to it and the changes have not been saved. At this point we want to save the information we have

provided. Touch the Save button located on the right side of the screen and the library is immediately saved and can be seen in the list located on the left side of the screen. A double tap on the directory ACME steel will open the directory where you will see the sub-folder A516 GR70. Another double tap on the sub-folder will expand the folder and you will see a library named 1000x6. Now we can start the data acquisition procedure. If you are seeing the graph on the page as seen in Fig 3.1. above you need to touch the show parameters button at the bottom of the screen. Move both the X and Y side rolls to their lowest positions using the joysticks on the control console and make sure they are not tilted from doing cones. Look at the lower left of the screen to see that the value for both X and Y is reading zero. If they are not simply touch the number being displayed and a box will open asking if you want to set the axis to zero. Choose yes. In the lower central portion of the screen you will see the flat angle values that have been created by the software. These are the side roll positions where the rolls will support the material but if you rotate left or right it will not bend the material. It is important that we set the roll on the material indeed side of the machine to this position. When the software auto calculates a program the roll will be set there automatically so we must create the library with it in this position also. We will assume that we are feeding the material from left to right so we must move our Y (right roll) axis using the joystick to the number we see displayed in the flat angle. Once it is in position we can raise the X (left roll) up to use as a squaring arm and insert the material into the machine. It is important that we always load the material into the center of the rolls due to the cambering of the central rolls. After squaring the plate in the machine you must pinch the plate with the lower central roll. You will be able to see the pinch pressure being used on the lower left side of the screen. Adjust it manually until it is the same as the pressure in the pinching box on the right. It is crucial that you use the same pinch pressure that has been suggested by the computer or the pressure that was edited in the pinching box by you. When the software writes the program it will use the pressure that is entered in in the pinching window. The reason it is crucial is that pinch pressure will affect the radius you achieve. For example if we use a side roll position of 30 and a pinching pressure of 70 bars maybe we get a radius of 300 mm. However if we use the same side roll position but use 90 bars of pinching pressure we will get a different radius then the 300 mm radius previously obtained. If the pressures are not the same the ability of the control to auto-calculate programs will not be accurate. Now that the plate is securely clamped in the machine with the correct pinch pressure we will ask the computer to calculate a radius. It is usually best to try to roll the tightest radius possible that the machine can perform in one pass. In the lower portion of the center of the screen you will see a box with a number in it that is proceeded with the letter **R** which stands for radius. If you touch this box a keypad appears and we can enter a radius we want to roll. We can enter 300 here for example. The software now calculates where to put the side roll in order to roll this radius based on the geometry of the machine. The position for the side roll will be displayed in the box next to the radius box you just used and is proceeded by the letter **A** which stands for angle in degrees. We may see A 64.7 for example. We need to lower X axis rotate the rolls so the plate is located above the left side roll. With the material located on top of the side roll we need to raise the roll until we reach 64.7 and then rotate the rolls creating the radius on the material. It is only necessary to roll out enough material to measure the radius that was actually achieved. If there was no spring back in the material the radius would be exactly 300 as we asked for but this will never be the case. Every material you use will have some degree of spring back that cannot be accounted for. This is the main reason that material libraries are necessary. So instead of a 300 mm radius we may have measured a 340 mm radius. You have to input this data into the software. You do this by inserting a point in the grid in the upper center section of the page. You will see a button labeled Insert point**.** When you touch this button a window pops up asking you to confirm that the material specifications you entered on the right of the page are correct. If they are confirm by touching the yes button. You will now see two new boxes

that appear to input the data for your test. Double tap the empty box for the roll position and enter in the value you used to roll the part... In our example we would enter 64.7. Now double tap the empty box in the radius column and enter in the exact radius you measured. Again in our example we would enter 340. After inserting the first point we will repeat the entire process 2 more times starting with entering a radius for the software to generate a side roll position for. The second radius should be something larger than the first, 1200 mm for example and the third radius should be something in-between the first two, maybe 700 mm. After you have entered your 3 tests into the data section touch the show graph button at the bottom of the screen. If you measured all of the radii correctly all 3 of the points should fall on the computer generated red line as we discussed earlier. If the points are not on the line you measured something wrong or input some data wrong and you will need to double check your work or possibly redo the test from the start. If however everything looks good you must now save the changes that were made to the material library by touching the save button on the right side of the screen. A window will open telling you the file already exists and do you want to overwrite it. Touch yes to confirm and the changes will be saved and the material library is ready to be optimized.

To optimize the library we have to navigate to the shapes page. Touch the menu button to open the main menu page then touch the shapes button. Once you have opened the shapes page touch the free shape at the lower right portion of the screen. It is located next to the button to go back to the main menu. This will open up a grid at the top center portion of the page where we can insert information about the shape we want to produce. We want to create a shape with a straight or flat section and a section with a radius. On the first line we will double tap the empty box in the length column to open the keypad and enter in 300mm. After we confirm by pressing OK a second line appears automatically. On this line we will double tap in the radius column and enter in 350 for the radius. Now double tap in the angle box on the same line and enter 180. On the right side of the screen you will see all the directories for the material libraries. Double tap to open the directories and chose the library that you created. Touch the info button located at the bottom of the screen and find the plate length for the test part and cut a plate to the dimensions indicated. Touch the Elaborate button on the right side of the screen. A new page will open, touch the set all to zero button located at the bottom of the screen and then touch OK. The program will be generated automatically, press ok when it is finished. Touch the Run button on the screen, switch the manual/automatic selector to automatic and press the Run button the control console to start the bending cycle. When the machine pauses insert your test plate into the machine and press the Run button again to finish rolling the part. While the machine is rolling the radiuses portion of the part make a note of the side roll position. Navigate back to the plates page and open the material library that we used for this test. Remove the finished test part from the machine and measure the flat section of the part. If the flat section is exactly 300mm we don’t have to do anything but if it is longer or shorter we need to add in this correction to the material library. Let’s assume that the flat section measured 308mm. We need to add the extra 8mm to the **ADVANCE BREAKS X and ADVANCE BREAKS Y** boxes that are located on the right side of the screen. In the **REFERENCE BEAM** box we need to enter the radius we asked the machine to roll which was 350. The last step in optimizing the library is to measure the actual radius that was rolled which should be 350mm or extremely close to it into the boxes where our other test radii were input by inserting a 4th point. After you add the 4th point check to make sure all the points fall on the line generated by the software and save the optimized file. The material library is now finished and ready for use.

WARNING: The data and values expressed in this example are purely an example and can vary from machine to machine. If this material library was created using your material it could now be used to create any shape possible for your machine using the auto-calculation feature that will be described in the next chapter.

4.0 CREATING AND USING SHAPES

This chapter explains how to create a program from a standard form or custom shape

4.1 USING SHAPES

It is extremely simple to create programs using the SHAPES section. From the main menu select shapes by touching the **Shapes** button. This opens the shapes page template seen in (Fig.4.1). There are 3 main shapes to choose from. They are located at the bottom of the screen; on the right you will see the round circle, ellipse, and free shape.

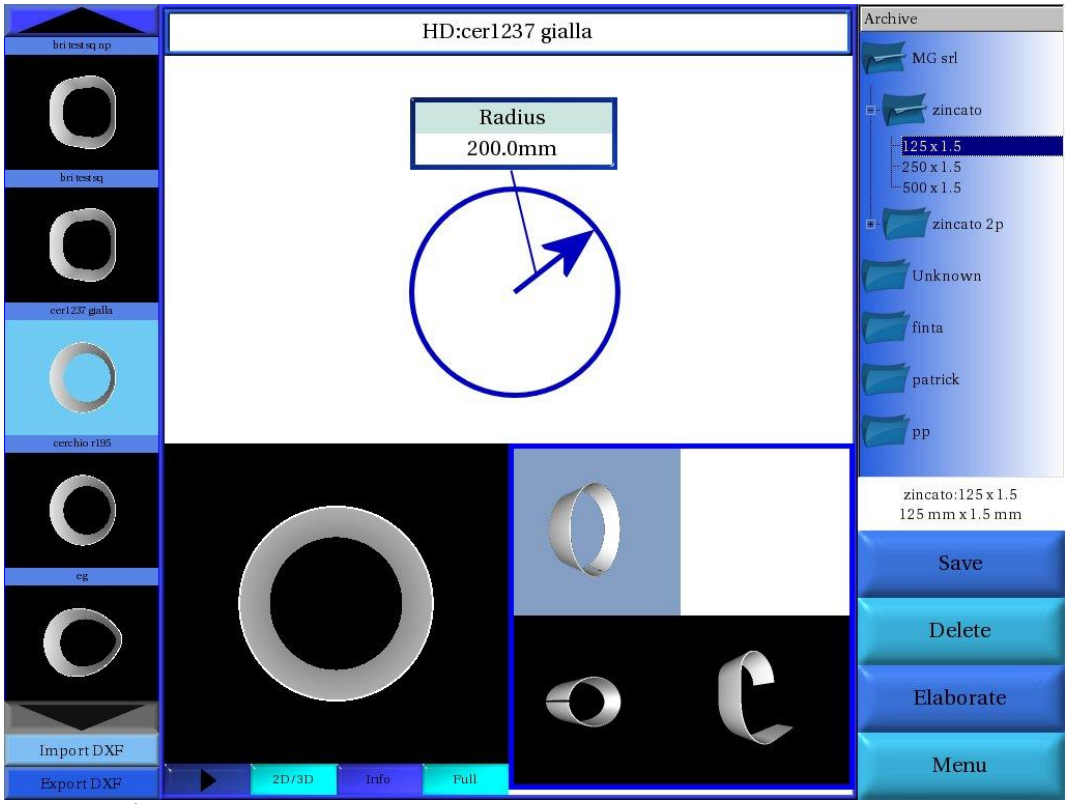
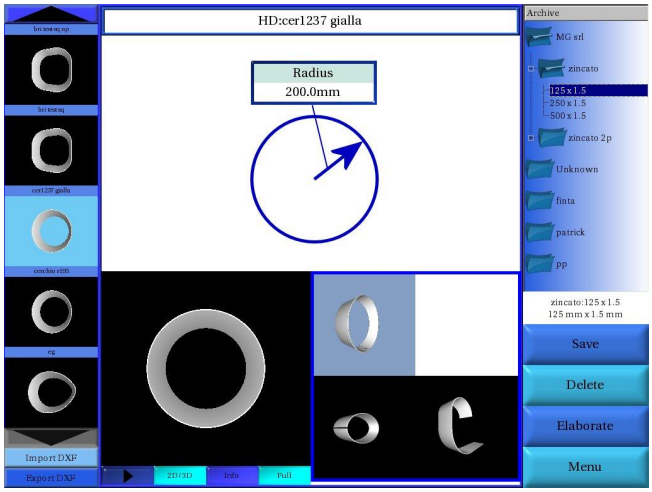


FIGURE 4.1 shapes page

In the paragraph hereinafter we'll show how to use the various forms available starting from the creation of a circle bending .

4.1.1 Circles

First we must select the material we are going to use from the material libraries that we created earlier. The directories are located at the right side of the screen and can be opened with a double tap on the directory folder, material folder and then tap the library name. Then touch the Circle figure located in the lower right central portion of the screen. After touching the circle you will see a circle appear in the upper center portion of the screen with a box were we can enter the radius we want to make. Touch the radius box and a keypad opens to enter this radius.



Touching the info button at the bottom left for each shape that we create opens a window with the following information: external sheet length, length internal plate, sheet medium length, cut length sheet, minimum radius, and maximum radius.

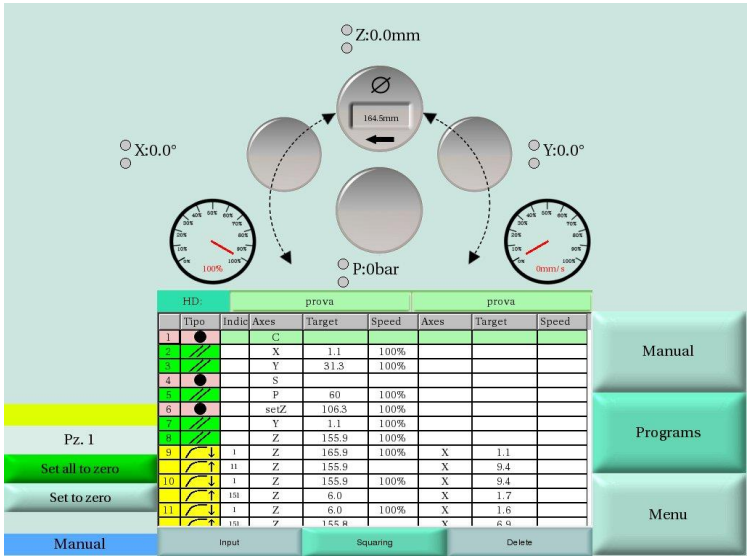
If the radius of your circle is one that you will be doing often with different materials it is possible to save this shape and radius in the quick load section located on the left side of the screen. Simply touch the top of the screen where it says HD and type in the name of the shape. For example cir radius 350. Touch ok and then touch the save button on the right side of the screen. You should only do this with shapes that know you will use often.

At this point you can touch the Elaborate button to the right that opens a page of corrections that can be used to customize and enhance the finished piece. This corrections page was created to easily correct any section of the program independently. This is important if you are getting material that is inconsistent batch to batch. When rolling the first piece you should always make sure that all the values are set to zero by touching the set to zero button at the bottom of the page. There are 3 settings that need to be checked or unchecked depending on what you are rolling and how you want the software to write your program. They are located on the right side of the screen. They are Machine opening, Input mode pre-bending, and No prebending. Machine opening should be checked if you want the machine to automatically lower the central roll and open the yoke after the part has been rolled. This is the default setting and most programs will end this way. Reasons you might want to turn it off would be if you were doing very big diameters or only sections of

diameters and don't want to let the part be loose in the machine before attaching some material handling devices to remove the part. Input mode pre-bending changes the mode of the pre-bending. The default is not checked and the software will write the program with our newly devolved and extremely accurate pre-bend technique. If the box is checked it will still perform the pre-bending but it will write the program with the classic style of pre-bending. This style is not as accurate and could require some adjustment to the program. There are instances when it is beneficial to use one system versus the other. No prebending is used when you don't want the machine to perform an initial pre-bend at all. The default is not checked. It is rare that this function is ever used

We will go over the rest of the adjustments and their functions later in this chapter.

After you have chosen your machine opening and prebending options you proceed by touching the Ok button at the bottom of the screen. If the radius you requested can be performed on the machine you will see a box on the screen saying the elaboration was successful. If there was some problem with calculating the radius you will get the message that it failed. If it failed press ok and double check that the radius you asked for is correct and within the capacity of the machine. If it was successful press ok and you will be taken back to the shapes page. Here you will notice that the Elaboration button has been changed to a Run button. Touching this button takes you to the execution page where you can actually have the software run the program and control the machine. Simply turn the Manual/Automatic sector to automatic and then press the Run button on the control console and the program starts as we discussed earlier in the auto-teaching section.



4.1.2 Elliptical

We must first choose our material that we will use the same way we chose it for our round shape earlier. Then for the development of the ellipse we will touch the ellipse shape at the lower central portion of the page. This opens up a window were we can insert the height and width along with our offset and extension for our shape. To input the height, width, offset, and extension simply touch the boxes and type in the value on the keypads that open and confirm by touching Ok. Height and width are just the simple dimensions of your part to be rolled. Offset refers to where we want the weld point to be and is measured in degrees. Zero degrees is located at the tightest section of the ellipse. 90 degrees would be at the largest section of the ellipse. The weld can be moved to any section of the part. The extension refers to how much of the ellipse we want to roll. 360 degrees for a complete or 180 for half. We can input any value here to roll as much or as little as we want. Once you have input your setting touch the elaborate button and follow the same procedures we used for the circle earlier.

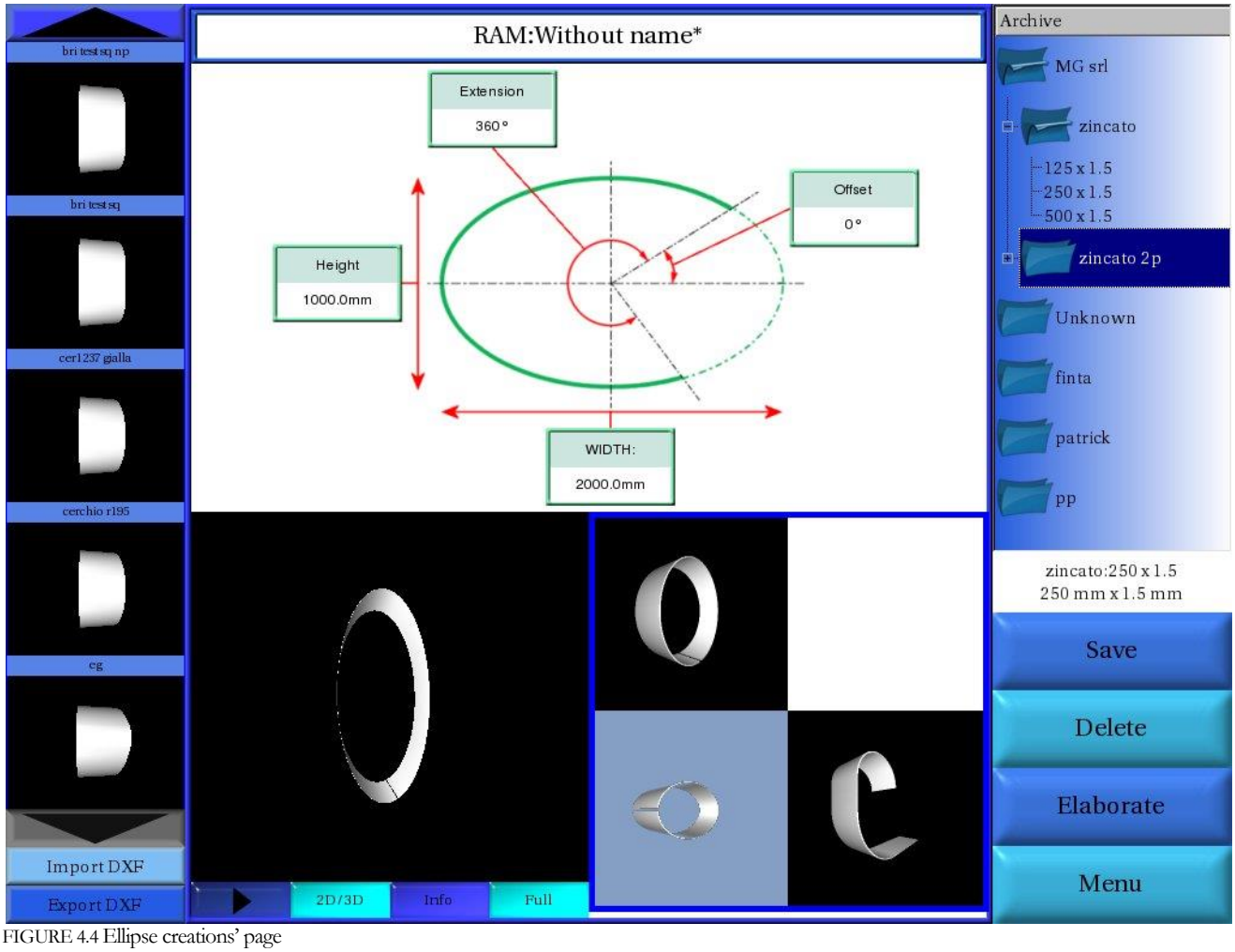


FIGURE 4.4 Ellipse creations' page

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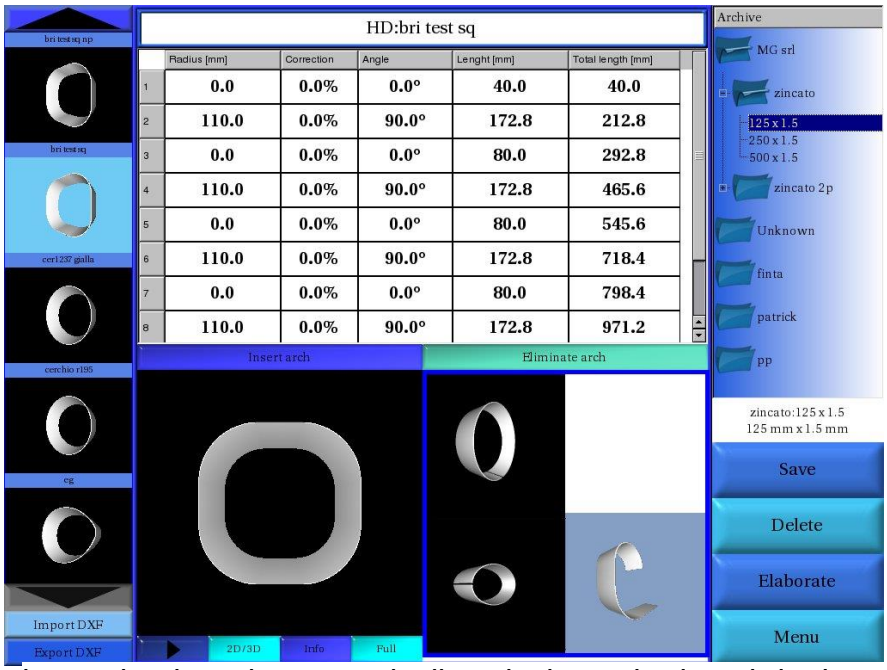
4.1.3 FREE SHAPE

As we did before we must choose the material to be used from the directories on the right side of the screen. Next touch the free shape button at the lower center of the page to open the free shape section. The free shape section has a powerful CAD engine built into to it that will help us easily create custom shapes, save them and recall them every time if the need arises (see fig. 4.6). To create a shape we can start from an existing shape that has been saved in the archive on the left of the page or create a new one. After inputting the data for our shape we can name the shape and save it to the archive. The grid in the middle of the window allows the insertion of data about the shape we want to create. There are two ways to insert this data. We can take a DXF file and save it onto a USB stick and import it directly to the grid using the import button on the lower left of the page or we can enter the information manually. Entering it manually requires a double tap on the screen in the box where you want to enter the value. In the first column labeled radius insert the value of the desired radius. If you want to create a flat part that is not curved just leave the value at zero in the radius column. The second column labeled correction is used to correct the radius of that specific step. This is useful if we are rolling a part where the weight of the material could affect the radius achieved. You may enter a positive or negative value here depending on what is needed. In the next column we can input the degree of angle that we want the radius to be rolled to. When you put in a value here it automatically calculates the length in the next column. It also works if you know what the length of the radius you want is. You can enter the length and it will automatically input the angle in degrees in the preceding column. The last column tells you the total length of the part up to the end of that step. Each time you enter data into any of the columns the software will automatically insert a new line below allowing you to enter a 2nd, 3rd, and 4th.....section for your part. If you forgot to enter a section of the part you just touch the screen on the step where you want to insert it and touch the insert arch button at the bottom of the grid. If you put in an extra step that you want to delete just touch the step and then touch the eliminate arch button. As you insert you steps you will see the part starting to take shape in the window below. Once all the steps are in you should see what your part should look like. If the shape is wrong you can touch each step of the grid to highlight that section of the part in the window below to try and determine where your error is located at. To edit a step just double tap the value you want to edit and type in the new one. When you have everything right you can touch the top of the screen to name the shape you have created. Then save the shape to the shape archive on the left of the screen by touching the save button. This does not save a program to execute by the machine. It only saves the shape to be called up later. You can choose this shape for another material or open it and modify the information in it, rename it and save it as another shape without having to start a new one again. To have the software write and then run the program touch



the elaborate button and follow the same procedure we used with the circle and ellipse earlier.

4.1.4 CORRECTIONS PAGE

Here we will talk about the corrections page and how each correction affects the part. This section is normally only used when changing from one heat lot of steel to another.

Global correction of bending: This is a correction rate that affects all the radii of the part to be rolled. (-50% to +50%)

Bending corrections Y: This is the correction for the axis for the prebending but only during the initial prebending. (-50% to +50%)

Bending correction for lost contact X; ***Bending correction for lost Y***: When the machine is rolling the material is normally in contact with all 4 of the rolls. In order to roll the part all the way to the edges to have a perfectly round part it is necessary to roll the edge of the plate to the center of the upper and lower rolls. To do this we end up using only 3 rolls instead of 4 because the edge of the plate must roll the center of the pinching rolls. When we lose contact with the 4th roll we have to compensate for this by rising the opposite side roll higher to continue to roll the same radius. This value is calculated automatically by the software when the program is generated but may need to be adjusted which you can do here by entering a percentage. (-50% to +50%)

Correction for bent passage straight Y; Correction for bent passage X: When you have finished rolling a radius that has a flat after it there will be a small section of the radius that transitions to the flat section that will not have the correct radius. You can correct this by increasing the travel by some number of mm.

Final rolling correction X: This is a correction acts on the final section of the bending of the part. As the plate nears the edge and the rotation stops there will be a small section of the radius that will have a larger diameter. This is due to this section of the radius not finishing

its bending process. We can have the side forming roll raise slightly higher by inputting a percentage here to tighten or loosen the radius at the section near the central rolls that didn't finish it's bending. (-50% to +50%)

Final rolling length correction: This is a length in millimeters and determines the length of the final rolling correction described above. (Note: if this is equal to zero is disabled FINAL ROLLING CORRECTION) (0mm to 1000mm)

Initial rolling correction Y: This is a correction acts on the initial prebend section of the bending of the part. As the plate nears the edge and the rotation stops there will be a small section of the radius that will have a larger diameter. This is due to this section of the radius not finishing its bending process. We can have the side forming roll raise slightly higher by inputting a percentage here to tighten or loosen the radius at the section near the central rolls that didn't finish it's bending. (-50% to +50%)

Initial rolling length correction: This is a length in millimeters and determines the length of the initial rolling correction described above. (Note: if this is equal to zero is disabled INTIAL ROLLING CORRECTION) (0mm to 1000mm)

Advance breaks x - advance breaks y - reference beam: These items were discussed and used for optimizing the material library earlier. Depending on the shape or radius you are making you may need to adjust them again here. The adjustment will only be for this program and will not affect the setting stored in the material library. This is not a common adjustment.

Joint Length: Here you can adjust the overlap where the prebend and bending cycles meet. It is used to transition the two different bending processes without leaving a visible joint. The value entered is millimeters of overlap between the end of the prebend and the start of the bending. This length is added to the length of the prebend without changing the starting position of the bending cycle. For example: (Joint length 50mm) In our example, suppose that the prebending is 400mm in length and after being adjusted it is increased to 450mm (with 50mm joint length). The plate will travel forwards until there is 450mm of plate protruding from the center of the rolls instead of the normal 400. It will then start to lift the side roll and rotate backwards (for the prebending) until it reaches the edge of the plate. It will then rotate forwards again but only until the original 400mm of plate are on one side of the central rolls and the other 50mm of prebent plate are on the other side of the central rolls. Now the other side roll will come up to start the bending process without leaving a flat joint at the transition due to the 50mm of formed plate on the opposite side of the central rolls.

Pre-bend length: Here you can adjust the length of the pre-bending. If it is set to zero the software will calculate the minimum length that is possible. There are instances when you may want this length to be longer. For example if you are making a part with more than one radius on it. Let's say the minimum prebend length on this machine is 100mm and the first radius in our part is only 130mm long. Instead of doing a prebend set to the minimum of only 100 and then changing rolls to finish the last 30mm it is better to have the prebend do the entire 130mm. So we would add a value of 30mm in this section.

Pinching tolerance: We can adjust the distance of how close to the edge of the plate the machine will rotate to. The default setting is .5 which means half the thickness of the plate. For example if we have a 10mm plate the rolls will only rotate with in 5mm of the edge of the plate. Increasing or decreasing this value will make this longer or shorter depending on your

needs and how close to the edge of the plate it is possible to get to without the plate coming out of the machine.

5.0 APPENDIX

This appendix explains all of the programmable axii along with command instructions that are not axis specific

5.1 Programming instructions

A The instruction "A" is used to open the holder opening commonly called "yoke" allowing the removal part after rolling. The instruction ends when a limit switch is activated which informs the PC to stop the movement. This limit switch is set according to different type of machine. For small and medium size machines generally the opening cycle ends after the yoke has fully opened and the top roll has lifted up to be able to remove the part past the cone bending attachment. For larger machines without the ability to tilt the top roll but the cycle "A" ends after the yoke has full opened.

C The instruction "C" is used to close the yoke after removing of the rolled part. The instruction ends when a pressure sensor records the correct pressure in the closing circuit.

It is important to remember that only after the proper closing pressure of the release is obtained will be possible to start pinching the material with the lower central roll. In fact, if the sensor does not detect the correct closing pressure will not raise either manually or with the “P” command which raises the roll in automatic mode. We recommend using the instruction "C" as the first step of any new program. This will allow the CNC to check if the closing pressure is correct and allow the proper function of the machine in the later stages of bending.

S The instruction "S" determines a suspension of the program. After this instruction is seen by the software the program will restart only after you push the RUN button again. There are no limits on the number of instructions used in the program. So every time the operator wishes to perform a manual operation during the bending cycle such as loading the plate into the machine you can insert the “S” instruction into the program. It is important however to remember that you can pause the program at any time by pressing the RUN button. For example you want to pause the program to check and make sure the radius being rolled is correct. Just press the run button and the program will stop until you press

the run button a second time. After the second pushing of the button the program will resume from where it was stopped at.

Zr The statement "Zr", which becomes the listing in "Setz", allows you to set Z (rotation axis) to the value we want. This will facilitate the identification of the position of the material in the later stages.

Consider that the value of Z-axis is automatically reset to zero with every program cycle. Then, after the stage of squaring the plate against a side roll, the zero point the Z axis corresponds to is not the edge of the plate. You have the section of plate that is extending beyond the center of the top and bottom roll that is touch the side roll for square. This distance will vary depending on the position of the side roll that was used. This may create confusion while rolling complex shapes with more than one radius. For example, suppose that the distance between the center of the central roller and the side roll being used as a squaring arm to 88mm. We could rotate the plate back to the center roll with the statement Z = - 88 then reset the axis with the instruction Zr = 0. The display of the Z axis will pass immediately to zero, generating exactly the point of origin to the top of the sheet. If our piece has a flat in the beginning then we write simply Zr = 88 without rotating the edge of the plate back to the center of the rolls. Now the plate position and the encoder position are matched. Of course you can use this statement several times within the program if you choose to do so. For example, if we had a flat section at the start of our part that is supposed to be 200 mm long. We could use the command Zr =88 and then the command Z = 200 to move the plate to the start of the radius. Then if we had a radius of 300 that was supposed to be 300 mm long we could reset Z to zero using the command Zr =0 and then use the Z =300. This is helpful if you are make some large square or rectangular parts where you want to roll only one half at a time and then start from the other end of the plate to roll the other half. It is easy to make mirror images of the shape this way.

D Instruction D (Delay) allows us to insert a delay of execution. When this step is reached this line the program stops and starts a countdown in seconds. For example if you programmed in D =5 the program will delay for 5 seconds before moving onto the next step. This type of instruction should only be used in completely automated systems where there is not an operator or personal that will be working around the machine.

T The instruction "T" is used only when there is an automatic plate loading system attached to the machine. When the software reaches a step with the “T” instruction it will pause and wait for a signal from a sensor that detects the presence of a plate ready to be loaded into the machine. At this point the feed table to load the plate into the machine is activated for a time specified in column T value. Then the program will continue to the next step. For example, the software arrives at a step with T = 50. The program stops and waits for the signal from photocell that the material is present. Upon receiving this signal the software executes the step T =50 and the feed table rotates forward for 5 seconds loading the sheet between the rollers of the machine. Then it will run the next step which is usually the command “P” to pinch the plate and start the bending process.

J The instruction "J" is used only when there is an automatic plate loading system. It is used in systems with only a single loading station. The “J” instruction sends a signal to a separate PLC that controls the entire loading process independently from the plate rolls operation. This allows the loader to go and get the next plate to be rolled while the machine is rolling the one it has.

J 1-4 The instruction "J" 1 to 4 is used only when there is an automatic loading system with multi-stations. The command J 1 will serve to drive the load cycle on the first sheet loading station, J 2 for second and so on.

JB 1-4 JB is used to create a program with 1 to 4 programs tied together depending on how many loading stations you have configured on your machine. For example, we are bending a diameter 500 mm with the plate located in station 1 of the loading system. We would proceed the steps for this program with the command (JB1). Within the program we would call the plate from station 1using the instruction (J1). We have a second plate loaded in station 2 that will have a diameter or 700 mm. We would add the steps to the end of the first program that was written but we would start the second program with (JB2) where we will call the station 2 (J2) and so on. Steps to bending of the part 1 will be contained within a block called JB1 and those used to roll part 2 are located in Block 2 (JB2). At this point when asked to carry out this program, it will alternate between station 1 and station 2.

F The instruction "F" controls a simple ON-OFF. Can be used depending on the types of applications installed on the machine. If F = 1 is enabled with the output port is ON. With F = 0 leads to OFF. The last step program switches automatically to the output OFF.

NOTE