

KOLLMORGEN®

Because Motion Matters™

IDE AKC-PPC

User's Manual

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1.0 IDE AKC-PPC

The AKC-PPC IDE is the software responsible for creating application designs for the AKP-PPC CNC.

This software will help developers program new applications quickly and easily, as it integrates several tools needed to help develop the features included in the AKC-PPC CNC.

The main goal of these tools is to save time: the easy filling in and automatic generation of configuration files eliminates the need to create files manually, which takes more time and can produce errors that in many cases are not easy to find and fix.

1.1 Start Screen

When starting the IDE AKC-PPC software, the first screen to appear is the following.



On this screen we can select the language and skin that will be used.

To use the software select a user level, enter the password and click Login. There are 2 types of user levels.

Application

This user must be used for the development/editing of a project. This user does not require a password.

To start the software with this user, click on the "Login" button

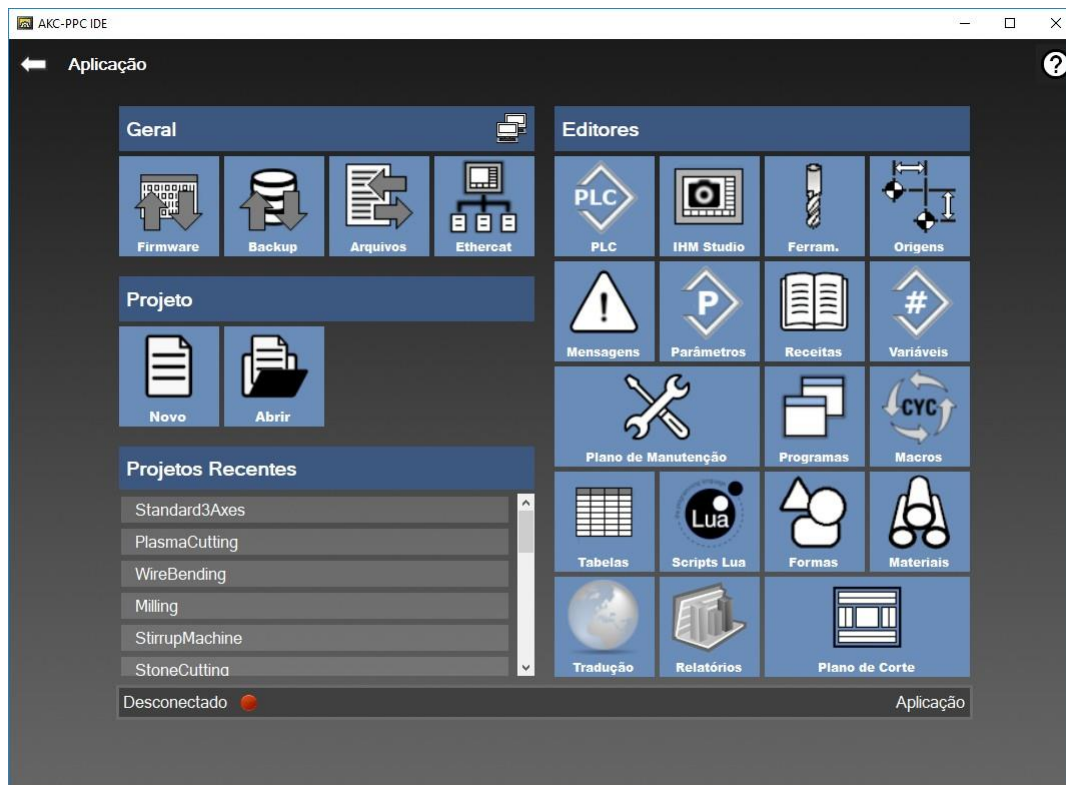
Engineering

This user is used internally for development/updating of files and resources To start the software with this user enter the password and click the "Login" button

After logging in, the software is ready to use.

2.0 HOME MENU

After logging in, the following screen will appear.



Each icon on this screen represents a functionality related to the CNC project.

On this screen we can see that the functionalities are separated into 4 groups: General, Project, Editors and Recent Projects.

NOTE:

Clicking on any button in the "Editors" group or the "General" group will change the displayed screen.

On this new screen there will be a taskbar with shortcut buttons for the tasks that are on the start menu.



The taskbar does not have 4 features that are in the start menu. These are:

- New Project
- Open Project
- Project Properties
- Save Project As

The taskbar has 4 features that are not in the start menu. These are

-back



Clicking this button returns the IDE to the start menu

-Send



Clicking this button sends the files related to the screen you have selected to the CNC

E.g.: If you are in the PLC screen and click send, it will send the PLC program that is compiled

This functionality is very useful when the CNC already has a published project and we need to update only the data of a respective editor.

-Expand work area



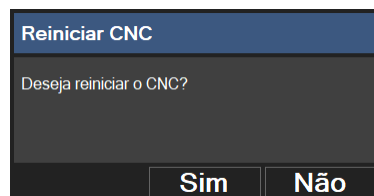
In some editors, for a better view of the editor, you can click this button and the respective editor will take up the IDE's entire screen.

This functionality is very useful especially in the "HMI Studio" editor.

-Restart CNC



By clicking on this button a confirmation box will be displayed.



When you confirm the CNC will restart.

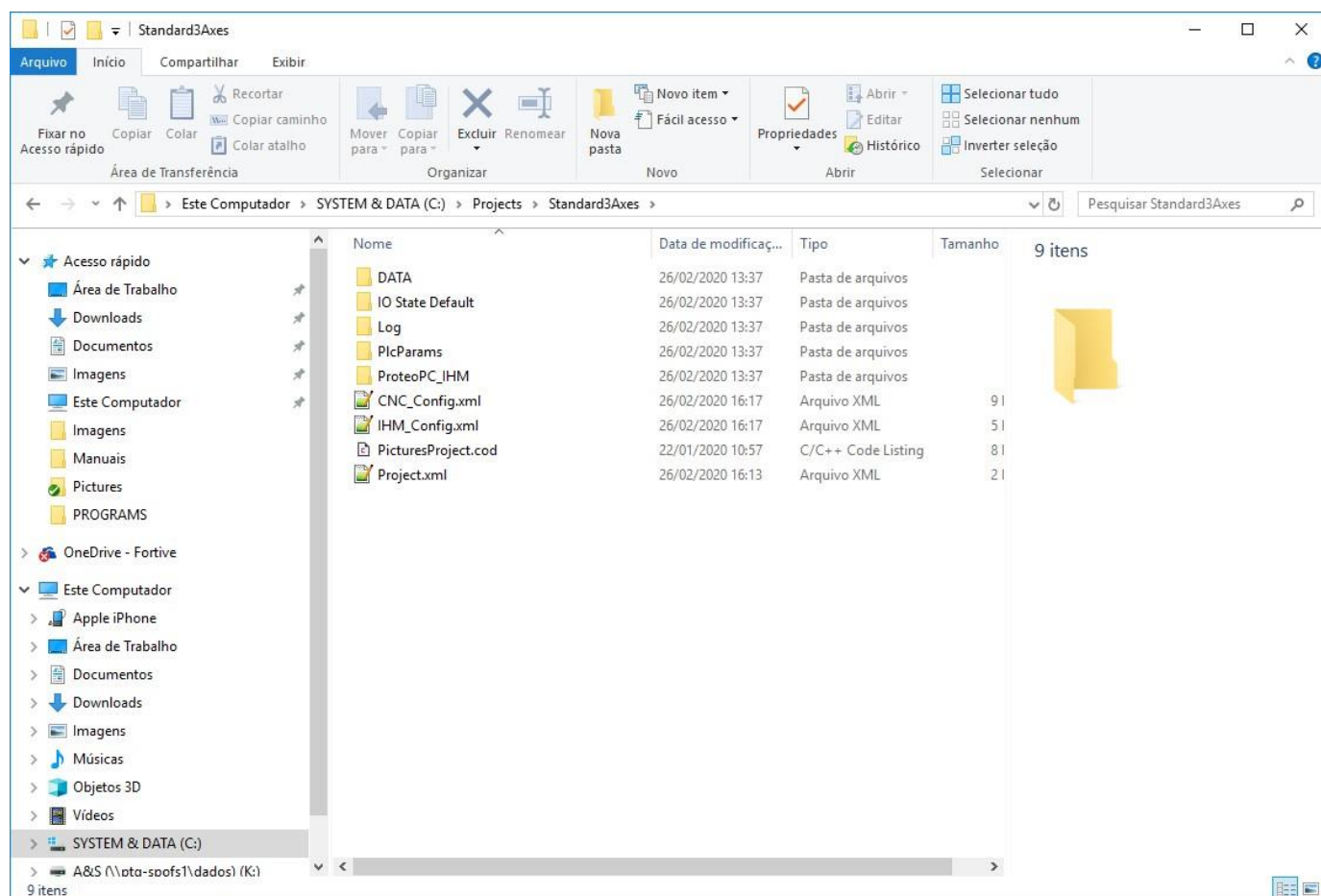
3.0 PROJECT GROUP

One of the great highlights of the AKC-PPC CNC is its customizability.

Using the AKC-PPC IDE we can develop many different types of projects that will be used on the CNC. Every CNC project is saved in folder format, not in a single file.

Inside this folder are all the files and folders used by the CNC and the IDE.

When receiving or creating a project, do not change any file or folder names manually without proper knowledge, as this may corrupt the project and cause the CNC and IDE to malfunction.

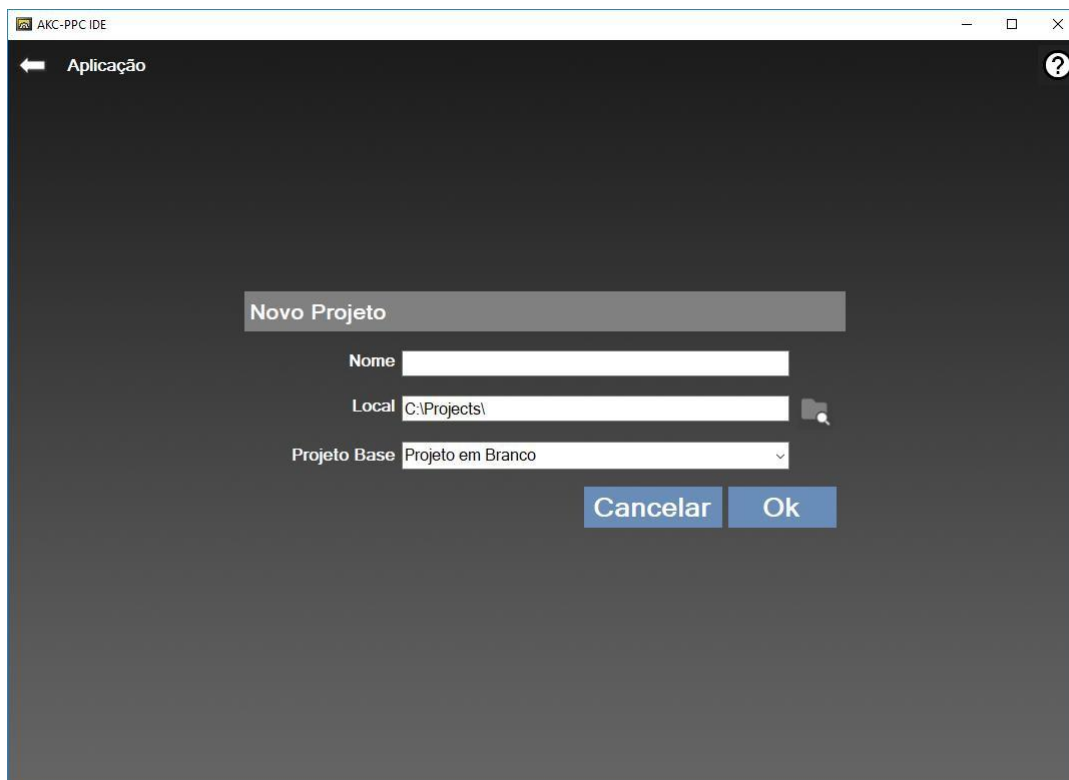


3.1 New Project

To create a new project, click the "New" button in the "Project" group.



The following window will appear:



Enter the project name

Choose the location where the project will

be saved Choose a base project

To finish press the "OK" button, after which the project will open.

NOTE:

The base projects contain basic functionalities such as manual movement, referencing, end of stroke, among others. These bases are very useful to save time in project development.

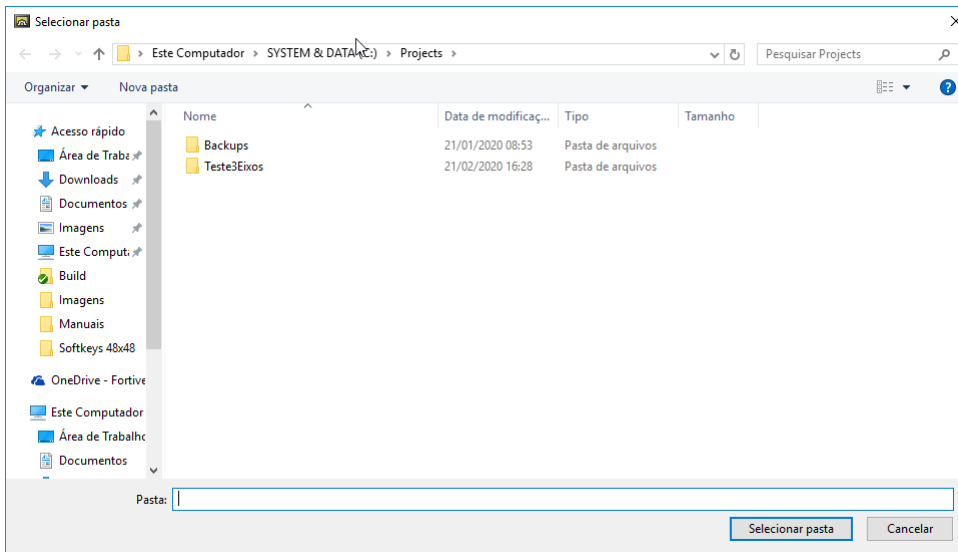
The blank project does not contain any functionality, so it should only be chosen by experienced users, since everything will need to be developed.

3.2 Open Project

To open a project click the "Open" button in the "Project" group



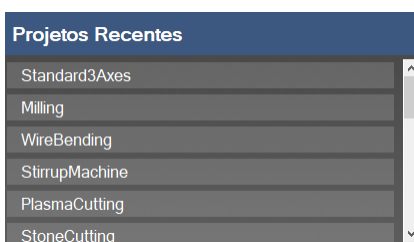
Navigate to your project folder and click "Select Folder"



This will open the project.

3.3 Recent Projects

Another way to open a project is the Recent Projects list.

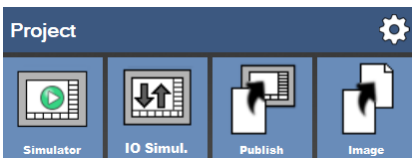


This list contains the last 20 projects that you have opened.

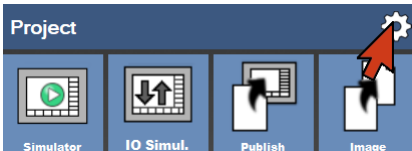
To open a project just click on the item in the list with the name of the project you want to open.

3.4 Project Properties

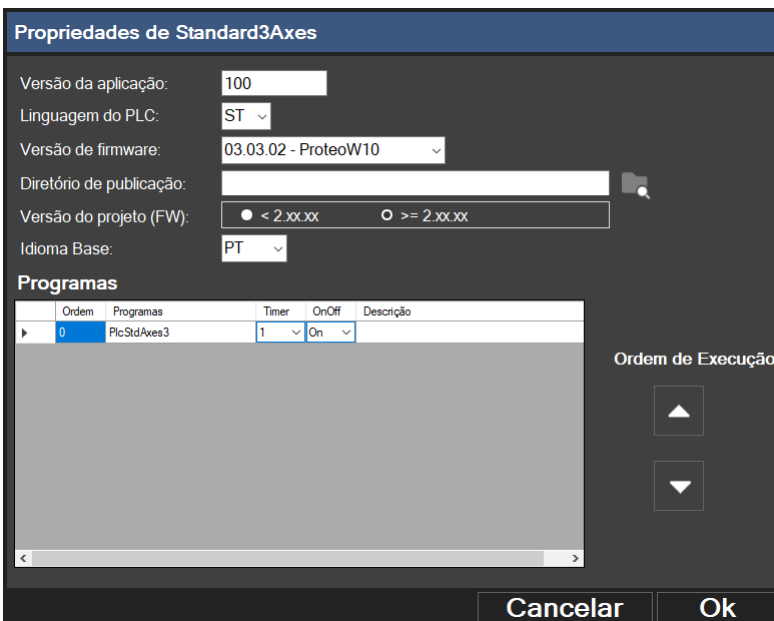
After the project is opened, the buttons in the "Project" group will change as shown in the following



With a project open click the "Project Properties" button on the "Project" group bar.



This brings up the Project Properties window.



In this window all fields must be properly filled out.

Application Version: is the number that should be assigned to the current version of the project. Used only for project developer control.

PLC Language: is the language that the PLC will be programmed in, it can be IL (Instruction List) or ST (Structured Text). It is recommended to use ST for all projects

Firmware version: is a field where you select the firmware version that will be used in the project.

Publish path: is the location where the project image will be published.

Project version(FW): This field must always be set to >=2xx.xx for projects with firmware version 2.00.00 or later.

Base Language: select the base language that is being used to develop the project

Programs: Here a list will be displayed with all the PLC programs existing in the project.

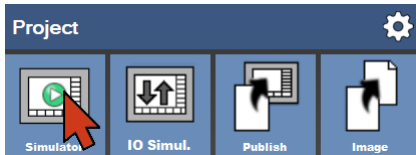
In this list we can configure whether the file will be executed or not and the order in which the files are executed.

3.5 CNC Simulator

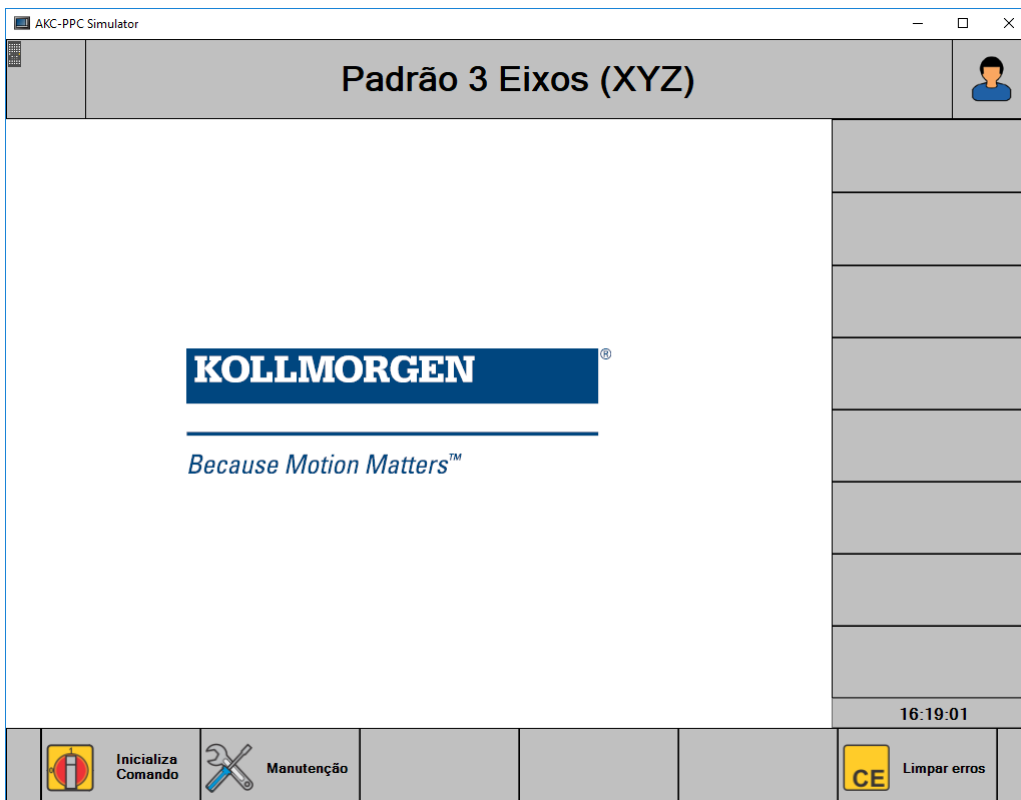
The AKC-PPC IDE has a CNC simulator.

With it you do not need the CNC hardware to test and verify the operation of the project being developed.

To use it, press the "Simulator" button in the "Project" group.



With this you will be able to fully test the developed project.



NOTE:

The CNC Simulator is software that, although it is integrated with the IDE, needs to be installed separately.

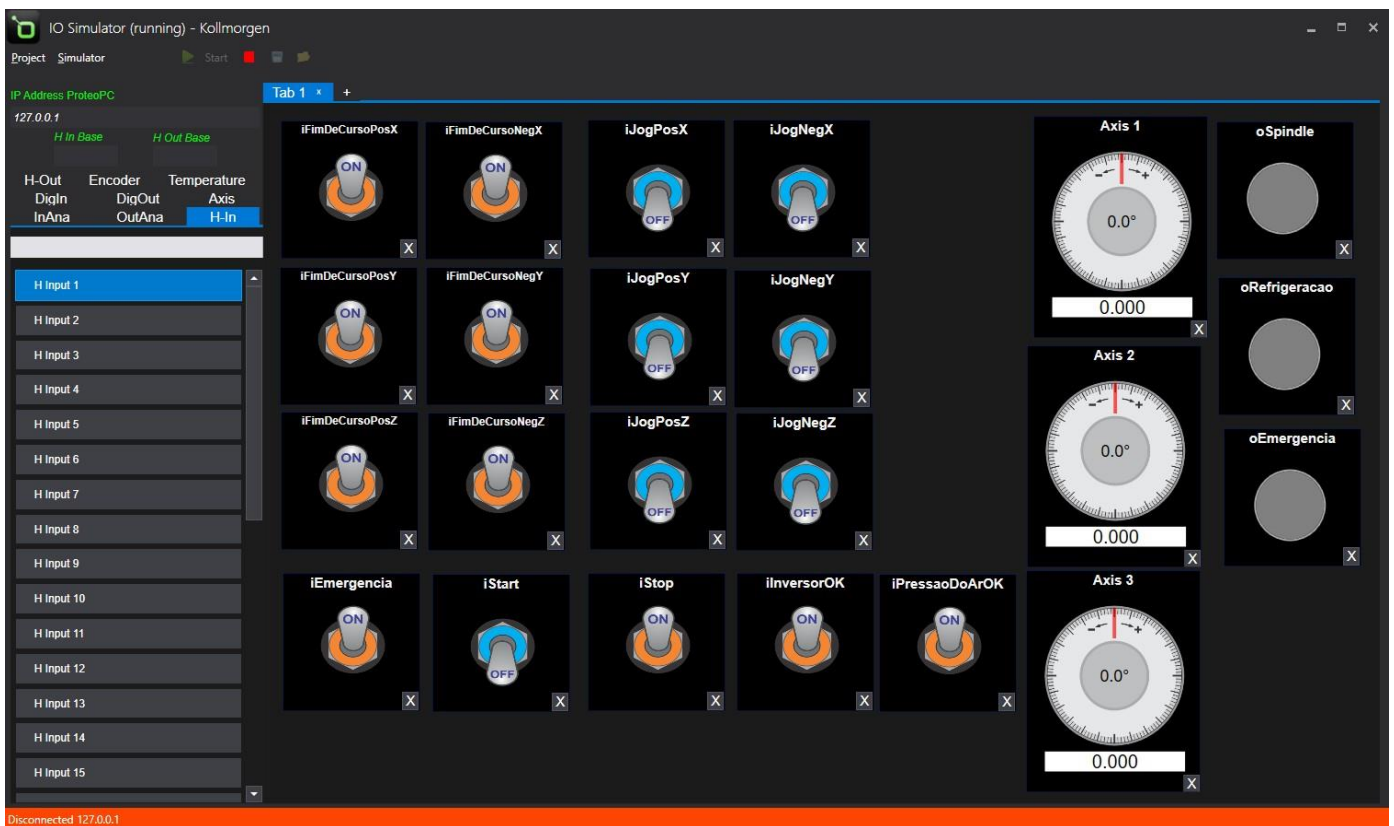
3.6 Machine Simulator

In the AKC-PPC IDE there is a tool that is very useful in developing and testing projects, the IO Simulator. This feature was developed in order to reproduce machine conditions without the need for "physical" equipment.

To use it, press the "IO Simul." button in the "Project" group.



Next you will see the IO Simulator screen



Components available in IO Simulator :

- Digital inputs and outputs
- 32 Axes
- 32 Analog inputs
- 32 Analog Outputs
- 32 Encoders
- 32 Temperature inputs
- 32 "Input" H-registers
- 32 "Output" H-registers

All the components listed above work as follows:

First you must select the desired component and in the list that appears, click on it and drag it to the desired position on the screen.

To better organize your project, you can create tabs to divide the amount of components in it. To add the tabs simply click on the "+" button and to rename them double click on the name.

Note that you cannot use two instances of the same component in different tabs, i.e. after you have dragged axis 1 to one tab, it cannot be dragged to any other tab.

To save the whole layout developed in the simulation, press the save button.

3.6.1 Start / Stop hardware simulation

To start the simulation you need to connect the IO Simulator to the desired device. The IO Simulator can be connected to either the CNC or the CNC Simulator.

To connect to the CNC Simulator, enter the host site IP "127.0.0.1" in the IP Address field. To connect to the CNC, enter the CNC's IP in the IP Address field.

After that, click on the "Start" button

Whenever you are connected and simulating, the bottom bar will display the message "Connected" along with the IP address of the device that is connected.

To stop the simulation you must press the "Stop" button, which is red when it is simulating and gray when it is not simulating.

NOTE:

It is not advisable to use the IO Simulator in conjunction with hardware (Drives / Card readers) as it will take priority over these devices.

All devices connected to the inputs will be ignored, and the IO simulator will prevail.

3.6.2 IO Simulator Components

As mentioned earlier, the IO Simulator has some components that will be used to simulate the hardware. In this topic we will explain each of these components.

3.6.2.1 Digital Inputs and Outputs

The digital inputs and outputs are selected via the DigIn and DigOut tabs.

By selecting these tabs, IO Simulator will show a list with all the inputs and outputs existing in the project (Registered in the PLC Editor).

All inputs are represented by a "Lever" type switch. All outputs are represented by a red "Led".

Both components have the name registered on top to make it easier to use.

The input has interaction with the user, that is, we can turn it on or off by clicking on the "lever" and the state will change from "on" to "off" and vice-versa.

3.6.2.2 Axes

We can drag up to 32 axes onto the created tabs of the simulator, but the axes are not devices that interact with the user.

They serve to display the position of the CNC, in the center of the motor is informed the position in degrees of the motor, that is, the position of the motor on the lap. And at the bottom the axis coordinate (axis position).

3.6.2.3 Analog Inputs/Outputs

The analog inputs are represented by a voltmeter where we must enter the desired voltage value, incrementing or decrementing through the buttons. The voltage limits are +10V and -10V.

The analog output is used only to display the value, it is a field where the voltage value in millivolts is reported.

3.6.2.4 Encoders

We can use up to 32 encoders on the CNC. The component that simulates the encoder can work in two ways, we can set it to rotate with a certain rotation or preset it to a certain position.

3.6.2.5 Temperature Inputs

There are up to 32 temperature reading channels that in the IO Simulator that are represented by a thermometer. Simply slide the component's slider to set the desired temperature.

3.6.2.6 ISO Program Variables / H Registers

H registers are used in ISO programs or to interface screens, tables and scripts. The CNC has 1000 variables of this type (#0 to #999).

In IO Simulator you can display or change the values of some of these variables.

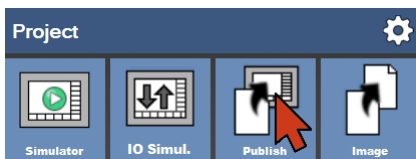
We reserve a total of 32 input (write) H-registers and 32 output (read) H-registers.

In order to use these registers it is necessary to set one base address for the input and another for the output, as if both were a starting pointer.

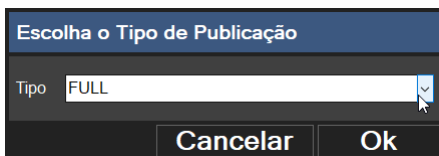
For example, if the base is 200 the H1 will be address 200, the H2 address 201 and so on up to the limit of 32.

3.7 Publish Project on CNC

To publish the project to the CNC, the IDE must be connected to the CNC. To do this, click the "Publish" button in the "Project" group



This will bring up the following screen



Select the type of publication you want to do. We have 4 types of publication:

Full : in this type of publication we will send the firmware, the application project, the parameters, programs and tables. This form is normally used the first time we are publishing the project in a new equipment.

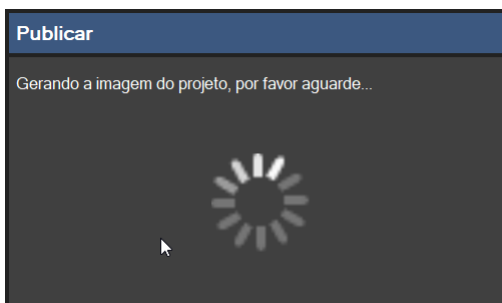
App+Machine : in this type of publication we will send the application project, the parameters, programs and tables.

App : in this type of publication we will send the application project

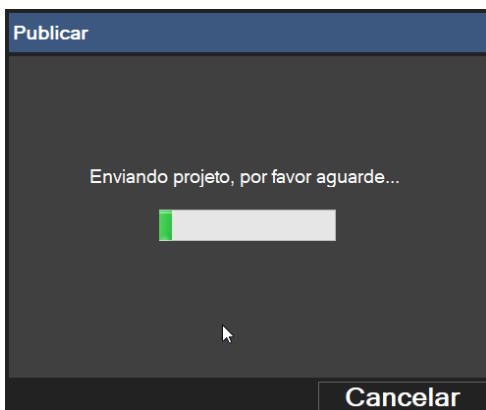
Machine : in this type of publication we will send the parameters, programs and tables.

After selecting the type, click the "Ok" button.

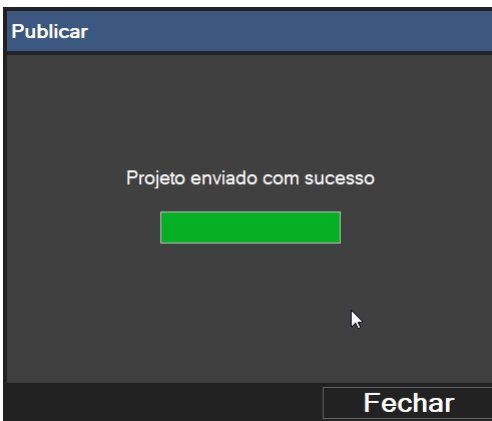
Once this is done, the following screen will appear



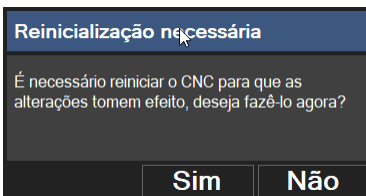
After generating the image, the following screen will appear



At the end this screen will be displayed



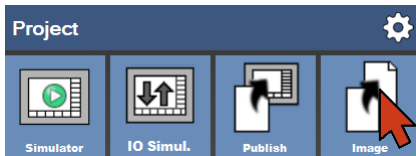
The files have now been transferred to the CNC. To finish click the "Close" button. Automatically the following screen will be displayed:



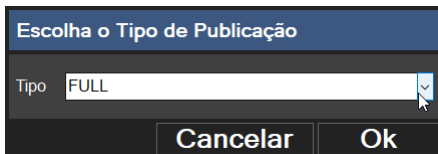
Click on the "Yes" button, because the image will only be used by the CNC after the restart.

3.8 Publish Project Image (Backup)

To publish a project image click on the "Publish" button in the "Project" group



As when you publish the project on the CNC, the following screen will appear



Select the type of publication you want to do. We have 4 types of publication:

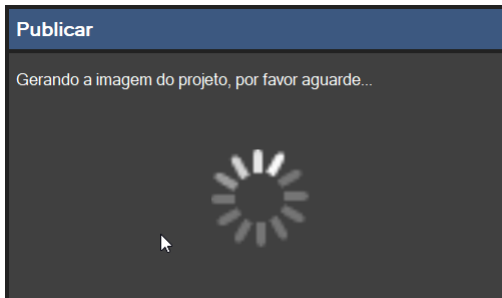
Full : in this type of publication we save the firmware, the application project, the parameters, programs and tables. This form is used when we need to have a complete image of a project.

App+Machine : in this type of publication we will send the application project, the parameters, programs and tables.

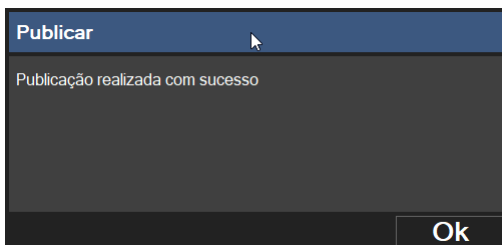
App : in this type of publication we will send the application project

Machine : in this type of publication we will send the parameters, programs and tables.

After selecting click the "Ok" button.



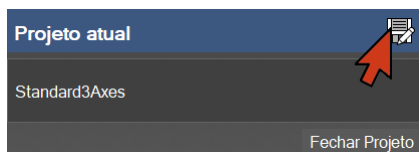
After generating the image the following screen will appear



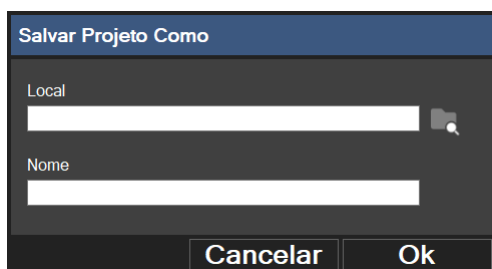
This has generated a Project Image file in the location determined in the "Project Properties". Click the "Ok" button to finish.

3.9 Save Project As

After opening the project, the "Recent Projects" group will be replaced by the "Current Project" group. In the "Current Project" bar click the "Save Project As" button.

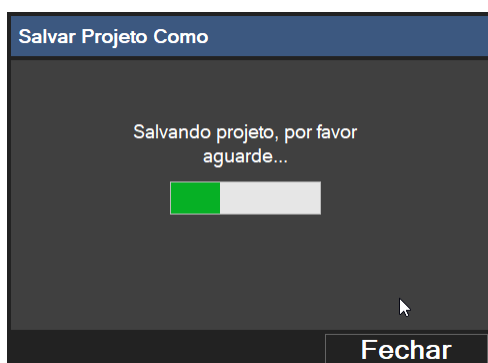


The following screen will appear.

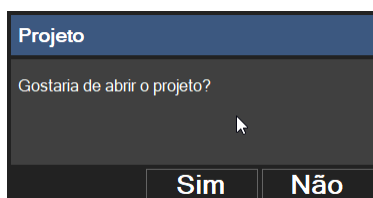


Enter the path where the project will be saved or click the button to browse for the folder where you want to save your project

Enter the name of the "Project", to finish click on the "OK" button, the following screen will appear.



When this is done click the "Close" button. After that a message box will be shown asking if you want to open the project.



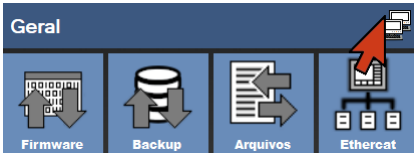
If you want to open the new saved project click the "Yes" button.

4.0 GENERAL GROUP

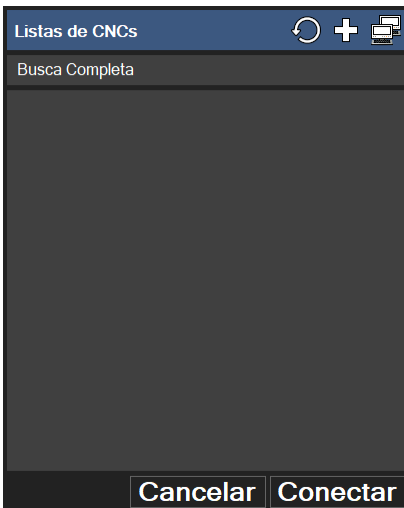
4.1 Connect IDE to CNC

To transfer files, perform backups, update firmware, transfer and use the CNC's debug mode, you must connect the IDE to the CNC.

To do this, in the "General" group, click on the "Connect" button



After clicking the following screen will appear:



In the upper bar of this window we have 3 important buttons, they are:

-Update List



Clicking this button will refresh the IDE to search for CNCs that are connected to the network

-Connect By IP



Clicking this button opens the IDE's window for adding a CNC to the list by entering an IP.

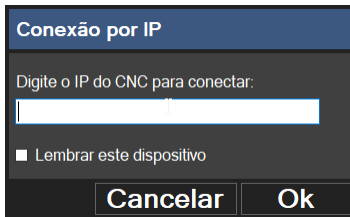
-Connect



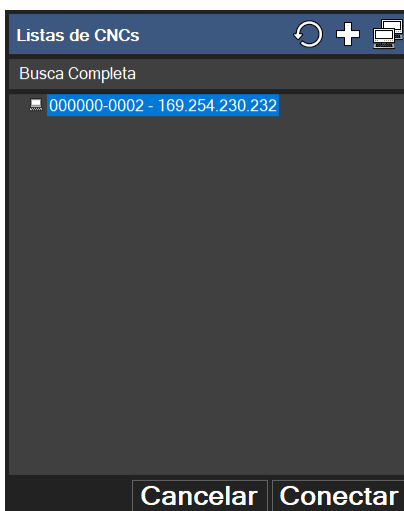
When you click this button with a CNC selected in the list, the IDE will try to establish communication with it.

When you open this screen the IDE will try to list all CNCs connected to the network.

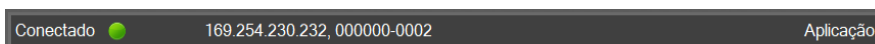
If the CNC you want to connect to does not appear in the list and you are sure it is connected to the network, click the "Connect by IP" . The following window will appear



Enter the IP of the CNC you want to connect to and click the "OK" button
Once this is done, the CNC should appear in the list.



In the list, click on the CNC you want to communicate with, and then click on the "Connect" button.
If the connection is successful, a connection status icon at the bottom of the software will indicate this, as shown in the following figure.



NOTE:

When you try to perform an action that requires a connection to the CNC and the connection has not yet been made, the connection screen opens.

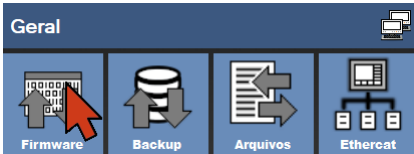
When you add a CNC to the list using the "Connect By IP" button, the CNC will be added to the list. If the list simply shows an IP number (not followed by a name) this item in the list is invalid and you will not be able to send/receive files from it.

When trying to connect to the CNC if its IP is "dynamic" the computer that is trying to connect must have its IP set to "dynamic" as well.

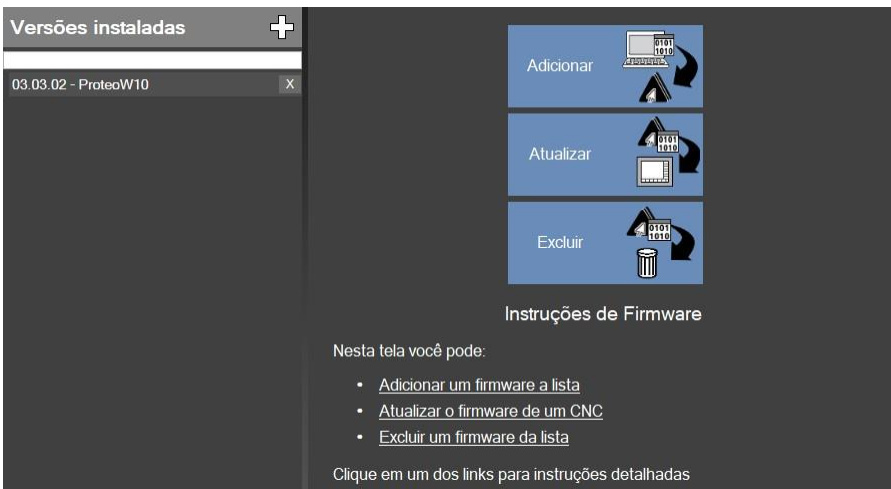
The same if it is with "static" IP, both must be "static" and within the same network range.

4.2 Firmware

To view the firmware screen, in the "General" group, click on the "Firmware" button



The firmware is a file that contains the entire basis for running the CNC. This file is the most important file for the operation of the CNC. In it are developed all the functionalities that the CNC has.



When you access the firmware screen you can perform the following actions.

- Add firmware
- Updating firmware in the CNC
- Delete firmware

4.2.1 Adding Firmware

There are two ways to add firmware to the list.

The first way is by clicking the "Add" (+) button on the "Installed Versions" bar



Another way is by pressing the "Add" button



Both options will open the "Windows Explorer" where you must browse for and select the firmware file you want to register.

All CNC firmware files are named "ProteoPC-firmware.image".

If the procedure was performed correctly the firmware will appear in the "Installed Versions" list and the following screen will appear.



On this screen we have information regarding the chosen firmware and we can insert annotations, if necessary. To insert some annotation click on the "Edit" button

A text box will appear on the screen.



Type your annotation, then click the "Save" button.

4.2.2 Upgrade Firmware

To transfer firmware to the CNC, it must first be registered in the IDE.

We can check the registered firmwares in the "Installed Versions" list.

To perform this function we have 2 options.

The first way is to simply click in the list of installed firmware on the desired version and the displayed screen will change, showing the data of the selected firmware.

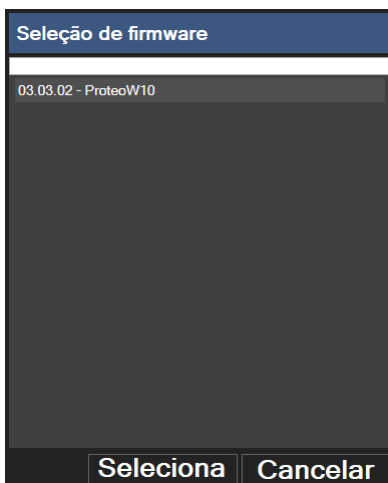


To send the selected firmware click the "Send to CNC" button. The

second way is to click the "Update" button

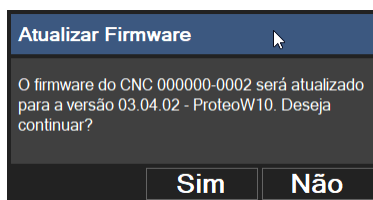


After that the following window will appear



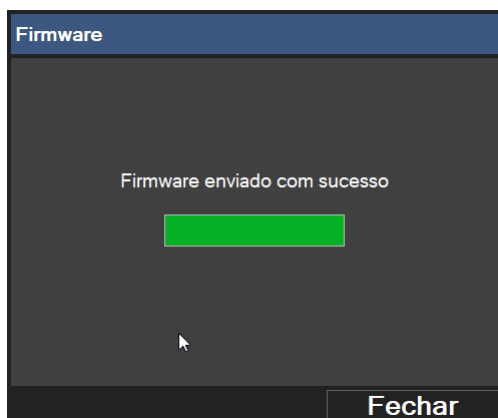
In this list of firmwares that appears, just click on the desired version and then on the "Select" button.

After running either way a confirmation box will be displayed.

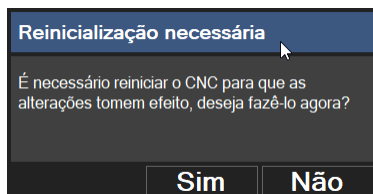


To confirm sending the firmware to the CNC click the "Yes" button.

A window will be displayed, showing the progress of the file transfer. When the transfer is complete the following window will appear:



Click the "Close" button and the following window will appear:



The firmware update will only be finished when the CNC is restarted.

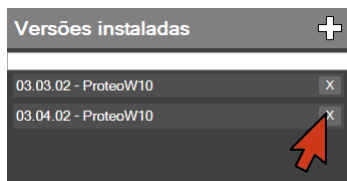
Confirm this by clicking the "Yes" button.

If this is not done the CNC will continue running with the latest firmware installed on it. If you click the "No" this newly downloaded firmware will only be used after the CNC is restarted or the next time the CNC is turned on.

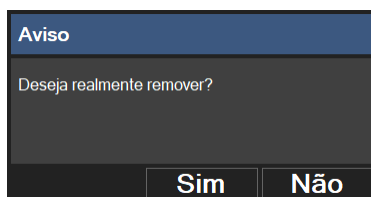
4.2.3 Delete Firmware

To delete firmware from the list we have 2 options.

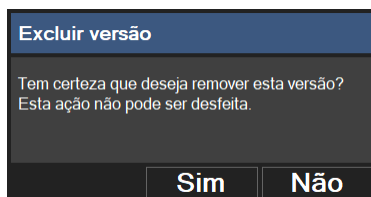
The first way is to click on the delete button that appears in the "Installed versions" list



This will bring up the following window



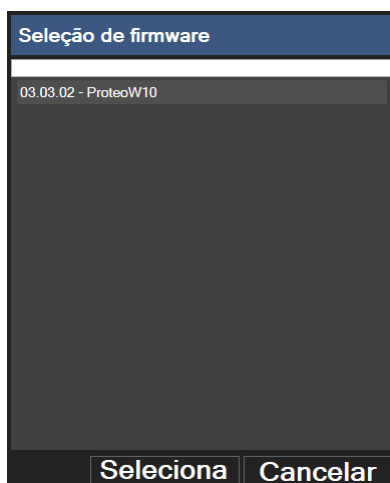
Click the "Yes" button to remove the firmware. A second confirmation window will appear



The second way is to click on the "Delete" button



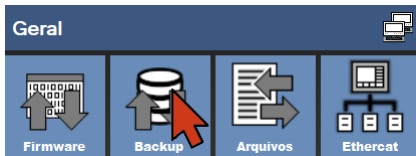
The following window will appear



Select the firmware you wish to remove from the list that appears and click the "Select" button. This will remove the firmware from the list.

4.3 Backups

To view the backup screen, on the "General" group bar click on the "Backup" button



The backup is a file similar to the image file, but its content can be obtained from a CNC or from an existing image file.



When you access the backup screen you can perform the following actions.

- Add a backup.
- Make a backup of the CNC.
- Restore a backup for the CNC.
- Delete a backup.

When you access the screen and if you already have backups registered, you can send them directly to the CNC by clicking on the desired version and pressing the "Restore" button.

4.3.1 Backup

To create a backup the IDE must be connected to the CNC. After that, click the "Back up the CNC" button.



This will bring up the following screen

All fields on this screen must be filled in

Type:

As in image publishing choose the type of backup you want to do. We have 4 types of backup:

- Full** : in this type of backup the firmware, the application project, the parameters, programs and tables will be added. This form is used when we need to have a complete image of a project.
- App+Machine** : in this type of backup the application project, parameters, programs and tables will be added.
- App** : in this type of backup will be added the application project
- Machine** : in this type of backup the parameters, programs and tables will be added.

Name:

Enter a name to identify the backup to be made

Date:

This field is automatically populated by the IDE

Backup Source:

Here we can choose 2 options:

- Remote Device** - With this option selected the backup will be done from a CNC. To do this it must be connected to the IDE
- Local Disk** - In this option the backup will be done from an image file. When you select this option a button will appear on the screen to search for this file.

CNC Name:

This field is automatically populated by the IDE

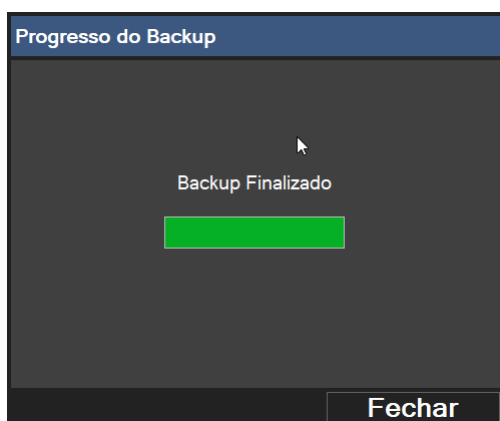
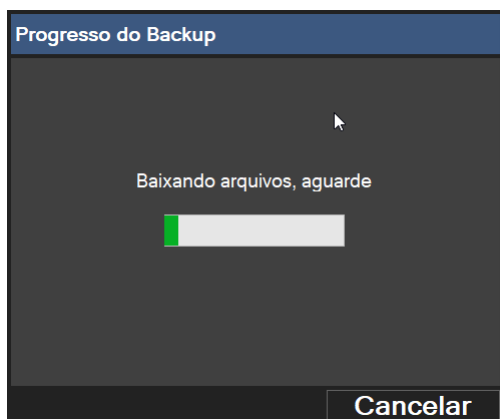
Description:

Enter any notes regarding the backup that will be done. With

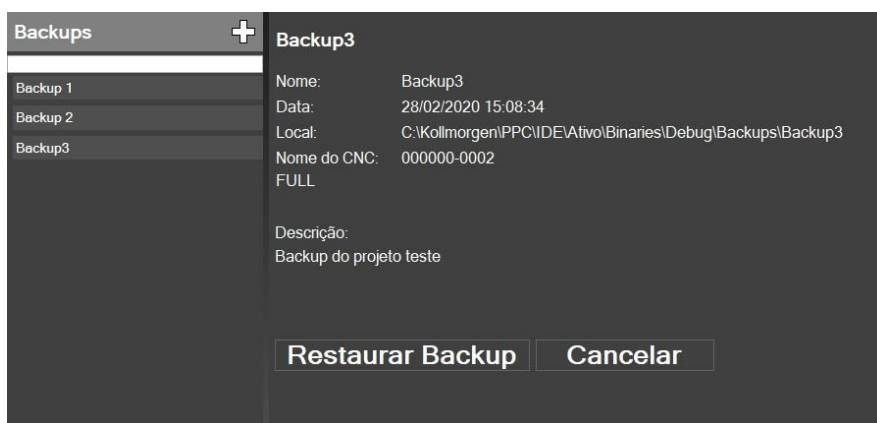
all the fields filled out, click the "Finish" button

4.3.1.1 Backup of a CNC

If the "Backup source" field was selected as "Remote Device" the following window will appear



When the backup is finished click the "Close" button



4.3.1.2 Backup from Image file

If the "Backup source" field has been selected as "Local Disk" the "CNC name" field will change to "Local" and the "Search" button will appear.

The screenshot shows a 'Novo Backup' dialog box. On the left, there is a 'Backups' list with items 'Backup 1', 'Backup 2', and 'Backup 3'. The main area is titled '(Novo Backup)'. It contains the following fields and controls:

- Tipo: FULL (dropdown menu)
- Nome: Backup4 (text input)
- Data: 23/03/2018 (text input)
- Origem do Backup: Local Disk (dropdown menu)
- Local: ProteoPC-full.image (text input) with a 'Buscar' button to its right.
- Descrição: Backup do projeto teste (text input)
- Buttons: 'Finalizar' and 'Cancelar' at the bottom.

Click the "Search" button. The "Windows Explorer" will open, now browse for the image file you want add as a backup.

With all the fields filled out, click the "Finish" button.

The sequence of screens that will be displayed are the same as the ones that appeared in the "CNC Backup".

This same procedure can be done by clicking on the "Add" Button

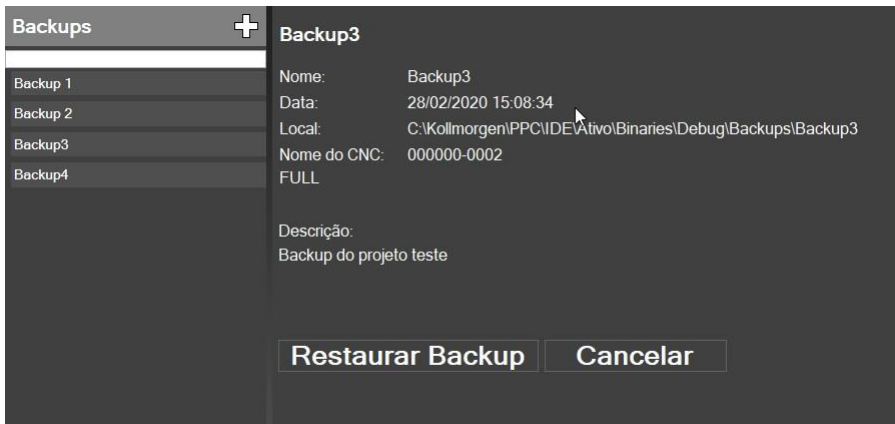


4.3.2 Restore Backup

To transfer a backup to the CNC, it must first have been previously created and be in the "Backups".

To transfer a backup to the CNC there are 2 options.

The first way is to simply click on an item in the backups list. This will change the displayed screen, showing the data from the selected backup.

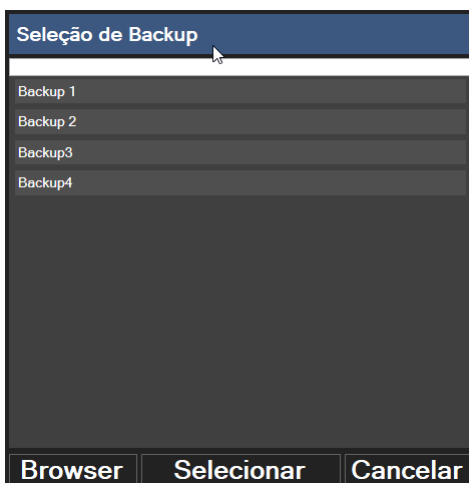


To send the selected backup click the "Restore Backup" button. The

second way is to click on the "Restore" button

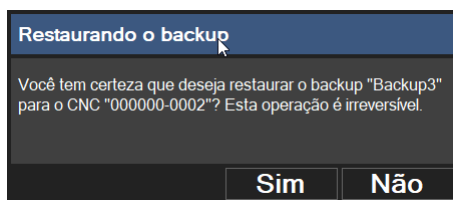


After that the following window will appear

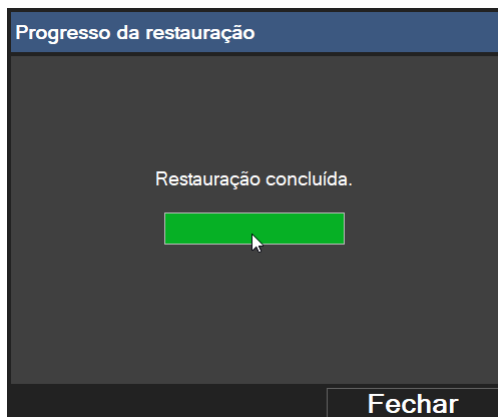


In this list of backups that appears, simply click on the desired item and then on the "Select" button.

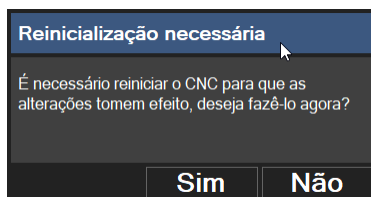
After running either way a confirmation box will be displayed.



To confirm sending the backup to the CNC click the "Yes" button. A window will appear, showing the progress of the file transfer.



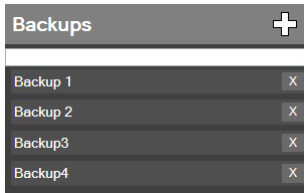
At the end of the transfer the following window will appear:



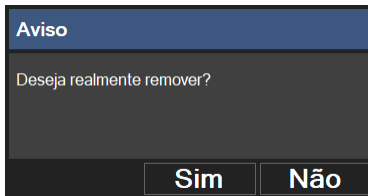
Restoring the backup will only be finished when the CNC is restarted. Confirm this by clicking the "Yes" button. If this is not done the CNC will continue running the current project.

4.3.3 Delete a Backup

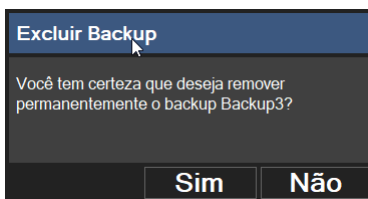
The procedure for deleting a backup is quite simple. We have 2 options for this. The first way is to click on the delete button that appears in the "Backups" list



This will bring up the following window



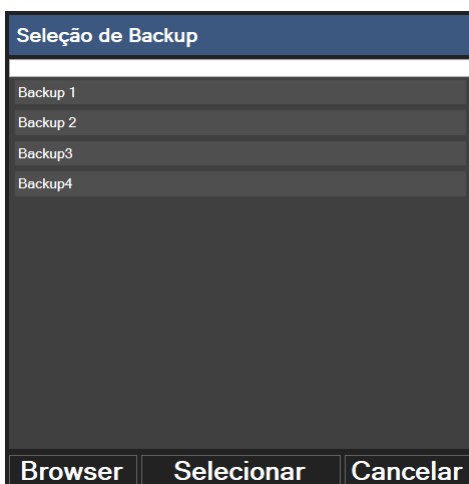
Click the "Yes" button to delete the backup. A second confirmation window will appear



The second way is to click on the "Delete" button



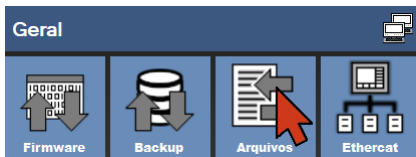
The following window will appear



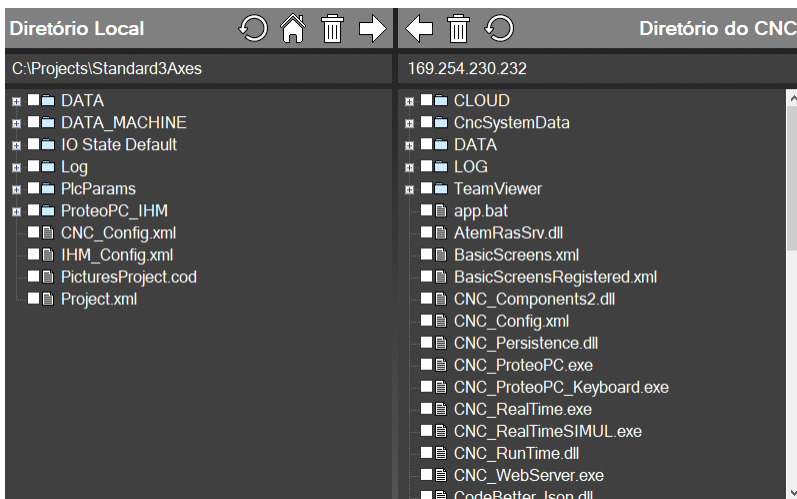
Select the backup you wish to remove from the list that appears and click the "Select" button. This will remove the backup from the list.

4.4 File Transfer

To view the File Transfer screen, in the "General" group bar click on the "Files" button



After that the following screen will appear.



On the left side of this screen is the "Local Directory" of the project that is selected. On this side we have the entire folder and file structure of our project.

In the "Local Directory" bar we have 4 buttons, they are:

-Update



Clicking this button will update the "Local Directory". This is necessary if any files have been added.

-Select Root folder



Clicking this button opens the "Windows Explorer" to choose the root folder of the "Local Directory". This should only be used if you do not have any open projects.

-Delete selected files



By clicking this button all selected files will be deleted from the "Local Directory".

-Send selected files



By clicking this button all files selected in the "Local Directory" will be uploaded to the "CNC Directory". A progress bar will be displayed to track the sending of the files. At the end of sending the files, if the folders are expanded, they will return to the initial condition.

In the "CNC Directory" bar we have 3 buttons, they are:

-Update



Clicking this button will update the "CNC Directory". This is necessary if any files have been added.

-Delete selected files



By clicking this button all selected files will be deleted from the "CNC Directory".

-Download selected files



By clicking this button all files selected in the "CNC Directory" will be uploaded to the "Local Directory". A progress bar will be displayed to track the sending of the files. At the end of sending the files, if the folders are expanded, they will return to the initial condition.

NOTE:

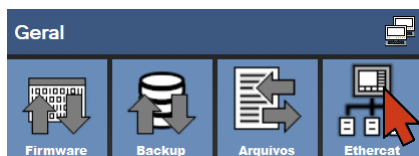
The file transfer feature should be used by advanced users, since most parts of the project, when being edited, change several files that if not properly synchronized can result in a CNC malfunction.

This feature should be used by less experienced users only to send ISO programs. These programs must be inside the directory
ROOT/DATA/PROGRAMS

4.5 Ethercat Network Scanning

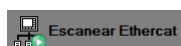
The AKC-PPC CNC uses Ethercat communication with the drives and network modules. With the IDE we can scan the network so that the CNC can communicate correctly.

To view the Ethercat network scanning screen, in the "General" group bar click on the "Ethercat" button

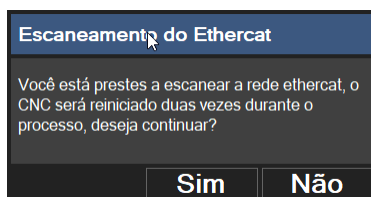


The Ethercat screen has a single specific button for this function.

To perform this function you must be connected to the CNC before scanning. To scan the network click on the "Scan Ethercat" button

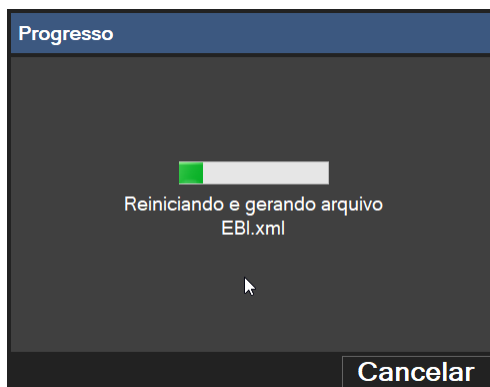


After that the following screen will appear



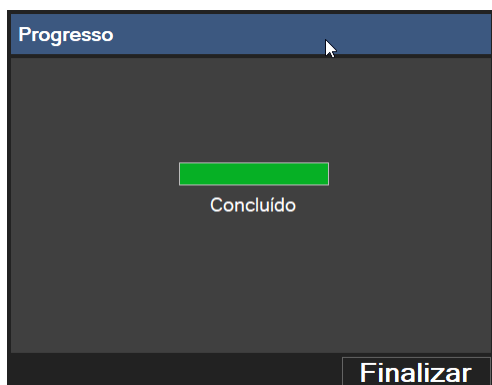
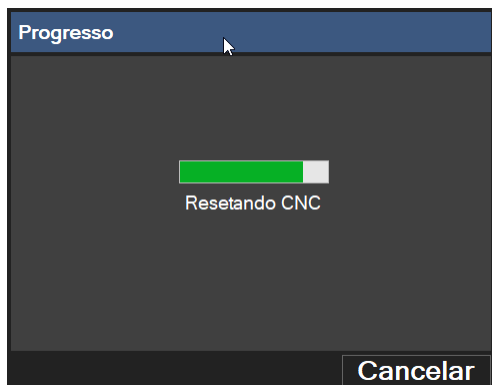
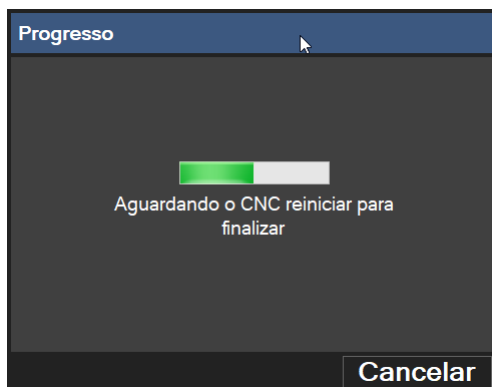
Click the "Yes" button to confirm the start of the scan

This will start the scanning process and the following screen will appear



This process takes a few minutes.

During this process a sequence of messages will appear telling you which step is being executed. The CNC will restart twice during this process.



After it has been restarted for the last time, the list of Ethercat devices that have been found and are connected to the CNC is shown on this screen.

Click the "Finish" Button to end the process.

Escanear Ethercat				
	Fornecedor	Nome	Descrição	Endereço físico
▶	Kollmorgen	AKD	AKD EtherCAT D...	1001
	Kollmorgen	AKD	AKD EtherCAT D...	1002
	Kollmorgen	AKD	AKD EtherCAT D...	1003

After this procedure, the cnc will be communicating with all these devices and they will all be operational from this point on.

NOTE:

If any Ethercat network elements are added or removed this procedure will need to be done again.

5.0 GROUP PUBLISHERS

The AKC-PPC IDE editors are the tools we will use to develop all the application design for the AKC-PPC CNC. In the "Start Menu" we have the "Editors" group



In this section we have all the editors available to assist in this purpose. Here we will explain the basic operation of each of these editors.

5.1 PLC

The AKC-PPC CNC has an integrated PLC.

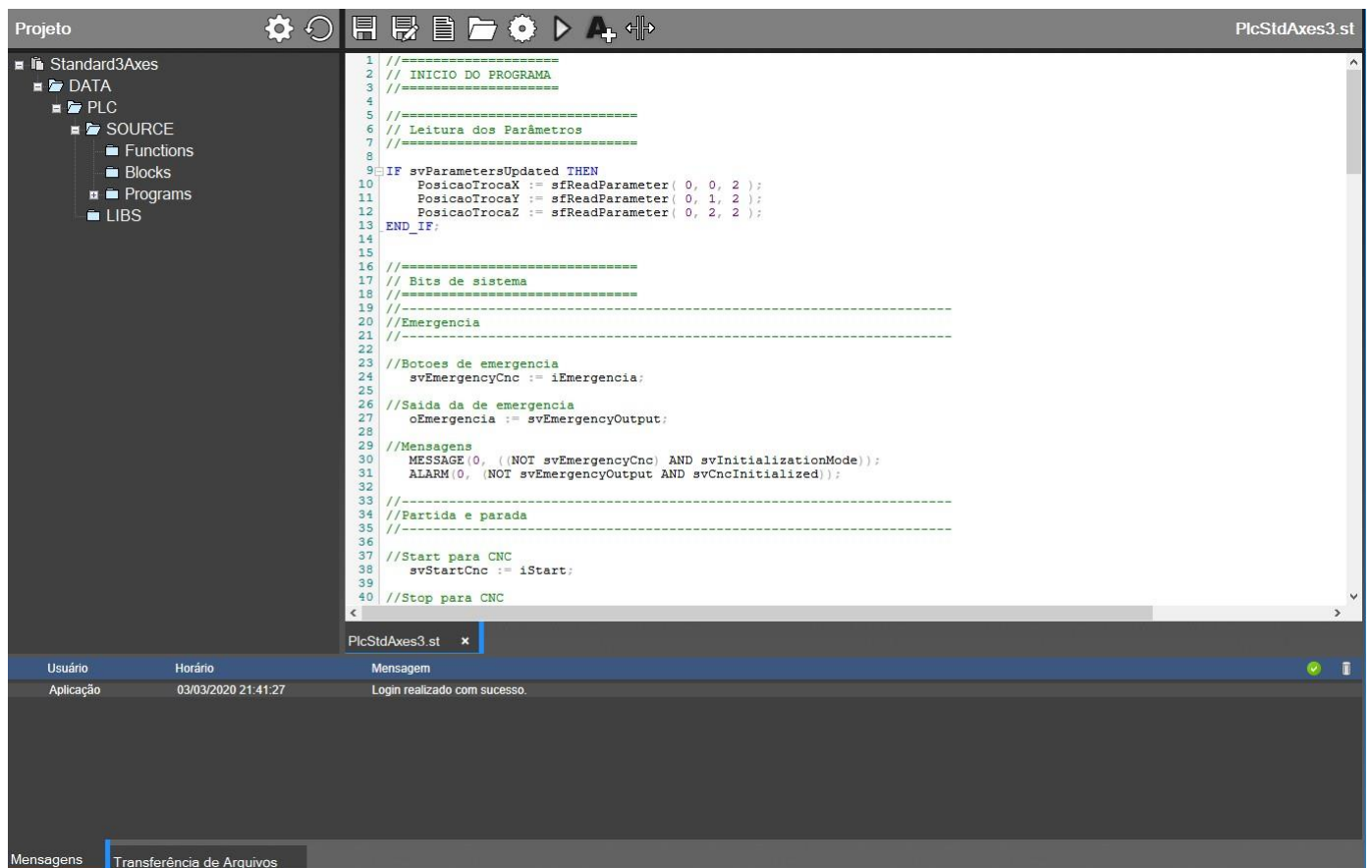
With the IDE we can program all the logic that will be used in the project.

In this manual we will cover the PLC programmed in ST language. In this screen we work with everything that is related to the PLC.

To view the PLC programming screen, in the "Editors" group click on the "PLC" button



After that the following screen will appear.



In the left area of this screen, we have the "Project" structure containing the folders and files related to the PLC. In this area you can navigate to open, add and delete PLC function files, blocks and programs.

In the right area of this screen we have the PLC file editor. In this area you will write the entire PLC program, blocks and functions.

In the lower area of this screen we have the message area. For some actions performed in the PLC editor messages will be added in this area.

To facilitate the writing of PLC code, the editor has an "Intellisense" system. With this feature, when you start typing, the editor will show the options of variables and functions, both system and user-created.

5.1.1 Upper Bar

The PLC editor has a top bar with 8 buttons that perform specific functions, described below.

-Save



This button will save the project that is in focus

-Save As



This button will save the file in focus with another name that the user will enter.

-New



This button will open a blank file named "New document.st".

-Open



This button will open the "Windows Explorer", to search for the file you want to open

-Compile



This button will compile the PLC.

-Debug



Pressing this button puts the IDE into "Debug" mode. The CNC must be connected to the IDE for this to happen.

-PLC variables



This button opens the window for registering the variables that will be used in the PLC.

-Split



This button splits the file screen in 2, allowing you to work on 2 different parts of the same file.

In the upper bar of the software we have the "Send" button. When we are in the PLC screen, this button will send the PLC files generated in the last compilation.



To execute this function you need to be connected to the CNC first.

5.1.2 PLC variables

To facilitate PLC programming, the CNC has several variables defined.

We call these variables "System Variables", since the user is not allowed to edit them. All these variables start with the prefix "sv".

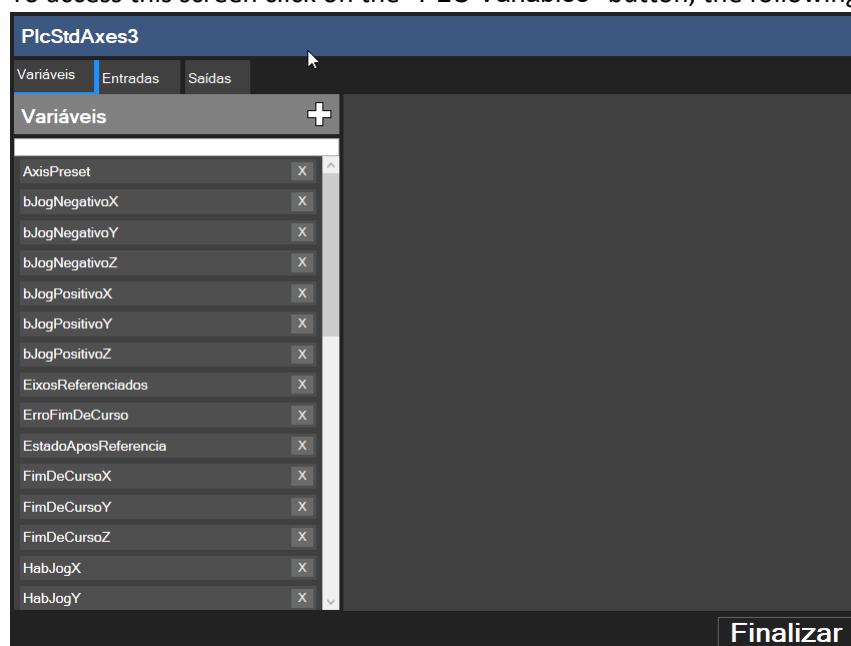
As soon as you type "sv" intelisense will show you all existing "System Variables".

For more information about "System Variables" and how to use them, refer to the PLC programming manual.

All variables that are used in the CNC and are not "System Variables" must be registered by the user.

For this function we have a dedicated screen.

To access this screen click on the "PLC Variables" button, the following screen will be displayed



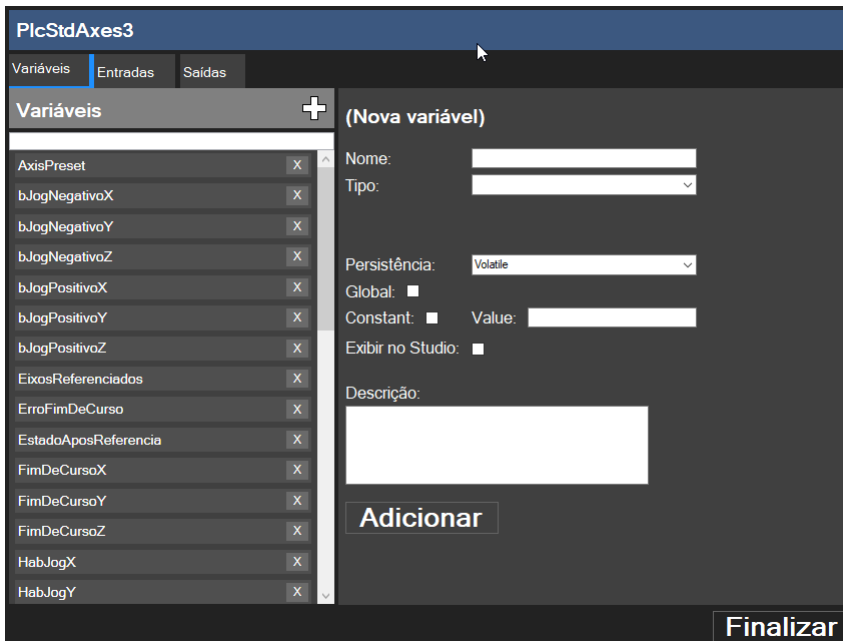
On this screen we can add, edit and remove variables that will be used in the PLC program. On this screen we can also define the variables for digital inputs and outputs.

5.1.2.1 Adding, Editing, and Deleting Variables

On the "PLC Variables" screen, select the "Variables" tab.
To add a variable click on the "Add New Variable to List" button



After that, the screen will appear as follows:



The fields "Name" and "Type" are required and must be filled out correctly. Do not use special characters or start with a number in the "Name" field.

In the "Type" field all the variable types that exist in the CNC appear, as well as all the "System Blocks" and the user-created Blocks

The "Persistence" field defines whether or not the variable value will be saved when the CNC is turned off. If you select the value "Volatile" the variable value is lost when the CNC is turned off/restarted.

If you select the value "Persistent" the value of the variable is retained when you shut down/restart the CNC.

The "Global" field should be marked on variables that will be used in other programs or in the blocks and functions that the user will build.

The "Constant" field must be checked if the variable in question is a constant. If this field is checked The "Value" field must be filled in with the value that this constant will have.

The "Display in Studio" field must be marked on variables that will be used in the HMI.

The "Description" field should be filled in with some relevant or explanatory remark about the variable. This field is not required.

After filling out all the fields correctly, click the "Add" button.

Once this is done, the added variable will appear in the list of variables.

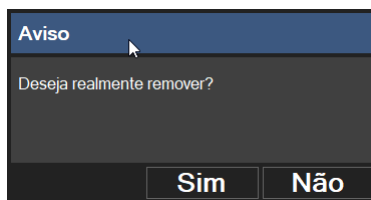
To "Edit" a variable click on the variable you want to edit in the variable list. Change the fields of the variable as desired.

To finish editing click the "Save" button.

To delete a variable, simply click on the "X" button that appears to the right of the variable



This will bring up the following window



To delete the variable click the "Yes" button

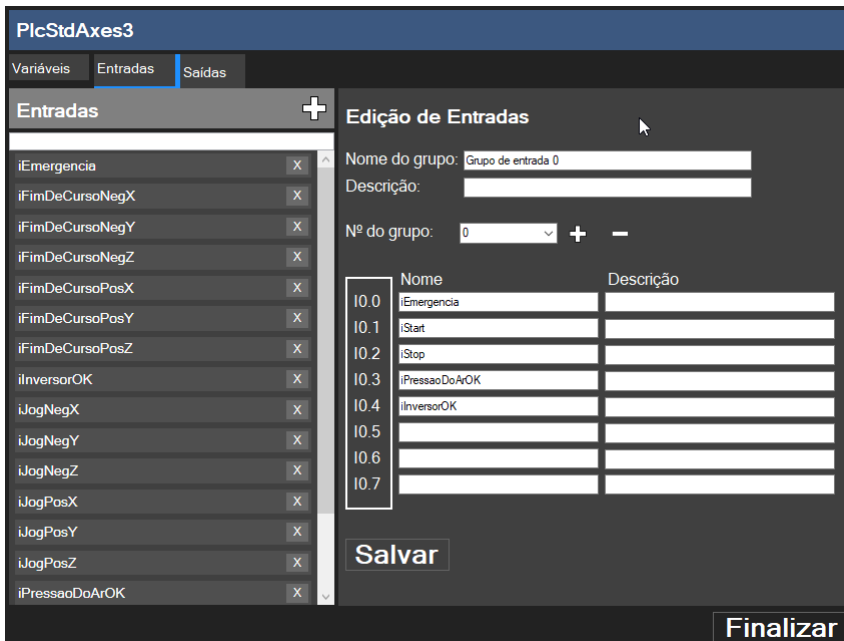
After finishing all the desired actions click on the "Finish" button

5.1.2.2 Defining Inputs

On the "PLC Variables" screen, select the "Inputs" tab.
To define an entry click on the "Add Entry" button



After that, the screen will appear as follows.



If "Entries" have already been defined, this screen can be accessed by clicking on the desired entry
Here on this screen we define all the inputs that the system will use.

These variables are separated into 8-bit groups.

These inputs originate from AKT input cards or AKD drives AKTs input cards read by the CNC are those with 8 inputs.

AKD drives have 7 inputs that are read, so the entry ending in ".7" on this screen should not be used if the device you are using is an AKD drive.

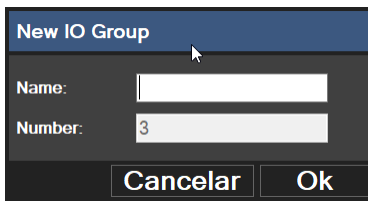
The first group has its starting address in byte 4000 (PLC address).

Each input device simply increments one unit at this address. 512 bytes are reserved for digital inputs and outputs.

First we must add the "Groups" on this screen.

Each group represents one device (AKT input card or AKD drive).

To add a group click on the "+" button that is aligned with the "Group No." field
The following screen will appear



Enter the name you will use for the group (Card Inputs 1, Drive Inputs 3, etc) and click the "Ok" button.
After that enter the names of the entries and their descriptions (not mandatory).
Click the "Save" button for each group you add or edit.

The CNC will first arrange the AKTs input cards and then the drives.

So if you have 3 drives and 2 AKT input cards connected to the CNC the groups will look like this: Group 0 -

First AKT card - Address byte 4000

Group 1 - Second AKT card - Byte address 4001 Group

2 - First AKD drive - Byte address 4002 Group 3 -

Second AKD drive - Byte address 4003 Group 4 - Third

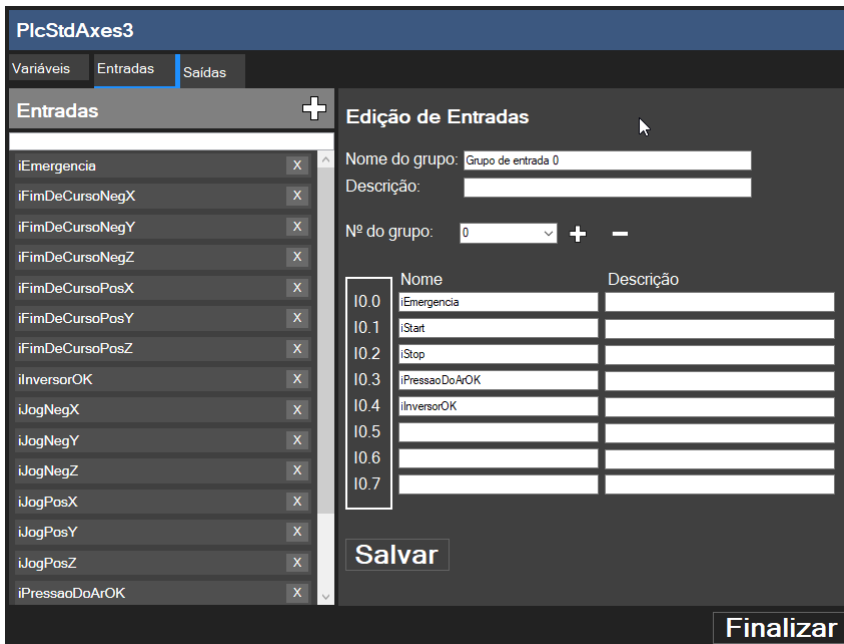
AKD drive - Byte address 4004

5.1.2.3 Defining Outputs

On the "PLC Variables" screen, select the "Outputs" tab.
To define an output click the "Add Output" button



After that, the screen will appear as follows:



If "Outputs" have already been defined, this screen can be accessed by clicking on the desired output Here on this screen we define all the outputs that the system will use. These variables are separated into groups of 8 bits.

These outputs originate from AKTs output cards or AKD drives AKTs output cards read by the CNC are those with 8 inputs.

AKD drives have 2 outputs that are used, so the outputs starting with the ending ".2" on this screen should not be used if the device you are using is an AKD drive.

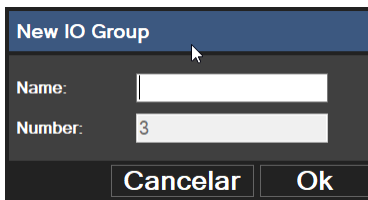
The first group has its starting address in byte 4511 (PLC address).

Each input device simply decrements this address by one. 512 bytes are reserved for digital inputs and outputs.

First we must add the "Groups" on this screen.

Each group represents one device (AKT output card or AKD drive).

To add a group click on the "+" button that is aligned with the "Group No." field
The following screen will appear



Enter the name you will use for the group (Card Outputs 4, Drive Outputs 2, etc) and click the "Ok" button.
After that enter the names of the outputs and their descriptions (not mandatory).
Click the "Save" button for each group you add or edit.

The CNC will first organize the AKTs output cards and then the drives.

So if you have 3 drives and 3 input cards AKTs connected to the CNC the groups will look like this: Group 0 -

First AKT card - Address byte 4511

Group 1 - Second AKT card - Address byte 4510

Group 2 - Third AKT card - Address byte 4509 Group 3

- First AKD drive - Address byte 4508 Group 4 -

Second AKD drive - Address byte 4507 Group 5 -

Third AKD drive - Address byte 4506

5.1.3 Functions

To facilitate PLC programming, the CNC has several functions defined.

We call these functions "System Functions", since the user is not allowed to edit them. All these functions start with the prefix "sf".

As soon as you type "sf" intellisense will show you all the existing "System Functions".

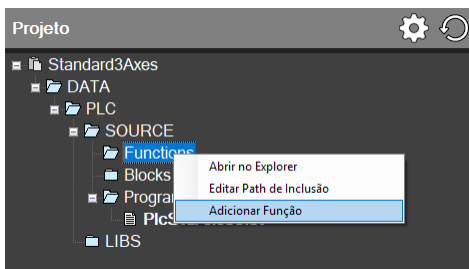
Functions can have several input data, but are characterized by only one output data.

For more information about "System Functions" and how to use them, refer to the PLC programming manual.

5.1.3.1 Add function

In the PLC editor we have the option to create functions according to the project's needs.

To add a function to your project you must right click on the "Functions" folder and select the "Add Function" option.



This will add a file named "New_Function.st" to the "Functions" folder.

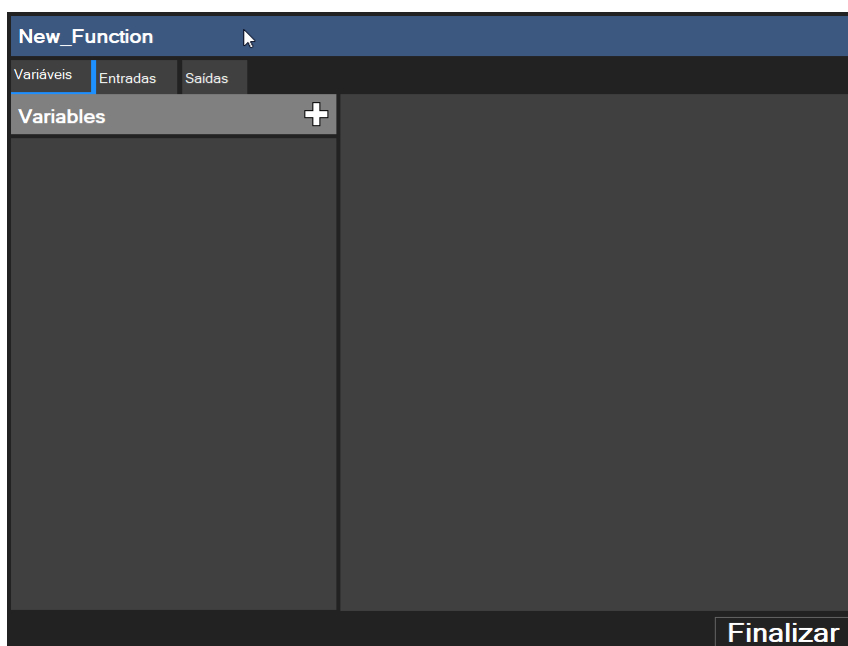
This file must be renamed. To rename this file right-click on it, in then click "Rename".

To build the function, double click on the function file. This will open the function file. To build the function you must add variables to the function.

As a rule we can add several input data, but only one output.

To add variables to the function, with the function file open, click on the "PLC Variables" button.

The following screen will appear:



On this screen we have 3 tabs to add the variables

Variables" Tab

In this tab we will register all the variables that will be used internally in the function. These variables have no connection with the PLC program.

Entries" Tab

In this tab we will register all the input variables that will be used in the function. These are the variables that will be filled in when we call our function in the PLC program.

Outputs" Tab

The name of the output variable is the same name that was assigned to the function. On this tab we will only register the type of this variable.

This is the data that will be used by the PLC program when this function is used in the PLC.

5.1.4 Blocks

To facilitate PLC programming, the CNC has several defined blocks.

We call these blocks "System Blocks", since the user has no permission to edit them. All these blocks start with the prefix "sb".

The blocks are used when we register the variables, they are not typed directly into the PLC program like functions, because they need to be instantiated.

The instance of the block is defined when we select the type of the

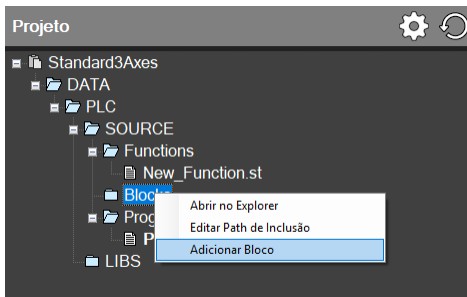
variable. Blocks can have a variety of input and output data.

For more information about the "System Blocks" and how to use them, refer to the PLC programming manual.

5.1.4.1 Add Block

In the PLC editor we have the option to create blocks according to the needs of the project.

To add a block to your project, right-click on the "Blocks" folder and select the "Add Block" option.



This will add a file named "New_Block.st" to the "Blocks" folder.

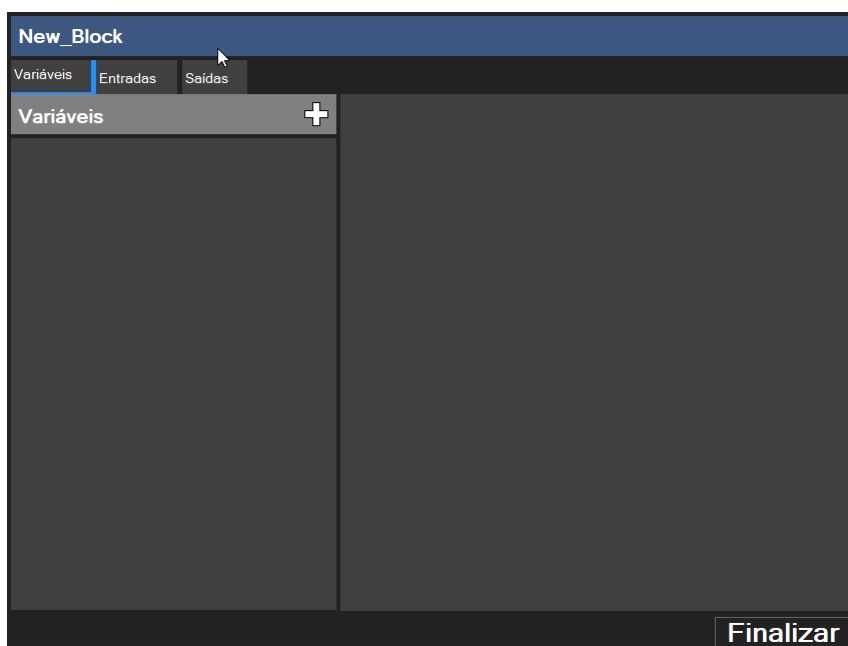
This file must be renamed. To rename this file right-click on it, in then click "Rename".

To build the block, double click on the block file. This will open the block file. To build the block, you will need to add variables to it.

Unlike the function, in the block we can add various input and output data to the block.

To add variables to the block, with the block file open, click on the "PLC Variables" button.

The following screen will appear.



On this screen we have 3 tabs to add the variables

Variables" Tab

In this tab we will register all the variables that will be used internally in the block. These variables have no connection with the PLC program.

Input" Tab

On this tab we will register all the input variables that will be used in the block.

These are the variables that will be filled in when we call our function in the PLC program.

Output" Tab

In this tab we will register all the output variables that will be used in the block. These variables are used in the PLC program as the block's return.

To access these variables, type the name of the variable that was instantiated, then type the "." key, after which intelisense will show the list with all the output variables of the block.

5.1.5 Compile

To compile the project we must press the "Compile" button mentioned earlier in the "Upper Bar" item.



Before starting the compilation it will save all the files that have not been saved yet. We can see the result of the compilation in the message area at the bottom of this screen.

Usuário	Horário	Mensagem
Aplicação	04/03/2020 09:15:36	Compilação realizada com sucesso.
Aplicação	04/03/2020 09:15:21	Compilando PlcStdAxes3.st.
Aplicação	04/03/2020 09:15:21	Arquivo PlcStdAxes3.st salvo com sucesso
Aplicação	03/03/2020 21:41:27	Login realizado com sucesso.

Mensagens | Transferência de Arquivos

When starting and ending the compilation a message will be displayed in this area.

If an error occurs during compilation, it will be displayed in this area, as we can see in the following image.

Usuário	Horário	Mensagem
Aplicação	04/03/2020 09:24:34	Erro na compilação.
Aplicação	04/03/2020 09:24:34	Error at line 195, file: PlcStdAxes3 : PosicaoTroaX is not defined
Aplicação	04/03/2020 09:24:31	Compilando PlcStdAxes3.st.
Aplicação	04/03/2020 09:24:31	Arquivo PlcStdAxes3.st salvo com sucesso
Aplicação	04/03/2020 09:15:36	Compilação realizada com sucesso.
Aplicação	04/03/2020 09:15:21	Compilando PlcStdAxes3.st.
Aplicação	04/03/2020 09:15:21	Arquivo PlcStdAxes3.st salvo com sucesso
Aplicação	03/03/2020 21:41:27	Login realizado com sucesso.

Mensagens | Transferência de Arquivos

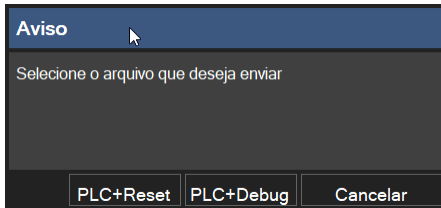
5.1.6 Transfer PLC

To perform this action the IDE must be connected to the CNC.

When you perform this action the IDE will send the PLC files generated in the last valid compilation to the CNC. To transmit the PLC to the control we must press the "Send" button.

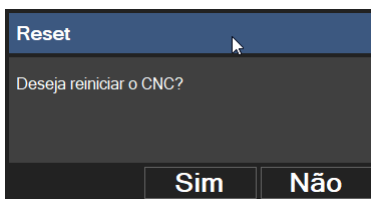


After that the following screen will appear



In this window we have 2 options for sending the PLC, PLC+Reset and PLC+Debug

In the PLC+Reset option the PLC file will be sent and will not be active until the CNC restarts.



To effect the PLC click on the "Yes" button

In the PLC+Debug option the PLC file will be sent and become active on the CNC after transfer.

We do not recommend using this option, especially if you have added a variable, or if the code has undergone a change in the number of lines.

This option is a more dangerous option and should only be used by more experienced users, since there can be some misalignment in the PLC memory addresses and with that some unexpected reactions can occur in the CNC.

We can see the result of the transfer in the message area at the bottom of this screen.

Usuário	Horário	Mensagem
Aplicação	04/03/2020 09:42:11	PLC.COD enviado com sucesso
Aplicação	04/03/2020 09:42:09	Enviando PLC.COD para o CNC Ativo.Model.Proteo

Mensagens | Transferência de Arquivos

To see the files that have been sent, click on the "File Transference" tab.

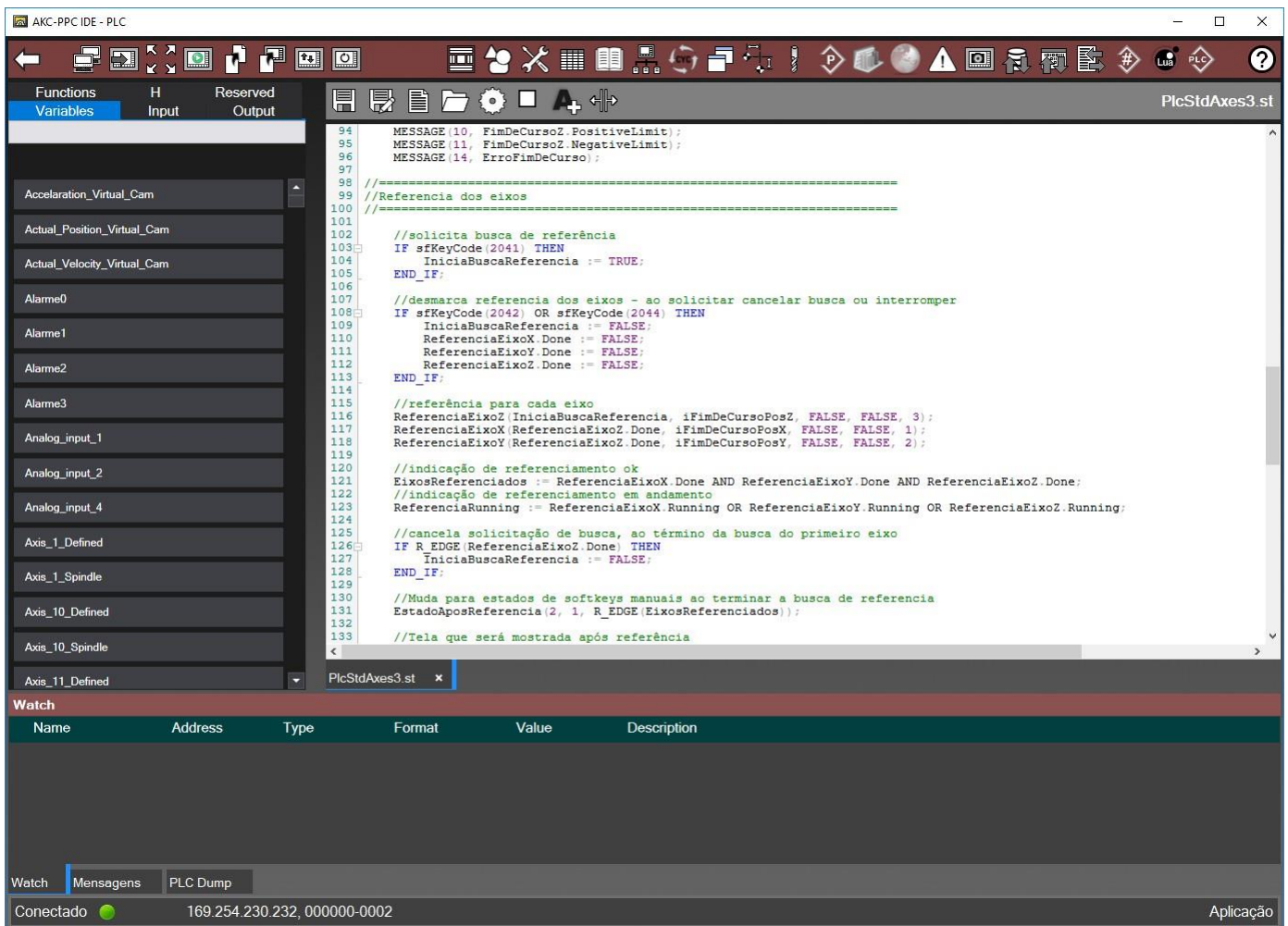
5.1.7 Debug PLC

To start Debug Mode we must press the "Debug" button mentioned earlier in the "Top Bar" item.



For this the IDE must be connected to the CNC.

If Debug Mode startup was performed correctly, the IDE's screen will change color and look as shown below.



Notice that the bars have changed color.

Note that in the lower message area two tabs are included, Watch and Plc Dump. At this point the file transfer tab will be removed.

To exit the Debug Mode click the "Stop Debug" button.



The bars will return to their previous color and the area where the Watch and Plc Dump was will become the message area again.

5.1.7.1 Check Variables - Watches

To use this feature we must be in Debug Mode, as shown above.

Note that there are no variables being checked in the Watch tab after we enter Debug Mode. To do this, we must select from the side list which variables we will monitor, as shown below. In the example below we have selected 4 variables.

The screenshot shows the AKC-PPC IDE - PLC interface. The main window displays a ladder logic program for 'PlcStdAxes3.st'. The left sidebar shows a list of variables, with four variables selected: HabJogX, HabJogY, ErroFimDeCurso, and EixosReferenciados. The bottom panel shows the Watch tab with the following table:

Name	Address	Type	Format	Value	Description
* HabJogX	5491.0	BOOL		0	
* HabJogY	5491.1	BOOL		0	
* ErroFimDeCurso	5505.1	BOOL		0	
* EixosReferenciados	5492.3	BOOL		0	

At the bottom of the interface, the status bar shows 'Conectado' (Connected) with a green dot, the IP address '169.254.230.232, 000000-0002', and the application name 'Aplicação'.

You can choose the format that the variable will be displayed in the "Format" column. You can change the value of the variable in the "Value" column.

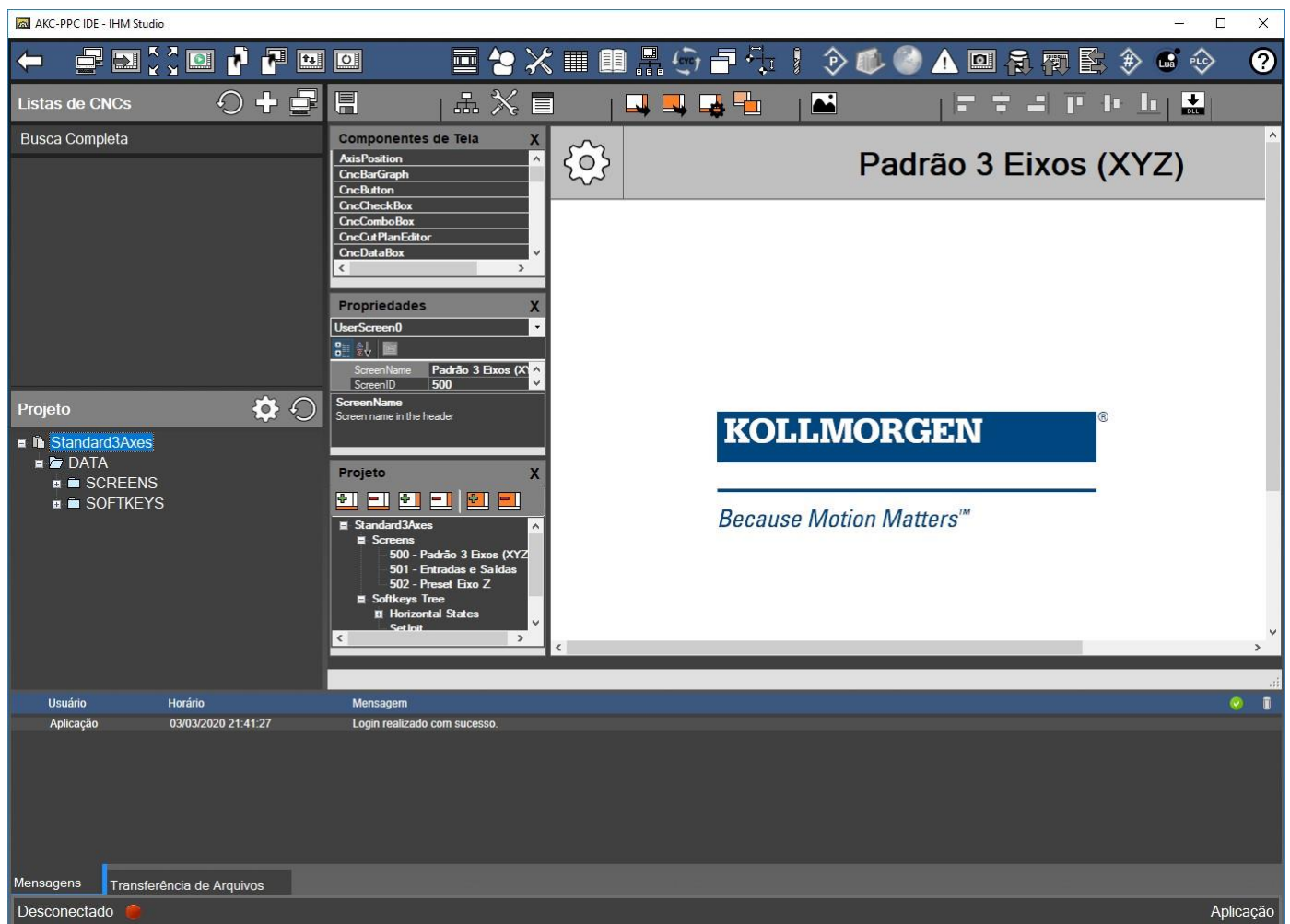
5.2 HMI Studio

The HMI Studio is the editor responsible for developing all the visual part of the AKC-PPC CNC project. In this editor we will build all the screens and their navigation for the project.

To view the HMI studio screen, in the "Editors" group bar click on the "HMI Studio" button



After that the following screen will appear



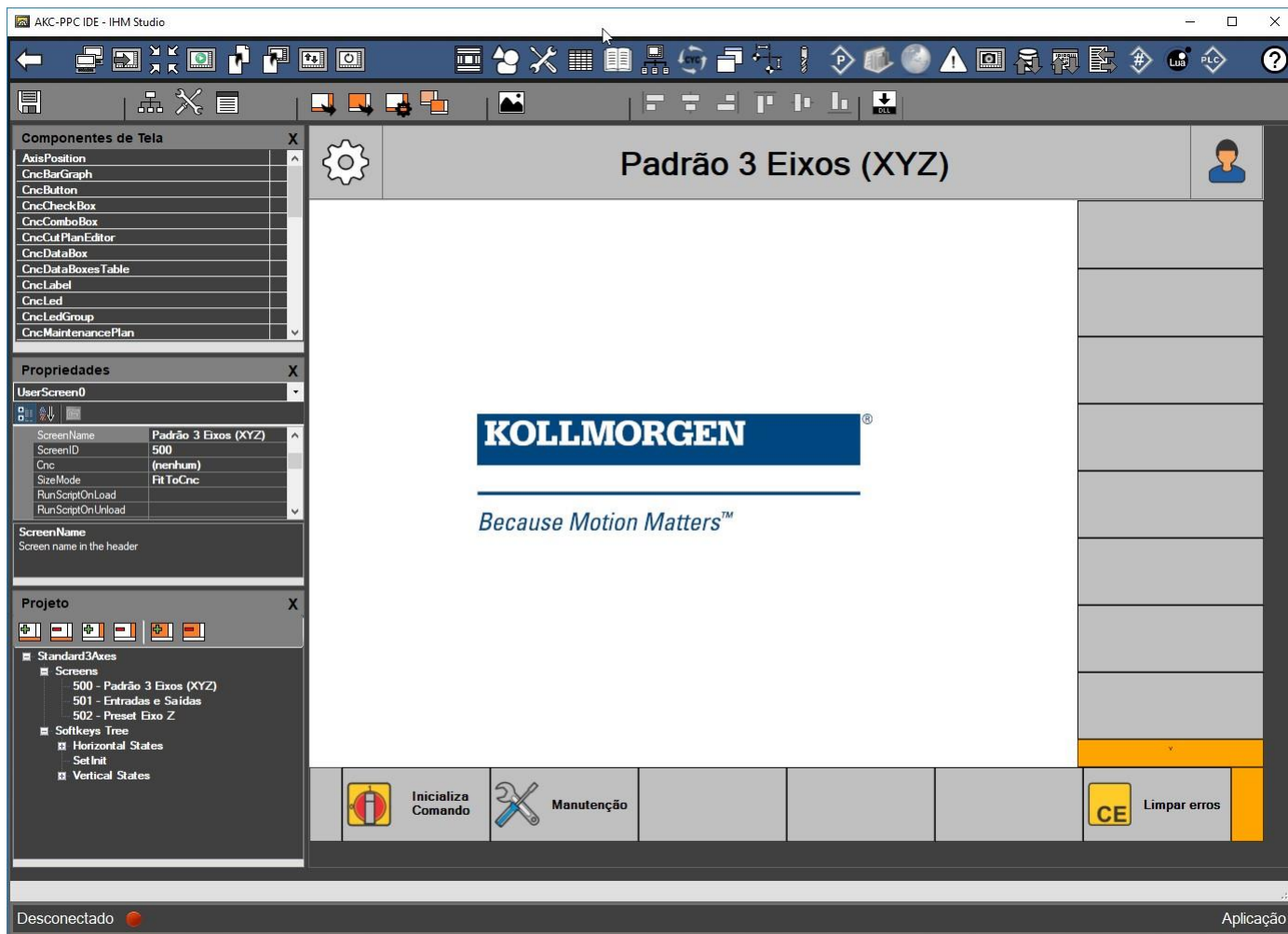
On the left side of this screen, at the top is the list of CNCs to connect to, and below is the structure of the "Project" containing the folders and files related to the HMI Studio. On the right side we have the HMI Studio editor.

To make your work easier and get a better view of the project, we recommend using this editor with the IDE's workspace expanded.

To do this click on the "Expand Desktop" button.



This will bring up the screen as follows.



So what we see in the IDE is only the HMI Studio editor.

This feature makes it much easier to develop the visual part of the project.

5.2.1 Upper Bar

The HMI Studio editor has a top bar with 16 buttons that perform specific functions, described below.

- Save



This button will save the HMI project

- Project Tree



This button will display the "Project Tree" in the left part of the editor

- Toolbox



This button will display the "Toolbox" in the left part of the editor

- Properties



This button will display the "Component Properties Box" in the left part of the editor.

- Generate softkeys



This button will compile the "Softkeys" files

- Generate Canvas



This button will compile the "Canvas" files

- HMI Configuration



This button will open the "HMI Configuration" screen.

- Select Base Screens



This button will open the screen for selecting the base screens that will be used in the project.

- Image Banks



This button will open the "Image Banks" screen

- Align left



- Align by center



- Align right



- Align from above



- Align by center



- Align from below



To use the alignment buttons you need to have at least 2 components selected. The alignment action will be based on the last selected component.

The selection can be made with the mouse (selecting an area with several components) or by clicking on each component with the "Control" key pressed down.

- Add DLL



This button will open Windows Explorer to select a DLL that contains user-developed components. This DLL must be produced based on the architecture of the CNC, so this is only recommended for very experienced users trained in programming the AKC-PPC CNC.

5.2.2 HMI Design

The HMI project is divided into 3 parts. HMI configuration, screens and softkeys. To build the HMI project we will go through these 3 items.

The purpose of the HMI configuration file is to define a series of defaults that will be used by the CNC and that will be loaded at startup. These standards are the colors, font sizes, etc.

Screens are the areas reserved to place all the components that will be used in the project. Softkeys

are sets of buttons placed in a particular area of the CNC.

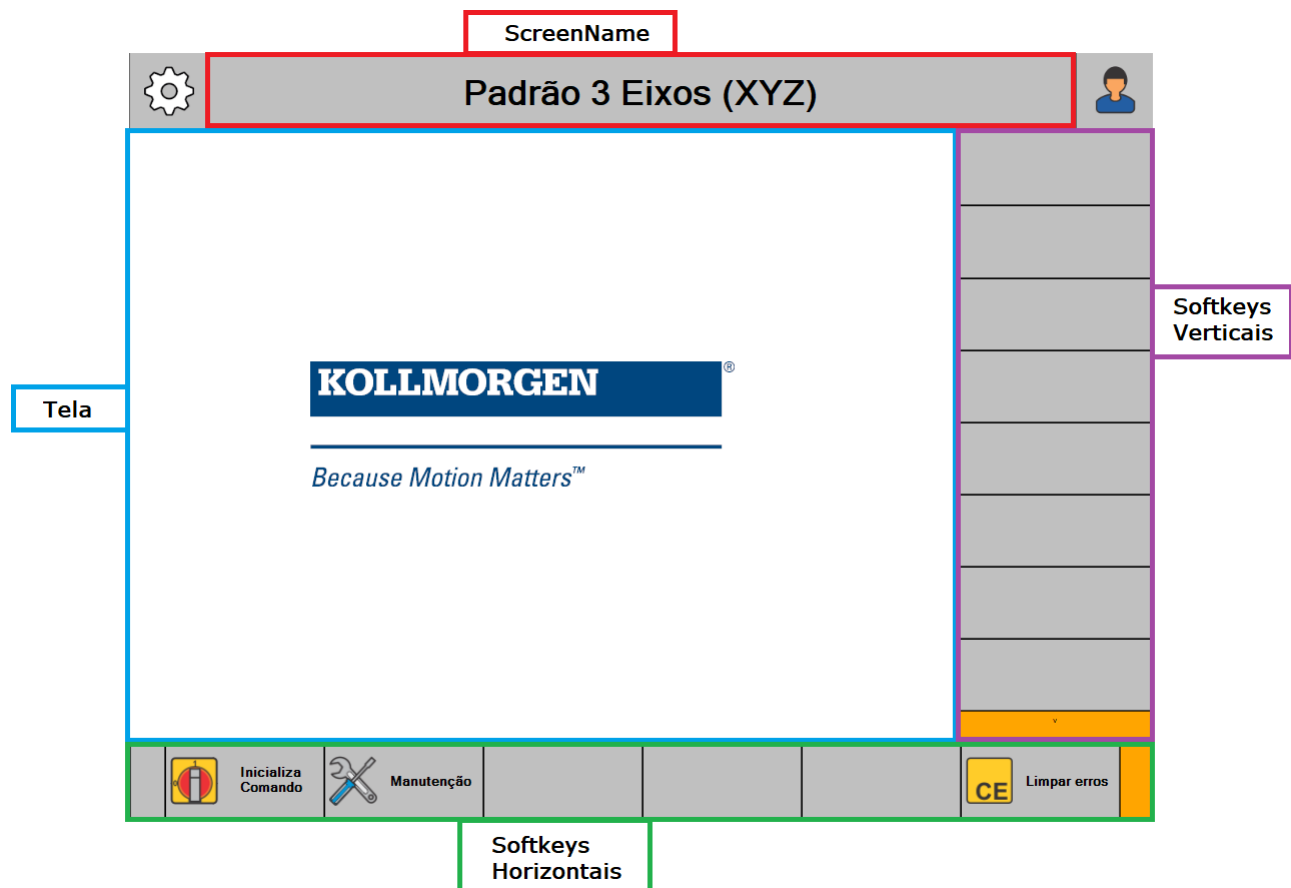
These buttons are intended to facilitate navigation between screens.

These buttons can also perform a number of actions in conjunction with the CNC, the PLC, or with Scripts.

We have 2 sets of softkeys that we call the "softkey tree".

We have horizontal and vertical softkey trees. The horizontal softkeys are in the lower area of the screen.

The vertical softkeys are in the right-hand side area of the screen.

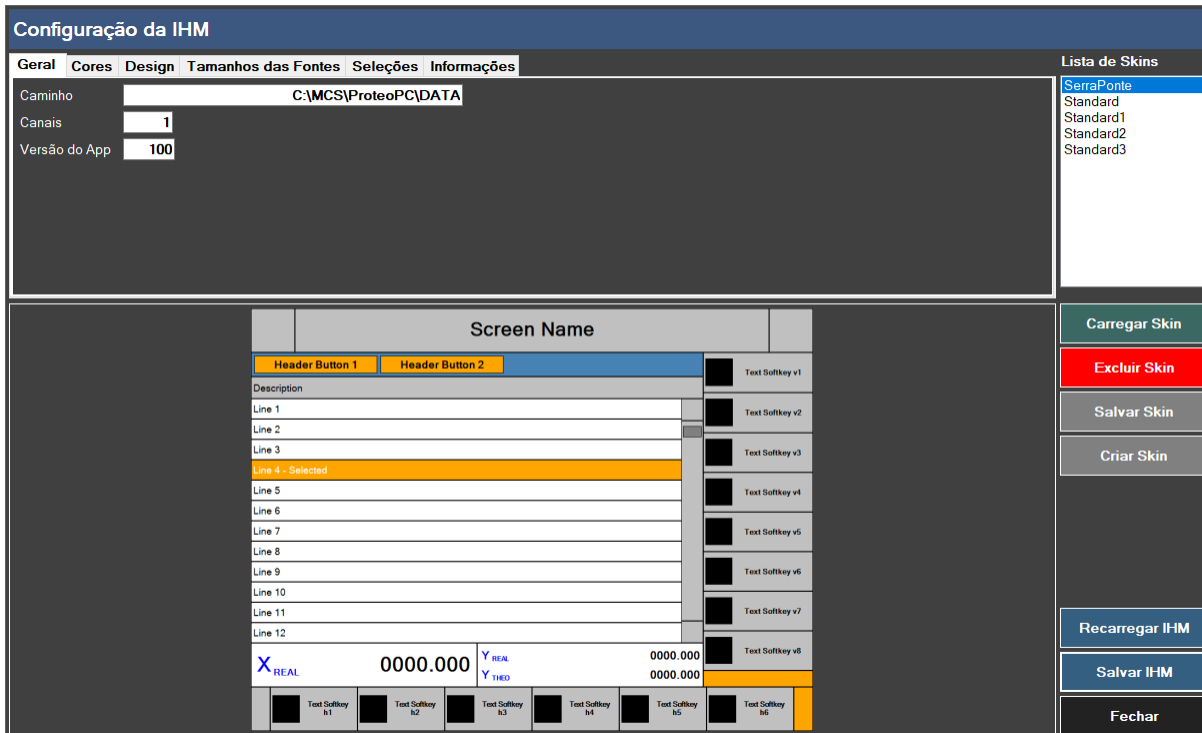


5.2.2.1 HMI Configuration

To configure the HMI project click on the "HMI Configuration" button



The following screen will appear.



On this screen we have all the resources available for configuring colors, fonts, sizes, and a few other features. With this we create an identity for the project. All these features are separated into 6 tabs.

Fill in all fields according to the project specification. To generate the configuration file click the "Save HMI" button.

If you have made changes in the fields on this screen and have not yet saved, but want to restore the current configuration, click "Reload HMI" button.

In this screen you can create your configuration pattern and store it for use in any project, so that you don't have to configure each project every time you start a new one. To do this, at the end of the configuration, click the "Create Skin" button. With this your default setting will appear in the list of skins.

To use a skin, select the skin you want to use from the list and click on the "Load Skin" button, then click on the "Save HMI" button.

On this screen you can delete or edit the skins you have created as well.

5.2.2.2 Screens

As mentioned earlier, the screens are the reserved areas where we will see all the components that will be used in the project.

The screens have the purpose of interfacing the CNC to the user. We have 2 types of screens, base screens and custom screens.

All screens are called by codes, which is a number that identifies the screen. These codes can be sent to the CNC by the PLC, softkeys, buttons, and scripts.

Base screens are ready-made screens that have defined properties and cannot be changed. Base screens are called by the codes 300 through 349.

The custom screens are the screens that we will build in our project, once we don't have any base screen that meets the project's need.

The custom screens are called by codes 500 to 549.

5.2.2.2.1 Base Screens

To use the base screens, you must select the screens that you will use in the project. To do this, click on the "Select Base Screens" button



The following screen will appear.



On this screen select all the base screens that will be used in the project. To save click the "Ok" button.

This is done because each screen that is used consumes memory and CNC processing time to load it. Therefore it is not recommended that all base screens are loaded if they are not used. This saves time when starting up the CNC as well.

5.2.2.2.2 Customized Screens

To insert a custom screen click on the "Add Screen" button in the "Project" box



This will add a blank canvas.

In the screen properties we need to program at least 3 properties.

-BackColor

It is the background color of the screen

-ScreenName

This is the screen text that will be displayed when you select it

-SizeMode

It is the type of the screen

In this property we have 3 options. Popup, ShowAxisPosition and FitToCnc;

The Popup screen will open centrally on the CNC.

On this screen we must program the Size property that this screen will have.

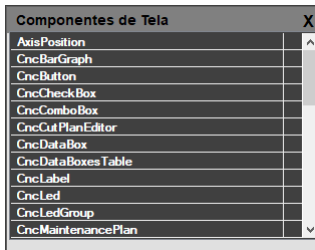
On the ShowAxisPosition screen the component showing the axis coordinates is displayed at the bottom of the screen. The height of the axis coordinate component is programmed in the CNC configuration file.

In the FitToCnc screen we will use the entire available screen area.

5.2.2.2.3 Components

To build the custom canvas we must add all the necessary components to the canvas. All available components are in the "Canvas Components" box

To add components to the canvas click on the desired component and drag it to the canvas.



To change component properties click on the component and change its properties in the box "Properties".



5.2.2.2.4 Special Components

There are some components that cannot have more than one instance in the project.

These are "GraphicMonitor", "MaintenancePlan" and "ProductionControl".

These components can only be entered once on a single screen.

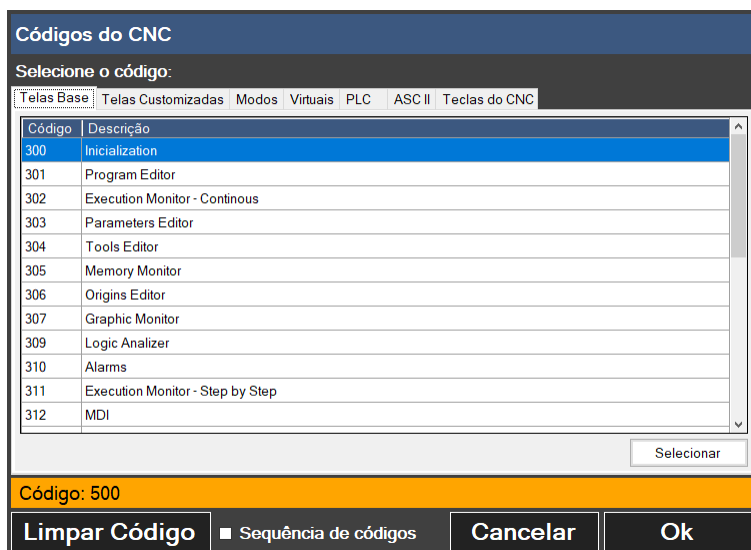
These components are used in base screens 307, 340 and 346 respectively.

So if you use any of these screens you cannot create any more screens with the components mentioned above.

If this rule is not followed, a CNC malfunction will occur.

5.2.2.2.5 Start Screen

To set the start screen, go to the project tree and double-click the "Set Init" item. This will bring up the following screen.



Select the screen code that will be the initial screen. This can be done by using the "Select" button, or by double-clicking about the code.

This selection must be made on the "Basic Screens" tab or the "User Screens" tab.

On this screen you can set up a sequence of codes that will be executed at CNC startup, with a maximum of 4 codes. One of these codes must be a screen.

5.2.2.3 Softkeys

As mentioned earlier, softkeys are sets of buttons placed in a certain area of the CNC. These buttons are intended to facilitate navigation between screens.

These buttons can also perform a number of actions in conjunction with the CNC, the PLC, or with Scripts.

We can call screens, send code to the CNC, change PLC memories and H-registers, run scripts, change selected softkey trees, among other features.

We have 2 sets of softkeys that we call the "softkey tree".

We have the horizontal and vertical softkey trees.

5.2.2.3.1 Softkey Properties

- **DescriptionText**

This is the text that will be displayed on the softkey

- **DescriptionTextOnPressed**

This is the text that will be displayed on the softkey when it is pressed

- **Image**

This is the text that will be displayed on the softkey

- **ImageOnPressed**

This is the text that will be displayed on the softkey when it is pressed

- **Type**

This is the type of softkey that will be used. We have 3 options to program this property:

Standard - here the softkey behaves like an ordinary button

Toggle - here the softkey behaves like a 2-state button, i.e. when clicked it goes to the "On" state. When clicked again it goes back to the "Off" state.

To have this effect we need to have a PLC variable programmed in the "MemoryBit" property.

Empty - here the softkey is not used, it will only have the background color filled in

- **MemoryBit**

Here we program the PLC memory that is linked to the softkey.

If the softkey's "Type" field is "Standard"

When you press the soft key the value of this variable goes to logic level 1
When you release the soft key the value of this variable goes to logic level 0

If the "Type" field of the softkey is "Toggle"

When you click the softkey the value of this variable will be inverted (if it is at logic level 1 it will be changed to 0 and if it is at logic level 0 it will be changed to 1) and it will hold this value until the next click.

- **LockBit**

Here we program the PLC memory that will be responsible for blocking the softkey action.
When this memory is at logic level 1 all softkey actions are blocked. When this memory is at logic level 0 all softkey actions are active.

- **RunScriptOnClick**

To run a script, put its name here (with the .lua eextension).

When you click on the softkey, if there is a valid scrip file in this property, it will be executed.

- **CodeOnPressed**

Pressing the softkey will send the code (or code sequence) that is programmed here to the CNC.

Here we can put the screen code, some code that is being used by the PLC, change the operation mode, etc.

- **CodeOnReleased**

When you release the softkey the code (or code sequence) that is programmed here will be sent to the CNC.

Here, as in the previous property, we can put the screen code, some code that is being used by the PLC, change the operation mode, etc.

- **NewStateHorizontal**

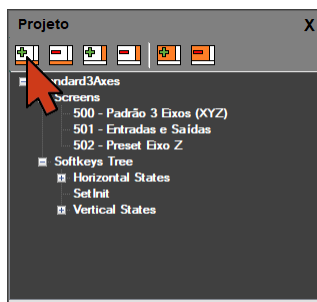
Here we program the number of the horizontal softkey tree that we want to call up when this softkey is clicked.

- **NewStateVertical**

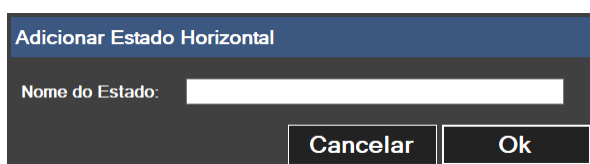
Here we program the number of the vertical softkey tree that we want to call up when this softkey is clicked.

5.2.2.3.2 Horizontal Softkeys

To add a horizontal softkey tree click on the "Add Horizontal Softkey State" button



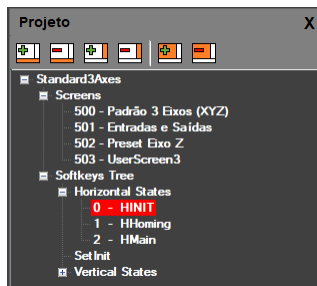
The following window will appear.



Enter the name of the state you want and then click the "Ok" button

An empty softkey tree will be added with the entered name.

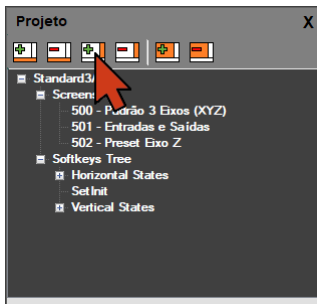
This tree can be viewed and selected in the "Project" box under the "Softkeys Tree / Horizontal States" node



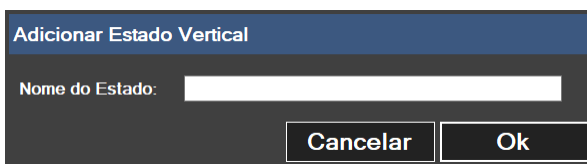
We recommend starting the horizontal softkey trees with "H_" or "H" for easy identification of it.

5.2.2.3.3 Vertical Softkeys

To add a vertical softkey tree click on the "Add Vertical Softkey State" button



The following window will appear.



Enter the name of the state you want and then click the "Ok" button

An empty softkey tree will be added with the entered name.

This tree can be viewed and selected in the "Project" box under the "Softkeys Tree / Vertical States" node



We recommend starting the name of vertical softkey trees with "V_" or "V" to make it easier to identify it.

5.2.2.3.4 Initial Softkeys

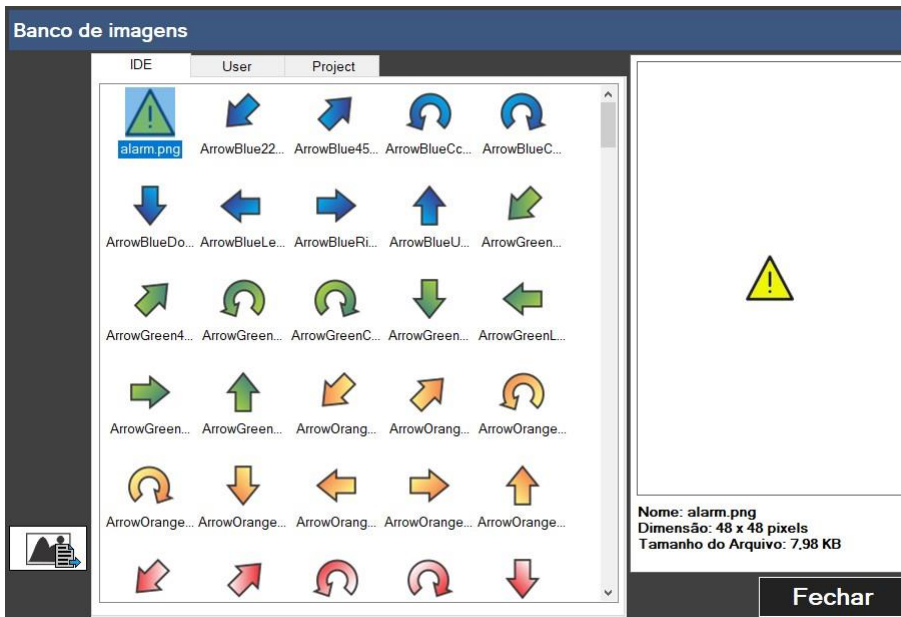
On CNC startup the softkey trees shown will be the trees with index 0 for both the horizontal and vertical tree.

5.2.2.4 Image Bank

All images that will be used in the project must be added to the IDE's "Image Database". To open the Image Bank screen click on the "Image Bank" button in the upper bar of the editor



After this action the following screen will appear



This screen has 3 tabs, IDE, User and Project.

The IDE tab contains images that we provide for the development of the project, in this tab you cannot add or remove images.

In the User tab an image bank file is generated and saved in a directory at the computer location.

In the Project tab an image database file is generated and saved within the project. So if someone else is going to work on the same project, or if this project is sent to someone else to view or edit, it is recommended that the pictures are loaded into this tab.

Do not put pictures with the same name in different tabs, because the IDE will use only one of them when using it.

5.3 Messages

The message editor is responsible for recording all messages that will be displayed by the PLC in the AKC-PPC CNC project.

Messages are displayed in the upper area of the screen, in the same area as the current screen name. When a message is displayed, this area is divided into 2 parts.

At the top the message will be displayed and at the bottom the name of the current screen will be displayed. To view the message screen, in the "Editors" group click on the "Messages" button.



After that the following screen will appear

ID	Tipo	Texto
0	Temporizada	Start bloqueado
0	Normal	Emergência pressionada
1	Normal	Máquina não referenciada
2	Normal	Stop pressionado
3	Normal	Erro de jog no eixo X
4	Normal	Erro de jog no eixo Y
5	Normal	Erro de jog no eixo Z
6	Normal	Fim de curso X positivo
7	Normal	Fim de curso X negativo
8	Normal	Fim de curso Y positivo
9	Normal	Fim de curso Y negativo
10	Normal	Fim de curso Z positivo
11	Normal	Fim de curso Z negativo
12	Normal	Falha no inversor
13	Normal	Falha na pressão de ar
14	Normal	Erro de fim de curso
0	Alarme	Emergência pressionada
*		

In this editor we see a table where we will register all the messages that will be displayed by the PLC. The upper bar of this editor has only the "Save" button.

The process of recording messages is very simple

In the table displayed on this screen we have three columns that must be filled in.

- ID

The ID is assigned automatically by the editor, but if you need to change this value, it is possible. It is by the value of this field that the message will be displayed by the PLC.

- Type

In this column we should select the type of message that will be displayed.

We have 4 types of messages that can be displayed on the CNC.

All these messages will be called by the PLC.

Type = Normal

This message is shown on the screen continuously, as long as the PLC memory that enabled the message is on logic level 1.

When this message appears the background color of the message will be yellow.

Type = Blinking

This message is shown on the screen with a time interval of 2s, as long as the PLC memory that enabled the message is on logic level 1.

When this message appears the background color of the message will be yellow.

Type = Timed

This message is shown on the screen for 4s, when the PLC memory that is linked to it detects a rising edge, i.e. changes from logic level 0 to logic level 1.

When this message appears the background color of the message will be yellow.

Type = Alarm

This message is shown on the screen continuously when the PLC memory that is linked to it detects a rising edge, that is, changing from logic level 0 to logic level 1.

This type of message is only removed from the screen when the "Clear Errors" button code is sent to the CNC (code 333).

When this message appears the background color of the message will be red.

- Text

In this field we must write the text of the message that will be displayed on the screen when the message is called by the PLC.

In this editor the following number of messages can be registered according to type:

128 messages of type "Normal". Index 0 to 127.

32 "Blinking" type messages. Index 0 to 31.

32 messages of type "Timed". Index 0 to 31.

64 messages of type "Alarm". Index 0 to 63.

To check the functions that perform the message display, refer to the PLC programming manual.

5.4 Parameters

The AKC-PPC CNC has a base screen called "Parameter Editor" this screen shows all parameters existing in the CNC. On this screen we have 4 tabs. General, Axis (which has 32 axes), PLC and Network. All these parameters are defined and cannot be customized, except for the parameters in the PLC tab. In this area we have 100 parameters reserved for the project and they are fully customizable.

All these parameters are password protected, with access only for the highest level user. Therefore the parameters set here should not be of use to a normal CNC operator. For this purpose it is recommended to build a screen, where the average operator can have full access.

The IDE's parameter editor is responsible for generating the parameter configuration files that are in the PLC tab. All customization of this tab is done in this editor.

To view the Parameters editor screen, in the "Editors" group, click on the "Parameters" button



After that the following screen will appear

#	Texto	Texto de Ajuda	Unidade	Formato	Limites
900	Posição de troca de ferramenta X	Posição X para efetuar a troca de ferramenta - G53	mm	5.3	-10000;10000
901	Posição de troca de ferramenta Y	Posição Y para efetuar a troca de ferramenta - G53	mm	5.3	-10000;10000
902	Posição de troca de ferramenta Z	Posição Z para efetuar a troca de ferramenta - G53	mm	5.3	-10000;10000
903	NA	-	-	3.0	0;1000
904	NA	-	-	3.0	0;1000
905	NA	-	-	3.0	0;1000
906	NA	-	-	3.0	0;1000
907	NA	-	-	3.0	0;1000
908	NA	-	-	3.0	0;1000
909	NA	-	-	3.0	0;1000
910	NA	-	-	3.0	0;1000
911	NA	-	-	3.0	0;1000
912	NA	-	-	3.0	0;1000
913	NA	-	-	3.0	0;1000
914	NA	-	-	3.0	0;1000
915	NA	-	-	3.0	0;1000
916	NA	-	-	3.0	0;1000
917	NA	-	-	3.0	0;1000

5.4.1 Upper Bar

The parameter editor has a top bar with 3 buttons that perform specific functions, described below.

- Save



This button will save the base of the parameter files

- Generate Files



This button will generate the PLC parameter files used by the CNC.

- Create new PLC file



This button will load a base where all parameters are blank

5.4.2 Parameter Table

The process for setting the PLC parameters is quite simple
In the table displayed on this screen we have 6 columns that must be properly filled in.

- #

This column is already filled out in the proper way by the editor.

- Text

Fill this column with the text that will be used by the parameter

- Help text

Fill this column with the help text that will be used by the parameter

- Unit

Fill this column with the text of the unit that will be used by the parameter

- Format

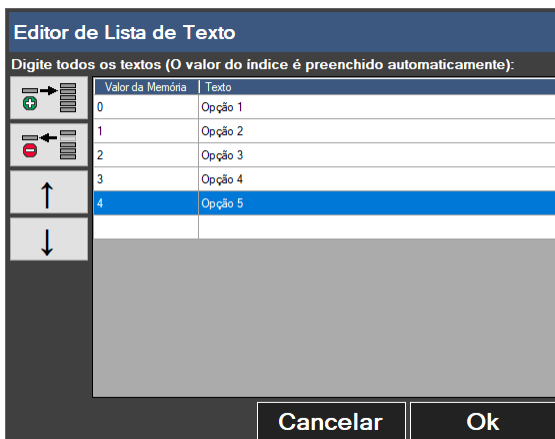
Fill in this column with the format of the number to be displayed

If this field is a number fill this column with the number of whole numbers of the number, followed by the digit dot and lastly the number of numbers that will be used in the decimal (fractional) part of the number.

The parameter can be configured to display a combo box with a list of texts

To use the parameter in this way put all the texts here in this column, separating them with the character ";".

To help you fill in the texts, double click on the field. This will bring up the following screen



On this screen we can add all the desired texts, in the correct order.

After typing all the necessary texts click the "Ok" button.

- Limits

In this column type the upper and lower limit of the parameter separated by the character ";".

If the format of the parameter in question is a combo box the value of this column will be ignored.

5.5 Scripts

The script in the CNC is a text file that will have a sequence of instructions that will be executed every time it is requested. This will usually happen by some component (button, softkey, screen, etc) that has this option available.

The CNC scripts are made based on the programming language "Lua". This programming language has been developed in Brazil in the mid-1990s.

The Lua programming manual can be accessed at <https://www.lua.org/manual/5.1/pt/manual.html>

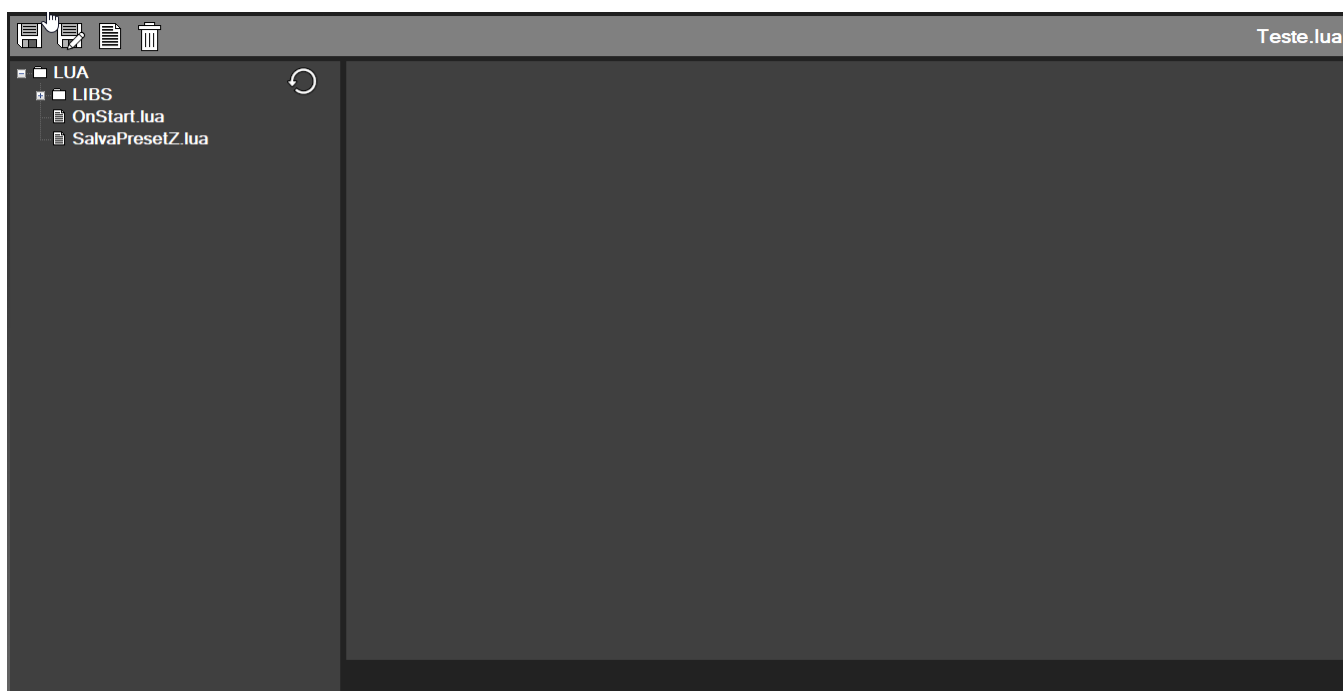
To complement this language we added some special functions referring to the needs of the CNC, such as writing and reading variables, tables, parameters, among others. This topic will be dealt with later.

In this editor we will do all the editing of these scripts.

To view the script editor screen, in the "Editors" group click on the "Lua" button



After that the following screen will appear



In the left area of this screen, we have the "Project" structure containing the folders and files for the Lua scripts. In this area you can navigate to open the existing script files.

In the right area of this screen we have the Lua script editor. In this area all scripts will be written.

5.5.1 Upper Bar

The script editor has a top bar with 4 buttons that perform specific functions, described below.

- Save



This button will save the file that is in focus.

-Save As



This button will save the file in focus with another name that the user will enter.

-New



This button will create a new script with the name that the user will enter.

- Delete



This button will delete the file that is in focus. A confirmation screen will appear to complete this action.

5.5.2 Create Script

To create a new script, click on the "New" button, the following screen will appear.

Enter the name of the script and then click the "Save" button.

An empty script will be created with the given name.

Every time a script is created its first line has the following statement: `require`

`"LIBS.System.System"`

Do not remove this line as it loads the libraries needed for the script to run.

5.5.3 Special CNC Functions

As mentioned earlier, to complement this language we have added some special functions regarding the needs of the CNC.

In this topic we will show you these functions.

5.5.3.1 Sleep(time)

Blocks the script from executing for a certain period of time.

Arguments:

time - An integer that defines the time in milliseconds that the execution will be blocked

Return:

No

Example:

```
Sleep(200)
```

5.5.3.2 GetKey()

Gets the last key that was pressed at the CNC.

Arguments:

No

Return:

The code of the last key that was pressed at the CNC (from the row of keys) or 0, if no key was pressed

Example:

```
local key = GetKey()
```

5.5.3.3 SetKey(key)

Sends a keycode to the CNC.

Arguments:

key - An integer that defines the key code to be sent to the CNC

Return:

No

Example:

```
SetKey(333)
```

5.5.3.4 GetParameter(paramNumber)

Gets the parameter value of the selected CNC.

Arguments:

paramNumber - An integer that defines the address of the CNC parameter to be selected

Return:

A float number containing the value of the selected parameter

Example:

```
local parValue = GetParameter(12)
```

5.5.3.5 SetParameter(paramNumber, value)

Sets the value for the selected CNC parameter.

Arguments:

paramNumber - An integer that defines the address of the parameter to be selected *value* - A float number containing the value to be set for the selected parameter **Return:**

No

Example:

```
SetParameter(12, 1)
```

5.5.3.6 GetParH(number)

Gets the value of the selected H register

Arguments:

number - An integer that defines the address of the H register to be selected

Return:

A float containing the value of the selected H register

Example:

```
local regValue = GetParH (600)
```

5.5.3.7 SetParH(number, value)

Sets the value of the selected H register

Arguments:

number - An integer that defines the address of the H register to be selected *value* - A float containing the value to be set for the selected H register **Return:**

No

Example:

```
SetParH(500, 8)
```

5.5.3.8 GetReservedVar(varNumber)

Gets the value of the selected reserved variable

Arguments:

var Number - An integer that defines the address of the reserved variable that will be selected

Return:

A float containing the value in the selected variable.

Example:

```
local resVarValue = GetReservedVar (10010)
```

5.5.3.9 SetReservedVar(number, value)

Sets the value of the selected reserved variable

Arguments:

var Number - An integer that defines the address of the reserved variable that will be selected *value* - A float number containing the value to be set for the selected reserved variable **Return:**

No

Example:

```
SetReservedVar(10004, 1)
```

5.5.3.10 SetError(errorNumber, groupNumber)

Adds an error to the CNC's error list **Arguments:**

errorNumber - An integer that defines the error code

groupNumber - An integer that defines the error group

Return:

No

Example:

```
SetError(10,1)
```

5.5.3.11 SetLog(groupNumber, eventNumber, valueNumber)

Adds an event to the CNC log list.

Arguments:

groupNumber - An integer that defines the event group.

eventNumber - An integer that defines the event code. *valueNumber*

- An integer that defines the event value. **Return:**

No

Example:

```
SetLog(1,1,3)
```

5.5.3.12 GetTabValue(id, line, col)

Gets the value of the selected field from the table

Arguments:

id - An integer that defines the ID of the table to be selected *line* - An integer that

defines the ID of the row to be selected *col* - An integer that defines the ID of the

column to be selected **Return:**

A float number containing the value of the selected field from the table

Example:

```
local tabValue = GetTabValue (100,4,3)
```

5.5.3.13 SetTabValue(id, line, col, value) Sets

the value of the selected field of the

Arguments table:

id - An integer that defines the ID of the table to be selected *line* - An integer that

defines the ID of the row to be selected *col* - An integer that defines the ID of the

column to be selected

value - A float number containing the value to be set for the selected field of the table

Return:

None

Example:

```
SetTabValue(100,5,4,10)
```

5.5.3.14 SaveTab(id, type)

Saves the selected table

Arguments:

id - An integer that defines the identification of the table that will be selected

type - An integer that defines the type of table that will be saved, the following options exist: Type =

0: saves file in binary format and extension ".tab"

Type = 1: saves file in text format separated by ";" and extension ".csv"

Return:

No

Example:

```
SaveTab(100,0)
```

5.5.3.15 SetMessage(msg)

Defines a message to be displayed at the CNC

Arguments:

msg - A string that defines the message that will be displayed. This string must start with a specific character, which determines the type of message that will be displayed.

If this string starts with the character '#' the message displayed will be a warning and have a yellow background

If this string starts with the character '*' the message displayed will be an alarm and have a red background

Return:

No

Example:

```
SetMessage("*Alarm Message")
```

```
SetMessage("#Warning Message")
```

5.5.3.16 GetErrorAmount()

Gets the amount of errors present in the CNC.

Arguments:

No

Return:

A float number containing the number of errors present in the CNC.

Example:

```
local ea =GetErrorAmount()
```

5.5.3.17 GetError(index)

Returns the selected error code and the error message.

Arguments:

Index - An integer corresponding to the index of the error you want to get information about (this index is generated by the function "GetErrorsAmount()" which returns the number of errors).

Return:

Returns a float number with the error code and a string with the error message. Since there are two returns, it is necessary to link this function in two different variables, see below.

Example:

```
local ec,em =GetError(t)
```

5.5.4 Reserved Scripts

We have some scripts that are executed regardless of the interaction with the CNC user. The use of these scripts is defined by the project developer.

These scripts are not created in the projects, so they need to be added by the project owner. These scripts should be named as shown below.

5.5.4.1 OnStart.lua

This script will run once after CNC startup.

5.5.4.2 OnCyclic.lua

This script will run cyclically every 500ms

5.5.4.3 Commands.lua

This script sends commands from the CNC via Socket for use by a program outside the CNC. In the Commands.lua file you must include all the request commands.

5.5.4.4 Sockets.lua

This script is the base library for the "Commands.lua" script.

So whether it needs to be added if you are going to use the function of sending commands via socket.

5.5.4.5 OnLuaKeyCode.lua

This script will be executed once when the CNC receives the code 481.

5.5.4.5 OnLuaMCode.lua

This script will be executed once when the CNC receives the code 482.

5.6 Tables

Table files have the function of storing a certain amount of data in an orderly fashion on the CNC.

The data in the tables can be accessed by the PLC, LUA scripts, and ISO programs (G-Codes).

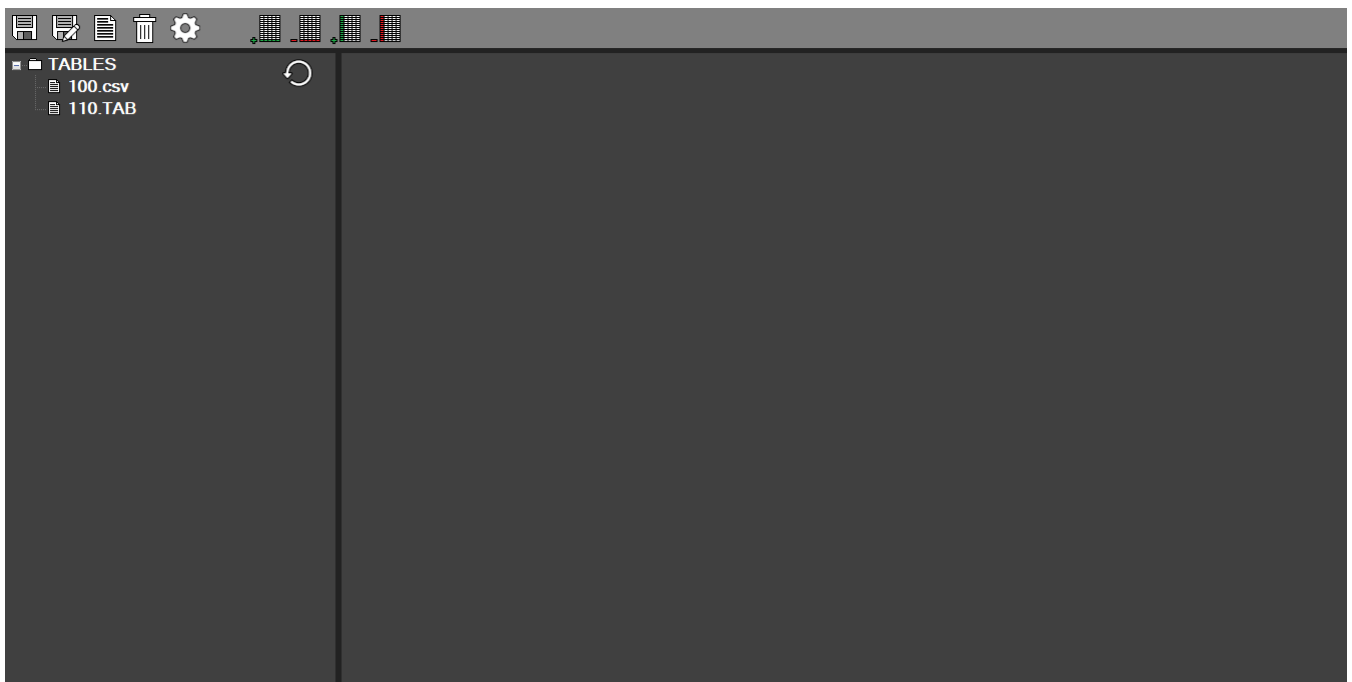
The data in the tables are not linked to specific variables, as is done in the CNC recipes; the tables are sorted into a file with a defined number of rows and columns. Each table field must be accessed by functions created in the CNC.

In this editor we can create, edit and delete project tables.

To view the table editor screen, in the "Editors" group click on the "Tables" button



After that the following screen will appear



In the left area of this screen, we have the "Project" structure containing all the existing tables in the project.

In this area you can navigate to open existing table files. In the right area of

this screen we have the editor of the selected table.

All data stored in the tables is of type float.

Use the '.' character for decimal numbers.

5.6.1 Upper Bar

The table editor has a top bar with 9 buttons that perform specific functions, described below.

- Save



This button will save the selected table

-Save As



This button will save the open table with another ID that the user will enter.

-New



This button will create a new table with the name and properties that the user will enter.

- Delete



This button will delete the selected table from the file. A confirmation screen will appear to complete this action.

- Table Properties



This button will display a window with the properties of the selected table.

- Add Line



This button will add a row to the selected table.

- Delete Line



This button will delete the row of the selected field in the selected table.

- Add Column



This button will add a column to the selected table.

- Delete Column



This button will delete the column of the selected field in the selected table.

5.6.2 Create Table

To create a new table, click on the "New" button, the following screen will appear

Criar Nova Tabela

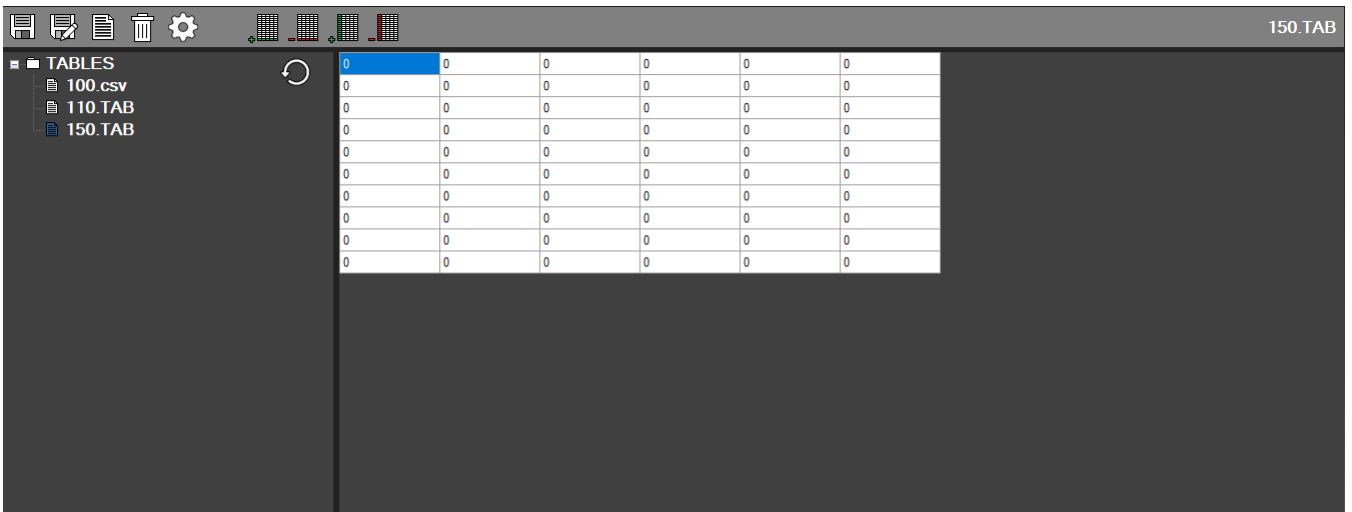
ID da Tabela

Linhas

Colunas

Cancelar **Criar**

Enter the table ID, the number of rows, the number of columns, and then click on the "Create" button. A table will be created with the entered properties. All fields in this new table will have the value "0". The file name of this table will be the number entered in the "ID" field and with the extension ".TAB".



5.6.3 Edit Tables

To edit a table, select it in the table tree.

Make the necessary changes and finally click the "Save" button.

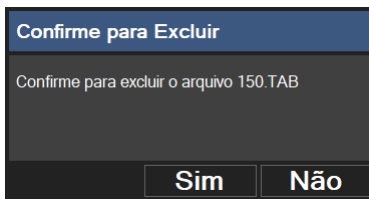
You can edit each piece of data in the table by entering the cell you want and typing the desired value for this cell.

You are also allowed to add or remove rows and columns via the buttons mentioned in the top bar.

5.6.4 Delete Tables

To delete a table, select it in the table tree and then press the "Delete" button

After that the following window will appear



Click the "Yes" button to confirm this action.

5.6.5 Table Data Access

As mentioned earlier, there are functions in the CNC to access all the data in the table.

When writing data to tables, this data is in volatile memory, so to keep this data if the CNC is turned off or restarted it is necessary to use an instruction to save the table after changing the data.

In the next topics we will show you these functions.

5.6.5.1 ISO Programs (G-Codes)

- Read data from table

#TAB [id, line, col]

To use this function, an H register must receive the data.

Example: Take value from table field with ID=100, row=5 and column = 2 and load it into register H=560 #560 =

#TAB [100, 5, 2]

- Write data from table

#TAB [id, line, col]

To use this function, an H register must provide the data for the function.

Example: Take value from register H=220 and write to table field with ID=100, row=4 and column = 3 #TAB [

101, 4, 3] = #220

-Save Table

#SAVETAB [id]

Example: Save table 100 in ".TAB" format

#SAVETAB [100] = 1

5.6.5.2 Lua scripts

These functions are detailed under "Special functions for the CNC" in the "Scripts" section

-Read data from the table

GetTabValue(id, line, col)

Example: Get value of table field with ID=100, row=5 and column = 2 and load it into a local Lua variable

```
localFieldValue = GetTabValue(100, 5, 2)
```

-Write data from the table

SetTabValue(id, line, col, value)

Example: Take value from local variable "newValue" and write to table field with ID=100, row=4 and column = 3

```
SetTabValue(100, 4, 3, newValue)
```

-Save Table

SaveTab(id, type)

Example: Save table 100 in ".TAB" format

```
SaveTab(100, 0)
```

5.6.5.3 PLC

All PLC interaction with the tables is done through "System Functions" and "System Blocks".

For more information about "System Functions" and "System Blocks" and how to use them, refer to the PLC programming manual.

-Read data from table

Function: sfReadTable

Block: sbReadTable

-Write data from table

Function: sfWriteTable

Block: sbWriteTable

-Save Table

Function: sfSaveTable

5.7 Recipes

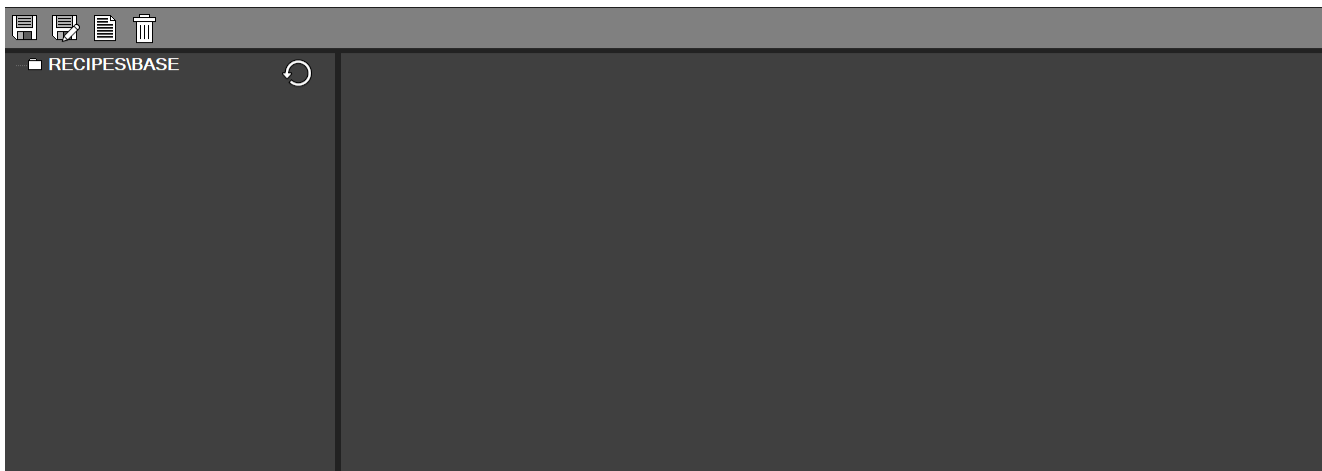
Recipe files have the function of storing numerical data in a list of defined variables. The stored data can be either CNC or PLC variables.

All the data that a recipe contains is defined in the IDE's recipe editor and is called a base recipe. Unlike tables the data contained in recipes is linked to specific variables that are defined in a specific field in this editor.

To view the recipe editor screen, in the "Editors" group, click on the "Recipes" button



After that the following screen will appear



In the left area of this screen, we have the "Project" structure containing all the existing base recipes in the project. In this area you can navigate to open the existing base recipe files.

In the right area of this screen we have the editor of the selected base recipe.

Here we will use the term "base recipes", because when you use or create a recipe in the CNC it will copy the recipe base while maintaining its data structure.

The base recipes are not editable in the CNC, so only the project owner has access to create them.

5.7.1 Upper Bar

The recipe editor has a top bar with 4 buttons that perform specific functions, described below.

- Save



This button will save the selected base recipe

-Save As



This button will save the open base recipe under another name that the user will type.

-New



This button will create a new base recipe with the name that the user will enter.

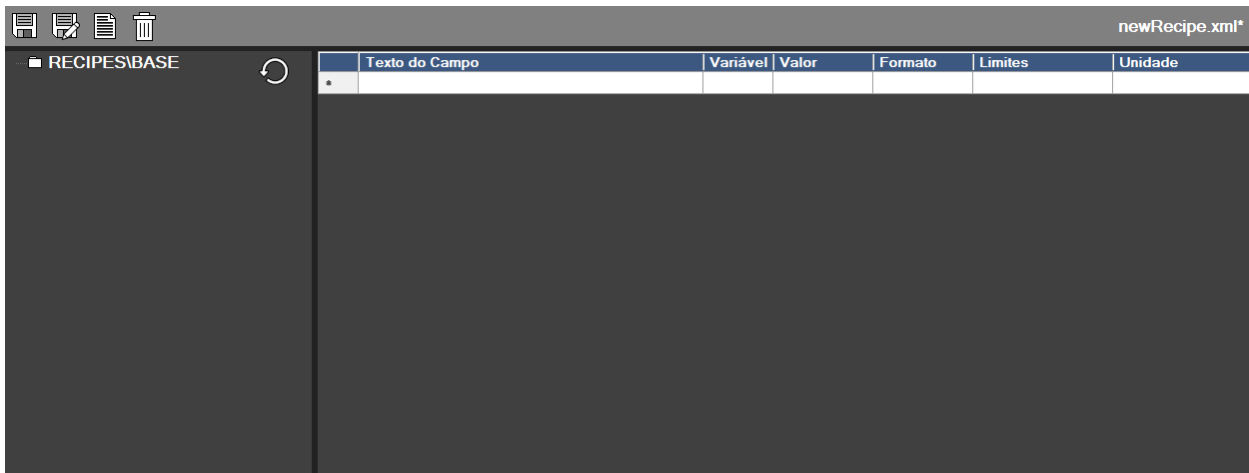
- Delete



This button will delete the file from the selected base recipe. A confirmation screen will appear to complete this action.

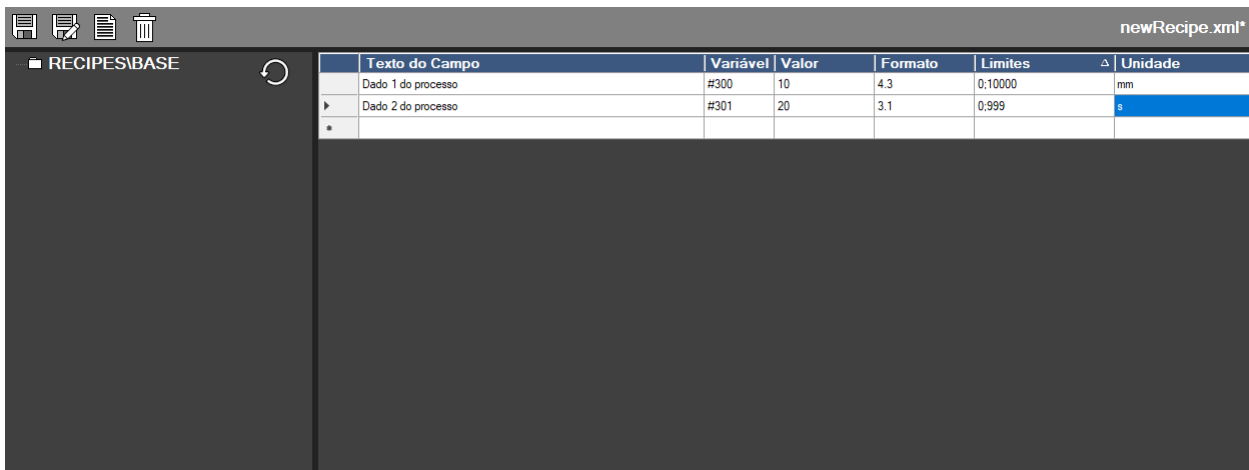
5.7.2 Create Base Revenue

To create a new base recipe, click on the "New" button, the following screen will appear



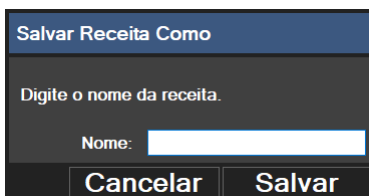
Note that the file has not been created yet.

Add all the necessary items for the base recipe by filling in all the required fields (line by line). When you start filling a line, another line will open underneath.



There is no limit to the number of lines, but the H registers have a limit of 1000 variables ranging from index #0 to #999.

To finish, click the "Save" button, the following screen will appear.



Enter the name of the base recipe and then click the "Save" button.

5.7.3 Edit Base Recipes

To edit a base recipe select it in the base recipe tree.

Make the necessary changes and finally click the "Save" button.

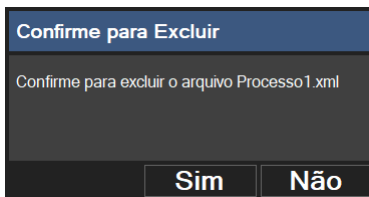
You can edit each field of the base recipe by entering the cell you want and typing the desired value for this cell.

You are also allowed to add or remove lines from the recipe.

5.7.4 Exclude Base Revenues

To delete a base recipe select it in the base recipe tree and then press the "Delete" button

After that the following window will appear



Click the "Yes" button to confirm this action.

5.7.5 Base Revenue Fields

The process for defining recipe fields is quite simple

In the table displayed on this screen we have 6 columns that must be properly filled in.

- Field Text

Fill this column with the text that identifies the usefulness of the variable

- Variable

Fill this column with the variable address, or the name of the variable that will be used

- Value

Fill this column with the value that will be loaded into the variable when the recipe is loaded

- Format

Fill in this column with the format of the number to be displayed

If this field is a number fill this column with the number of whole numbers of the number, followed by the dot character "." and lastly the number of numbers that will be used in the decimal (fractional) part of the number.

The parameter can be configured to display a combo box with a list of texts

To use the parameter in this way put all the texts here in this column, separating them with the character ";".

To help you fill in the texts, double click on the field. This will bring up the following screen.

Valor da Memória	Texto
0	Opção 1
1	Opção 2
2	Opção 3
3	Opção 4
4	Opção 5

On this screen we can add all the desired texts, in the correct order. After typing all the necessary texts click the "Ok" button.

- Limits

In this column type the upper and lower limit of the parameter separated by the character ";". If the format of the parameter in question is a combo box the value of this column will be ignored

- Unit

Fill in this column with the text of the unit that the variable uses
Of all the fields, the unit is the only one that is not required

5.8 Maintenance Plan

The maintenance plan component has the function of recording actions configured in the CNC project. These actions should relate to periodic checks that the user needs to do on the machine/system that the CNC is controlling.

The CNC can make these entries in 5 ways:

- for time
- by runtime
- by time depending on the state of a PLC variable
- by unit increment through a PLC variable on logic level 1
- by incrementing through a PLC variable on logic level 1 using a second variable with the value of the increment

The maintenance plan has two forms of records Maintenance and Control.

The Maintenance registers need to be confirmed when the programmed limit is reached. And until it is confirmed, it will block some functions of the CNC, according to the project made. This confirmation can only be done by users previously determined in general parameter 12 or users higher than that.

Control records do not require confirmation, since they do not have any locking actions. This type of record simply stores data based on the configuration made.

To view the maintenance plan editor screen, in the "Editors" group bar click on the button "Maintenance Plan".



After that the following screen will appear

										Manutenção	Controle
Texto	Texto do Cabeçalho	Texto da Mensagem	Memória de Erro	Tipo de Medição	Tipo de Bloqueio	Memória de Verificação	Memória de Incremento	Programado	Registrado	Tempo Para Repetir Aviso	Excedido
[Empty table area]											

5.8.1 Upper Bar

The Maintenance Plan editor has a top bar with 8 buttons that perform specific functions, described below.

- Save



This button will save the maintenance plan

When saving the maintenance plan, 6 files are generated

2 of these files relate to fields that contain text and must be translated if the project is multilingual.

- Add Line



This button will add a row to the selected record table.

- Delete Line



This button will delete the selected row from the selected record table.

- Reset Line Measured Values



This button will reset all measurements made on this line, if the project file has any values.

- Reset Measured Values of All Lines



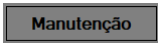
This button will reset all measurements made on all lines, if the project file has any values.

- Get Measured Values from Data



This button will load all measurements made at the CNC in all lines. For this action to be successful it is necessary to make sure that no lines have been added or removed from the registers.

-Select Maintenance Records



Displays the table where all maintenance records will be configured. Clicking this button changes the background color of the button, indicating which type of record is selected.

-Select Control Records



Displays the table where all control records will be configured. By clicking on this button the background color of the button will change, indicating which record type is selected.

5.8.2 Maintenance Records

Each line of the maintenance records has 13 fields that need to be properly filled out and are described below.

-Text

Text that will be displayed for the maintenance record

-Header Text

Text that will appear in the header of the confirmation message box

-Message Text

Text that will appear in the content of the confirmation message box

In this field the programmed value can be added to the message, by typing "{0}" at the location in the text where you want this value to appear.

Example:

To display the value in hours for a field as shown below

"This maintenance occurs every X hours."

Fill in this field as follows:

"This maintenance occurs every {0} hours."

The maintenance plan component will put the value of the field "Scheduled" in place of the text "{0}".

-Error Memory

PLC memory address that the maintenance plan will set to logic level 1, every time the programmed time is reached

-Measurement Type

0 - for time

1 - by runtime

2 - by time of a PLC variable with status at logic level 1

3 - by unit increment through a PLC variable on logic level 1

4 - by incrementing through a PLC variable on logic level 1 using a second variable with the value of the increment

-Locking Type

Not implemented - set to 0.

When you need to do some blocking, do it from the PLC using the "Error Memory".

-Verification Memory

PLC memory that will be checked if the register's measurement type is 3 or 4.

If the logging type is equal to 3 and this variable goes to logic level 1 the maintenance plan will increment one unit.

After this action the maintenance plan will force the value of this variable to 0.

If the register's measurement type is equal to 4 and this variable goes to logic level 1 the maintenance plan will increment the quantity that is in the increment memory. After this action the maintenance plan will force the value of this variable to 0.

-Increment Memory

PLC memory that will be used as counting increment if the measurement type is 4. As mentioned before.

-Programmed

This is the time in hours that will be used to warn the user that maintenance needs to be done if the record's measurement type equals 0, 1 or 2.

This is the count value in units that will be used to warn the user that maintenance needs to be done if the record's measurement type equals 3 or 4.

When the registered limit is reached the error memory associated with this record will be set to logic level 1. In the window that will appear (confirmation box) the user can confirm this action.

As mentioned earlier, this confirmation can only be made by users previously determined in the general parameter 12 or higher-level users.

The maintenance plan has a log file, all actions that happen here will be recorded in this file.

-Registered

In this field the record count for all measurement types is recorded

If the record's measurement type is equal to 0, 1 or 2 here the time in hours will be displayed.

If the record's measurement type is equal to 3 or 4 here the count value in units will be displayed.

-Time To Repeat Warning

This is the time in minutes that the maintenance plan will use to redisplay the confirmation box for a maintenance that has the recorded value greater than the scheduled value and when maintenance was requested, it was not performed.

-Exceeded

In this field the record overflow count for all measurement types is recorded If the measurement type of the record equals 0, 1 or 2 here the time in hours is displayed.

If the record's measurement type is equal to 3 or 4 here the count value in units will be displayed.

5.8.3 Control Records

Each line of the control records has 5 fields that need to be properly filled in. These fields are:

-Text

Text that will be displayed for the control record

-Verification Memory

PLC memory that will be checked if the register's measurement type is 3 or 4.

If the logging type is equal to 3 and this variable goes to logic level 1 the maintenance plan will increment one unit. After this action the maintenance plan will force the value of this variable to 0.

If the register's measurement type is equal to 4 and this variable goes to logic level 1 the maintenance plan will increment the quantity that is in the increment memory. After this action the maintenance plan will force the value of this variable to 0.

-Measurement Type

0 - for time

1 - by runtime

2 - by time of a PLC variable with status at logic level 1

3 - by unit increment through a PLC variable on logic level 1

4 - by incrementing through a PLC variable on logic level 1 using a second variable with the value of the increment

-Increment Memory

PLC memory that will be used as counting increment if the measurement type is 4. As mentioned before.

-Registered

In this field the record count for all measurement types is recorded

If the record's measurement type is equal to 0, 1 or 2 here the time in hours will be displayed.

If the record's measurement type is equal to 3 or 4 here the count value in units will be displayed.

5.9 Programs

ISO programs, or G-Code as they are known, are text files that contain a set of instructions that will be executed in sequence by the CNC.

In the AKC-PPC CNC these files must be formatted in ANSI or UTF-8 standard.

These files must be saved without extension.

The name of these files must be whole numbers from 1 to 32000.

The first line of the program usually contains the program number, the user level that created it, and its description.

Putting the user level in the first line of the program will block users with a lower level than the program creator from editing the program on the CNC. This is a good way to control errors when the user is not educated enough to edit certain types of programs.

For this type of file we have 3 folders reserved for storing them. Each of these folders has a different function in the CNC environment.

-Programs folder

This is the folder that the lowest level user has access to on the CNC and is where he/she should put his/her programs to be selected and executed.

-Folder PROGRAMS/SUB.DIR

In the AKC-PPC CNC we call the programs inside this folder sub-programs.

To view this folder the user must be logged in with user permission for this level or higher. This permission is set in general parameter 12.

To call the execution of a subprogram use the following statement:

```
G65 P "Subprogram name"
```

Example: Calling the execution of subprogram 10 within another program To set up this action, insert the instruction in the program as follows:

```
G65 P10
```

When you pass to execute this line, subprogram 10 will be executed entirely and only after this execution is completed will it return to the root program that called it.

-Folder PROGRAMS/CYC.DIR

In the AKC-PPC CNC we call the programs inside this folder fixed-cycle programs. These programs have a special instruction that calls their execution.

These instructions are parameterizable (as is the fixed-cycle) and when they are called they will pass the parameterized data for correct execution.

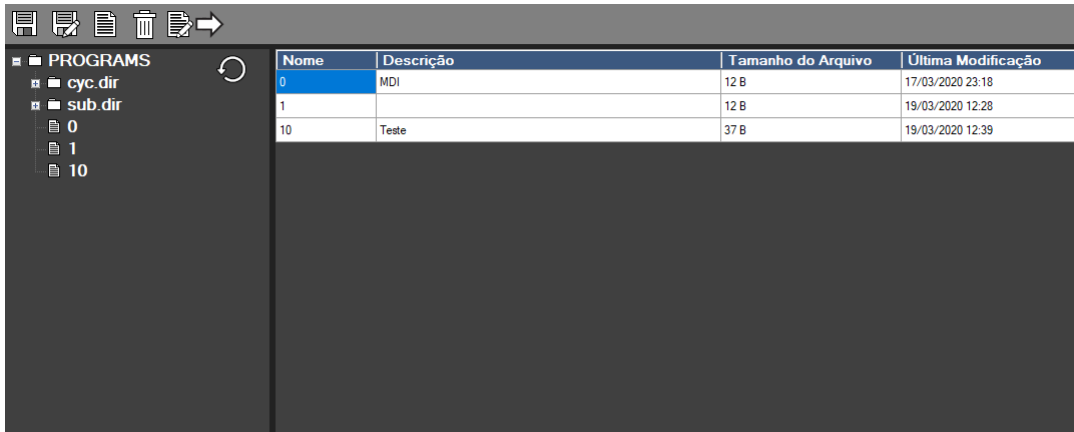
These instructions are customizable and we will see about how to build them in the Macros section.

For more information, see the CNC ISO Programming manual.

To view the program editor screen, in the "Editors" group click on the "Programs" button.



After that the following screen will appear



In the left area of this screen, we have the "Project" structure containing the folders and files referring to the CNC programs. In this area you can navigate to open the existing program files.

In the right area of this screen we initially have the list of files in the selected folder. In this area we can also open the programs

In this area all programs will be written, after they have been selected.

The program name "0" must not be edited or created. This program has a special function in the CNC.

5.9.1 Upper Bar

The table editor has a top bar with 9 buttons that perform certain functions. These are:

- Save



This button will save all open programs

-Save As



This button will save the selected program under another name that the user will type in. After that it will be necessary to update the first line of the program.

-New



This button will create a new program with the name and description that the user will enter.

- Delete



This button will delete the file from the selected program. A confirmation screen will be displayed to complete this action.

-Edit Selected Program



This button will display the editing area and open the selected program in the table for editing if it is not already open.

-Back to Program Select



This button will return to the program selection table.

-Split



This button splits the file screen in 2, allowing you to work on 2 different parts of the same file.

- Close Selected Program



This button will close the selected program. If it is edited a confirmation screen will be displayed to confirm the action. If there are no more programs open the screen will return to the program selection table.

5.9.2 Create Program

To create a new program, click on the "New" button, the following screen will appear

Enter the program name and description, then click the "Add" button.

The program will be created in the selected folder. Be careful when doing this. An empty program will be created with the given name.

Every time a program is created its first line will have the following statement:

```
:%"Program Name" ("Program Description")
```

Do not remove this line as it will be used in the CNC to display the program description information.

5.9.2.1 Add User Level in the Program

The CNC has 10 user levels ranging from "0" to "9", with "0" being the highest level and "9" being the lowest level. By adding the user level to the program we block it from being edited on the CNC by a lower level user.

To allow the lower-level user to edit the program on the CNC you do not need to add anything in the first line. To block editing of the file in the CNC we must add the following statement between the program name and the program description:

```
["user level "E]
```

Example: Allow editing by users level 4 and above in program 10 with description "Part 22099-NX"

The first line of this program should look like this:

```
:%10 [4E] (Part 22099-NX)
```

NOTE:

For fixed-loop programs we usually set the user level "0" which is the highest level. This means that no other logged-on user can edit this program at the CNC.

We also do this in some subprogram files, depending on the project.

5.9.3 Edit Programs

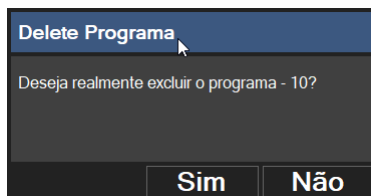
To edit a program, select it from the tree on the right or from the table that appears in the right area when you click on a folder in the tree.

Make the necessary changes and finally click the "Save" button.

5.9.4 Delete Programs

To delete a program select it from the tree on the right or from the table that appears in the right area when you click in some folder in the tree, then press the "Delete" button.

After that the following window will appear



Click the "Yes" button to confirm this action.

5.10 Macros

As mentioned earlier in the "Programs" section, in the AKC-PPC CNC there is a way to build customizable ISO instructions that execute specific programs called fixed-cycles.

These instructions are called "Macros".

These macros are instructions that will call the execution of fixed-cycles in an ISO program.

The macros contain all the parameters that will be passed to the fixed-cycle and will be used when executing it.

In the CNC the macros are related to the general parameters "1 - Machine type", "2 - Main machine type" and "3 - Alternate machine type" that will be used in the CNC.

If the machine type used is any of the available "Lathes" the "size" of the macro used must be 2D.

If the machine type used is "Milling" or "Cutting Machine" the "Dimension" of the macro used must be 3D. This is very important for the correct operation of the macros.

If all this is not correct, the macros will not be displayed or scheduled.

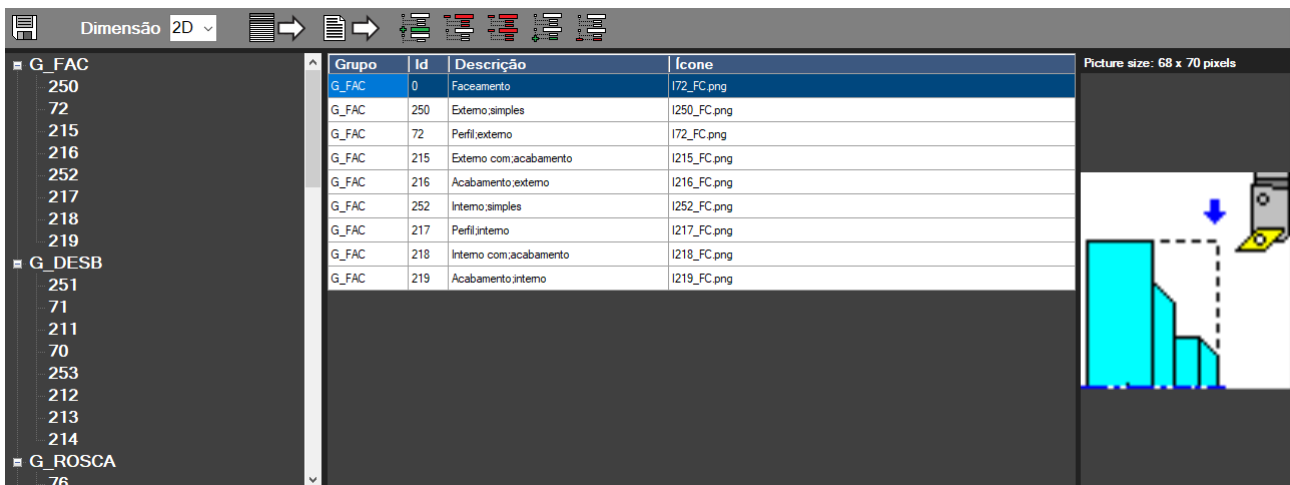
The macros must be entered and separated into groups, which will be used to facilitate navigation in the cycle-fix menu.

We can have up to 16 macro groups. It is mandatory to have at least 1 group. Each group can contain up to 16 macros, which respectively are associated with 16 fixed-cycles.

To view the macro editor screen, in the "Editors" group bar click on the "Macros" button



After that the following screen will appear



In the left area of this screen, we have the "Project" structure containing the groups and macros existing in the CNC. In this area you can navigate to open the existing macros and groups.

In the right area we can edit the existing macros and groups on the CNC for the selected dimension. In this area we can insert groups and macros, as well as program the parameters that the macros will have.

5.10.1 Upper Bar

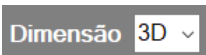
The macro editor has a top bar with 11 buttons and a comboBox that perform certain functions. They are:

- Save



This button will save all macros and groups, generating all the files needed for the macros and their group menu to function correctly.

- Dimension



The macros are related to the general parameters 1 "Machine type", 2 "Main machine type" and "3" "Alternate machine type" that will be used in the CNC.

If the machine type used is any of the available "Lathes" the "Dimension" of the macro used must be 2D.

If the machine type used is "Milling" or "Cutting Machine" the "Dimension" of the macro used must be 3D. This is very important for the macros to function correctly.

If all this is not correct, the macros will not be displayed or scheduled.

-Edit Selected Macro



This button will display the screen for editing the macro.

- Edit Selected Cycle



This button will display the screen for editing the cycle for the selected macro. As seen previously, the fixed cycles are in the folder "PROGRAMS/CYC.DIR".

- Edit Group



This button will return to the screen to edit the selected group.

- Add New Group



This button will add a new group to the project.

- Delete Selected Group



This button will delete the selected group from the project.

- Delete All Groups



This button will delete all groups in the project.

- Add New Macro



This button will add a new macro to the project.

- Delete Selected Macro



This button will delete the selected macro from the project.

- Add Parameter to Macro



This button will add a parameter to the selected macro.

- Delete Macro Parameter



This button will delete the selected parameter from the selected macro.

5.10.2 Add Group

With the correct dimension selected click the "Add Group" button
The following window will appear

Enter the "Description" text that will be displayed to identify the group.
Enter the "Group Name" that will be associated with all macros that will be inserted in the respective group. Choose the image that will identify the group.
The image field is not required, but it will make it much easier when the CNC user is using it.
To finish click on the "Add" button.

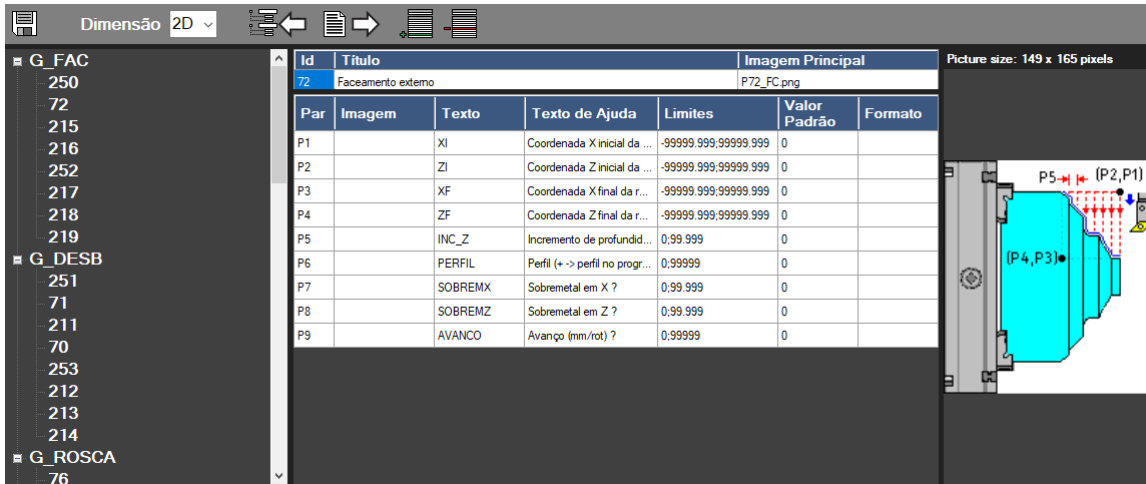
5.10.3 Add Macro

Click the "Add Group" button
The following window will appear

Enter the "Description" text that will be displayed to identify the Macro.
Enter the integer "Macro ID" which must be the same as the cycle number that the macro will call in your execution.
Choose the image that will identify the group.
Choose the group this macro will belong to.
The image field is not required, but it will make it much easier when the CNC user is using it.
To finish click on the "Add" button.

5.10.4 Edit/Set Macro parameters

Select the macro you wish to define or edit the parameters for by clicking in the left side tree or by selecting from the table and clicking the "Edit Selected Macro" button. This will take you to the macro editing screen.



The process of setting the macro's parameters is quite simple. They are done in the 2 tables that are on this screen.

5.10.4.1 Table 1

In the first (upper) table we have 3 columns that must be filled out properly.

-Id

This column is already filled out in the proper way by the editor.

- Title

Fill in this column with the text that will be used by the macro in the ISO instantiation.

- Main Image

Fill this column with the image that will be used by the macro when it is being edited/inserted into the CNC ISO program. To do this, double-click on the field, and the "Windows Explorer" will appear to search for the image that will be used in this field.

5.10.4.2 Table 2

In the second (lower) table displayed we will add the macro's parameters. To do this use the "Add Parameter to Macro" button.

To delete a selected parameter use the "Delete Parameter in Macro" button.

In this second table we have 7 columns that must be properly filled.

- Pair

This column is already filled out in the proper way by the editor.

- Image

Fill this column with the image that will be used by the macro when this parameter is selected. To do this double click on the field, and the "Windows Explorer" will appear to look for the image that will be used in this parameter when it is selected.

- Text

Fill this column with the text that will be used by the parameter when assembling the ISO instruction.

Here we usually use very short or abbreviated text (no periods or special characters), with a maximum of 4 characters. This is recommended to make the ISO instruction shorter and easier to understand.

- Help text

Fill this column with the help text that will be used by the parameter when it is selected.

- Limits

In this column type the upper and lower limit of the parameter separated by the character ";".

If the format of the parameter in question is a combo box the value of this column will be ignored

- Default Value

This is the value that will initially be loaded into this parameter when this statement is entered.

- Format

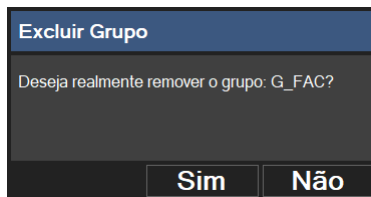
Fill in this column with the format of the number to be displayed

If this field is a number fill this column with the number of whole numbers of the number, followed by the digit dot and lastly the number of numbers that will be used in the decimal (fractional) part of the number. The parameter can be configured to display a combo box with a list of texts

To use the parameter in this way put all the texts here in this column, separating them with the character ";".

5.10.5 Delete Group

Click the "Delete Selected Group" button The following window will appear



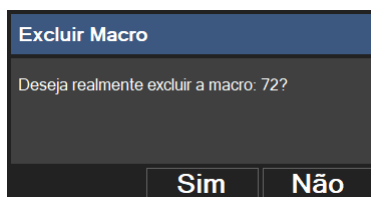
To complete this action click the "Yes" button.

NOTE:

When you delete a group all macros linked to the group will be deleted as well.

5.10.6 Delete Macro

Click the "Delete Selected Macro" button The following window will appear



To complete this action click the "Yes" button.

5.10.7 Using the Macro in the ISO Program

There are 3 ways to program these instructions on the CNC.

- "G" key

Pressing the "G" key will bring up the ISO programming screen.

Then enter the cycle number, to finish press the "Ok" button

This will bring up the programming window for the fixed cycle.

-Shortcut using CNC code

When using the code "650" on any button or softkey the "Menu" screen of fixed-cycles will be displayed. Navigate this screen to select the desired cycle.

When you select the fixed cycle your programming window will appear to program its parameters.

-key "4" opens a window

A window will appear with a field to enter the cycle number and a "Menu" button that if pressed will display another window, where you can visually navigate to select the desired cycle.

When you select the fixed cycle your programming window will appear to program its parameters.

NOTE:

If there is more than one group, when you display the group menu screen on the CNC you will see all the existing groups. When you select a group you will see all the macros that this particular group contains.

By selecting the macro we can program it, and when it is finished the instruction will be added to the ISO program.

If there is only one group, when you display the group menu screen on the CNC you will see all the macros that this single group contains.

By selecting the macro we can program it, and when finished the instruction will be added to the ISO program.

5.11 Forms

There is a base screen in the AKC-PPC CNC called the "Shape Editor".

We use this screen to generate ISO programs based on programs that are parameterized.

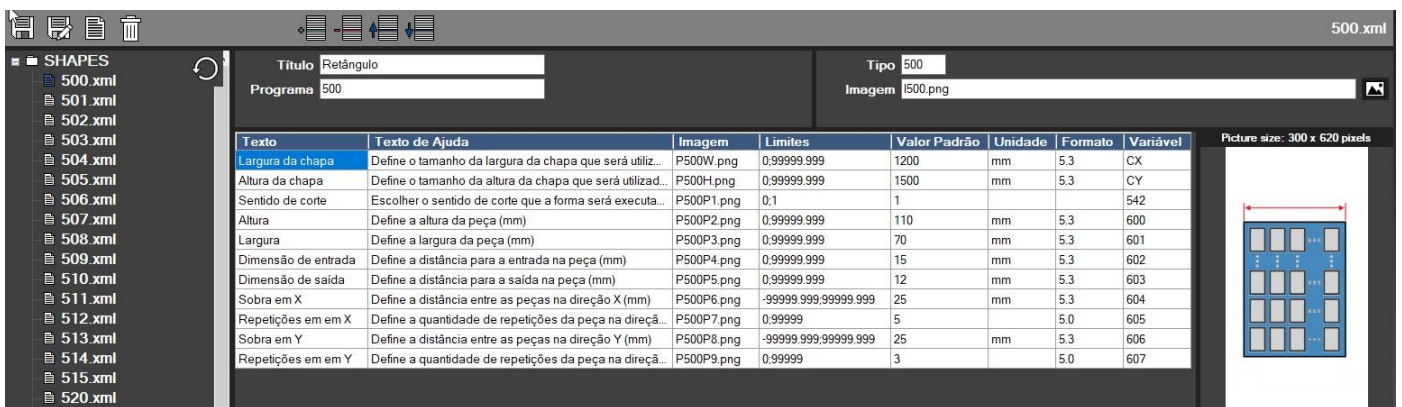
On this screen we program all the necessary parameters and command the "Shape Editor" to generate the final ISO program, with ISO functions only.

In the "Shape Editor" of the AKC-PPC IDE we will create the shape files with all the parameters we need to build them.

To view the shape editor screen, in the "Editors" group, click on the "Shapes" button



After that the following screen will appear



In the left area of this screen, we have the "Project" structure containing the folders and files referring to the existing shapes in the CNC project. In this area you can navigate to open the existing shape files.

In the right area of this screen we have the area for editing the shape.

5.11.1 Upper Bar

The shape editor has a top bar with 8 buttons that perform specific functions, described below.

- Save



This button will save the edited shapes

-Save As



This button will save the selected shape with another name and properties that the user will type in.

-New



This button will create a new base recipe with a name and properties that the user will enter.

- Delete



This button will delete the file of the selected shape. A confirmation screen will appear to complete this action.

- Add Line



This button will add a row in the selected shape with default data

- Delete Line



This button will delete the selected line as follows

- Move Line Up



This button will move the selected parameter line up

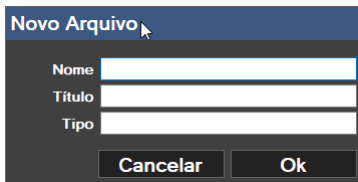
- Move Line Down



This button will move the selected parameter line down

5.11.2 Create Shape

To create a new shape, click on the "New" button, the following screen will appear



Enter the text with the name of the shape file. Type the text with the title that describes the shape.

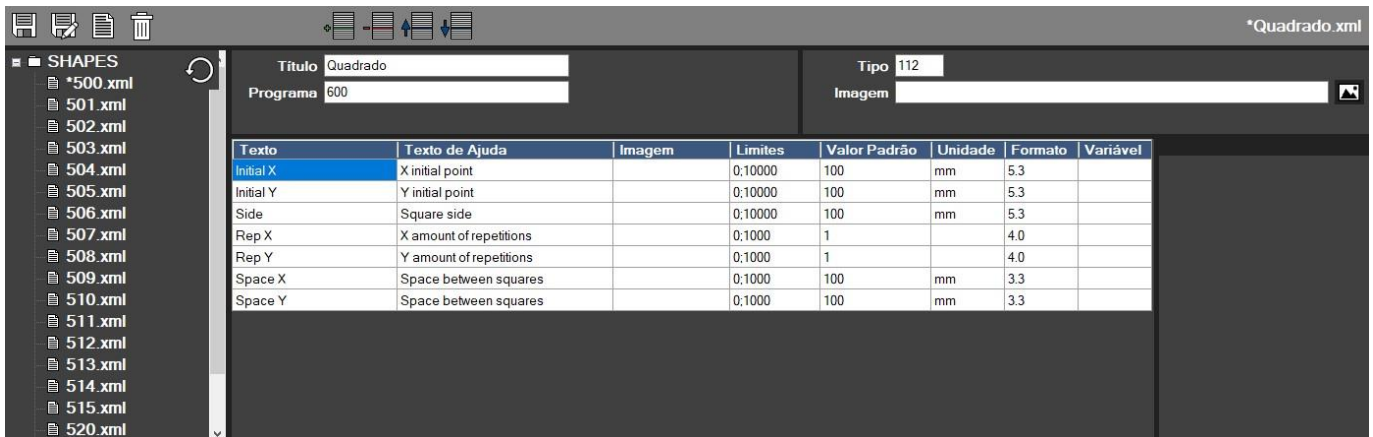
Enter an integer with the type that will identify the shape.

The 3 fields you enter must be unique, that is, they must not have been used in any other form.

To finish click the "Ok" button.

A shape will be created with the entered properties.

When creating a new shape some parameters are already added as an example. These parameters can be edited or removed if necessary.



5.11.3 Edit Shape

To edit a shape select it from the shape tree.
The form has two areas that must be properly filled in.
Make the necessary changes and finally click the "Save" button.

5.11.3.1 Area 1

In the first (upper) area we have 4 fields that must be properly filled out.

- Title

Fill this field with the text that will be used to identify this shape on the CNC. This text must be unique.

-Program

Fill this field with the number of the sub-program that will be used as the basis for generating the ISO program in this way.

-Type

Fill this field with an integer that will identify the shape. This number must be unique.

- Image

Fill this field with the image that will be used to identify this shape on the CNC. To do this, click on the "Select Image" button on the side of the field, and the "Windows Explorer" will appear to search for the image that will be used in this field.

The image field is the only one that is not required.

5.11.3.2 Area 2

In the second (bottom) area displayed we have a table where we will edit the shape's parameters. You are allowed to edit each piece of data in the form by entering the cell you want and entering the desired value for this cell. You are also allowed to add or remove parameters by the buttons mentioned in the top bar. To do this use the "Add Row" and "Delete Row" buttons. To change the order of the rows use the buttons "Move Row Up" and "Move Row Down". In this table we have 8 columns that must be properly filled out.

- Text

Fill this column with the text that will be used by the parameter.

- Help text

Fill this column with the help text that will be used by the parameter when it is selected.

- Image

Fill this column with the image that will be used by the shape when this parameter is selected. To do this double-click on the field, and the "Windows Explorer" will appear to look for the image that will be used for this parameter when it is selected.

- Limits

In this column type the upper and lower limit of the parameter separated by the character ";".
If the format of the parameter in question is a combo box the value of this column will be ignored

- Default Value

Fill this column with the value that will initially be loaded into this parameter.

- Unit

Fill this column with the text of the unit that will be used by the parameter

- Format

Fill in this column with the format of the number to be displayed

If this field is a number fill this column with the number of whole numbers of the number, followed by the digit dot and lastly the number of numbers that will be used in the decimal (fractional) part of the number. The parameter can be configured to display a combo box with a list of texts

To use the parameter in this way put all the texts here in this column, separating them with the character ";".

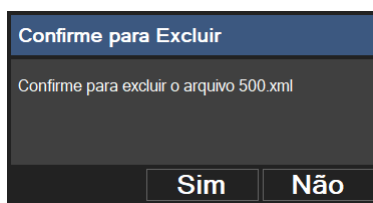
- Variable

Fill this column with the number of the H register associated with this parameter and that will be used in the sub-program or fixed-cycle.

5.11.4 Exclude Form

To delete a shape, select it in the table tree and then press the "Delete" button

After that the following window will appear



Click the "Yes" button to confirm this action.

5.12 Cutting Plan

There is a base screen in the AKC-PPC CNC called "Cutting Plan".

Similar to the "Shape Editor", we use this screen to generate ISO programs based on programs that are parameterized.

The big difference between the "Shape Editor" and the "Cutting Plane" is that in the cutting plane you can add several shapes and place them in the most convenient positions for a better use of material.

In this screen we add several types of shapes, program all the necessary parameters for the required work, and command the "Cutting Plan" to generate the final ISO program, with ISO functions only.

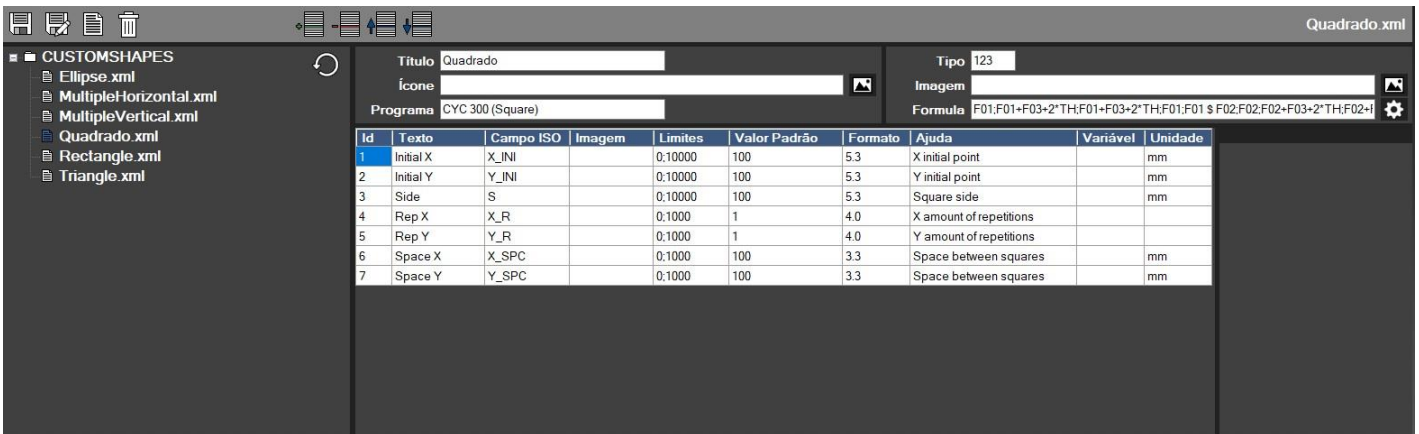
In the "Cutting Plan" of the AKC-PPC IDE we will create the shape files with all the parameters we need to build them. In this editor we will also create the formulas to generate the drawings that will be displayed when adding the shapes in the

"Cutting Plan" of the CNC.

To view the cut plan editor screen, in the "Editors" group click the "Cut Plan" button.



After that the following screen will appear



In the left area of this screen, we have the "Project" structure containing the folders and files referring to the existing shapes in the cutting plan of the CNC project. In this area you can navigate to open the existing shape files.

In the right area of this screen we have the area for editing the shape.

The programming of these shapes is very similar to the programming seen in the shape editor section.

5.12.1 Upper Bar

The shape editor has a top bar with 8 buttons that perform specific functions, described below.

- Save



This button will save the edited shapes

-Save As



This button will save the selected shape with another name and properties that the user will enter.

-New



This button will create a new base recipe with a name and properties that the user will enter.

- Delete



This button will delete the file of the selected shape. A confirmation screen will appear to complete this action.

- Add Line



This button will add a row in the selected shape with default data.

- Delete Line



This button will delete the selected line as follows

- Move Line Up



This button will move the line of the selected parameter up.

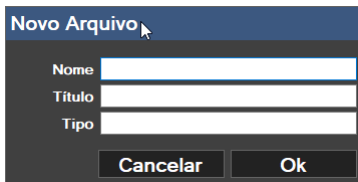
- Move Line Down



This button will move the selected parameter line down

5.12.2 Create Shape

To create a new shape, click on the "New" button, the following screen will appear.



Enter the text with the name of the shape file. Type

the text with the title that describes the shape.

Enter an integer with the type that will identify the shape.

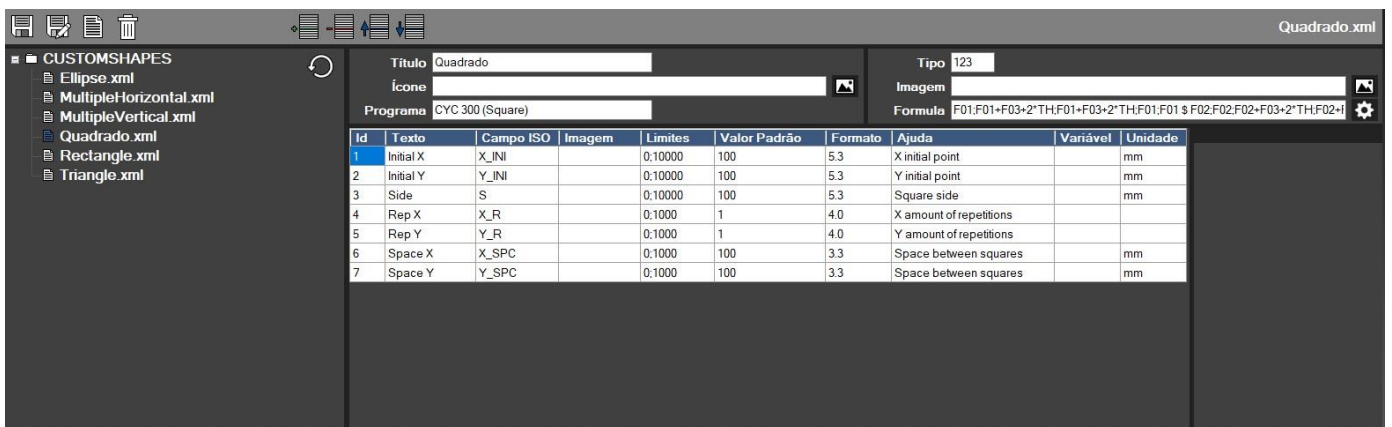
The 3 fields you enter must be unique, that is, they must not have been used in any other form.

To finish click the "Ok" button.

A shape will be created with the entered properties.

When creating a new shape some parameters are already added as an example. These parameters can be edited or removed if necessary.

For ease of development the example formula is functional and can be tested if in doubt.



5.12.3 Edit Shape

To edit a shape select it from the shape tree.

The form has two areas that must be properly filled in.

Make the necessary changes and finally click the "Save" button.

5.12.3.1 Area 1

In the first (upper) area we have 6 fields that must be properly filled out.

- Title

Fill this field with the text that will be used to identify this shape on the CNC. This text must be unique.

- Icon

Fill this field with the image that will be used to identify this shape on the CNC. To do this, click on the "Select Image" button on the side of the field, and the "Windows Explorer" will appear to search for the image that will be used in this field.

The icon field is not required.

-Program

Fill this field with the number of the subprogram or cycle that will be used as the basis for generating the ISO program in this way.

If you use fixed-cycle enter "CYC" + "fixed-cycle number".

-Type

Fill this field with an integer that will identify the shape. This number must be unique.

- Image

Fill this field with the image that will be used to identify this shape on the CNC. To do this, click on the "Select Image" button on the side of the field, and the "Windows Explorer" will be displayed to search for the image that will be used in this field.

The image field is not required.

-Formula

Fill this field with the formula that will draw the shape based on its parameters.

All angles should be considered in radians

Other

TH - tool thickness

PI - mathematical constant 3.14159265358979323846...

Pow(n,p) - power function n^p

Sqrt(n) - square root Abs() -

absolute value Log(n,b) -

log of n in base p

Log10(n) - log of n in base 10

Exp(n) - exponential of n

5.12.3.1.1 Formula - Connection Types

r = line - will connect points by line segment

CW#P1#P2#P3 - clockwise arc with 3 parameters

CCW#P1#P2#P3 - counterclockwise arc with 3 parameters P1 - Arc radius

P2 - Start angle of arc in degrees P3 -

End angle of arc in degrees

In arcs the parameters P1, P2 and P3 can be formulas

Assemble the formula starting with the command (CW or CCW)

Add parameters or formulas using the '#' character as separator

5.12.3.1.1 Formula - Fixed Figures For Connections

Lines#P1#P2#P3 - fixed and parallel lines with 3 parameters

P1 - Dimension X

P2 - Y Dimension

P3 - Slope angle of the lines (fill in 0 or 90)

Rectangle#P1#P2- rectangle with 2 parameters

P1 - Dimension X

P2 - Y Dimension

Ellipse#P1#P2- Ellipse with 2 parameters

P1 - Dimension X

P2 - Y Dimension

CircleD#P1 - circle with 1 parameter P1

- Circle Diameter

CircleR#P1- circle with 1 parameter

P1 - Radius of the circle

5.12.3.1.1 Formula - Terminations for the connections

All connections can be followed by the following terminations

.Fill = last point of the shape, considers the inner part of the shape

BG = last point of the shape, considers the outer part of the shape (treats it as a hole)

5.12.3.1.1 Formula - Test

To test and verify that the formula is correct click on the "Test" button, the following screen will be displayed

This screen will show all the parameters added to this form.

The dimensions of the plate and tool will also appear to assist the drawing. Fill in each of these fields in the appropriate way.

To perform the test click on the "Draw" button.

To close this screen click the "Ok" button.

5.12.3.2 Area 2

In the second (bottom) area displayed we have a table where we will edit the shape's parameters.

You are allowed to edit each piece of data in the form by entering the cell you want and entering the desired value for this cell. You are also allowed to add or remove parameters by the buttons mentioned in the top bar.

To do this use the "Add Row" and "Delete Row" buttons.

To change the order of the rows use the buttons "Move Row Up" and "Move Row Down". In this table we

have 10 columns that must be filled out properly.

-Id

This column is filled in automatically by the editor.

- Text

Fill this column with the text that will be used by the parameter.

- ISO field

Fill this column with the text that will be used by the parameter when it is used in the "Program" field a fixed-cycle program.

Here we usually use very short or abbreviated text (no periods or special characters), with a maximum of 4 characters. This is recommended to make the ISO instruction shorter and easier to understand.

- Image

Fill this column with the image that will be used by the shape when this parameter is selected. To do this double-click on the field, and the "Windows Explorer" will appear to look for the image that will be used for this parameter when it is selected.

- Limits

In this column type the upper and lower limit of the parameter separated by the character ";".

If the format of the parameter in question is a combo box the value of this column will be ignored

- Default Value

Fill this column with the value that will initially be loaded into this parameter.

- Format

Fill in this column with the format of the number to be displayed

If this field is a number fill this column with the number of whole numbers of the number, followed by the digit dot and lastly the number of numbers that will be used in the decimal (fractional) part of the number. The parameter can be configured to display a combo box with a list of texts

To use the parameter in this way put all the texts here in this column, separating them with the character ";".

- Help text

Fill this column with the help text that will be used by the parameter when it is selected.

- Variable

Fill this column with the number of the H register associated with this parameter and that will be used in the sub-program or fixed-cycle.

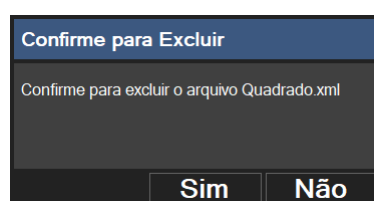
- Unit

Fill this column with the text of the unit that will be used by the parameter

5.12.4 Exclude Form

To delete a shape, select it in the table tree and then press the "Delete" button

After that the following window will appear



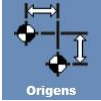
Click the "Yes" button to confirm this action.

5.13 Origins

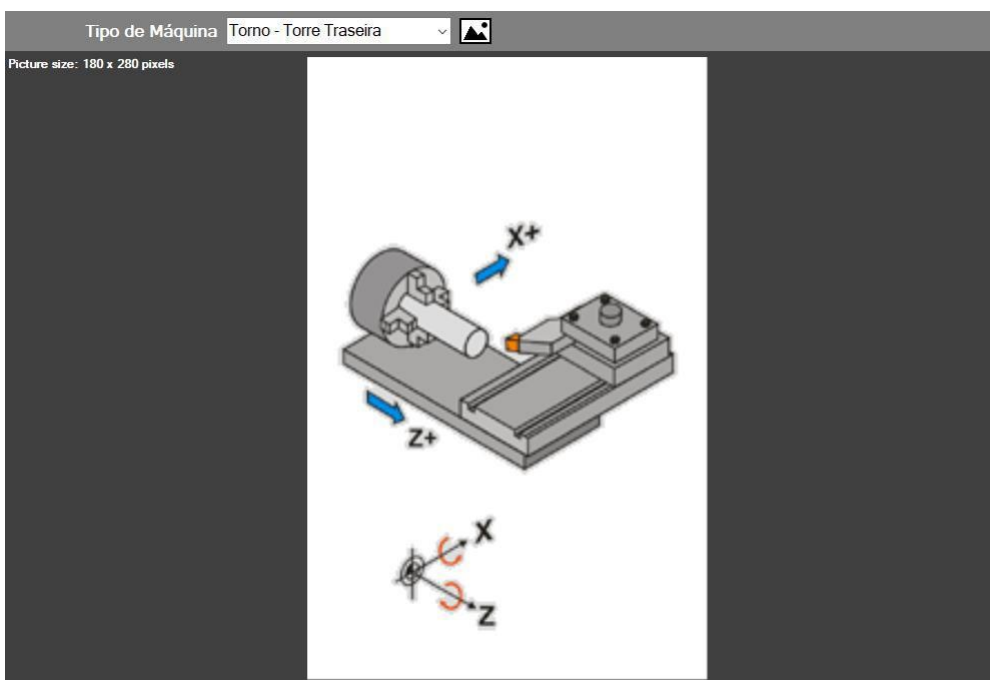
The AKC-PPC CNC has a basic screen called "Source Editor". This screen shows all the sources that exist on the CNC with a value for each axis, and an image is shown to the right of this screen.

The purpose of the AKC-PPC IDE's Source Editor is to select the image that will be displayed in this area according to the type of machine that is selected (setting made by general parameters 1, 2 and 3) on the CNC.

To view the origins editor screen, in "Editors" click on the "Origins" button



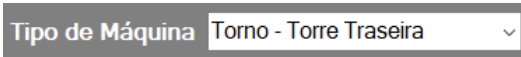
After that the following screen will appear



5.13.1 Upper Bar

The source editor has a top bar with 1 button and 1 combobox that perform specific functions, described below.

- Machine type



In this comboBox the machine type that will receive the selected figure will be selected. Note that here we have 4 machine types (Rear Lathe, Front Lathe, Mill and Cutter).

- Select Picture



With the machine type selected click this button to select the image that will be displayed for this machine type. Clicking this button will open the "Windows Explorer", where you can browse and select the desired image file for the selected machine type.

5.14 Tools

The AKC-PPC CNC has a basic screen called "Tool Editor". This screen shows all the tools on the CNC and their configuration.

The tools are configured in a standard way in a table, which has certain parameters.

TN	F	Lx	Lz	R	Lc	DLx
01	Acabamento	0.000	0.000	1.000	3	0.000
02	Desbaste	0.000	0.000	1.000	8	0.000
03	Rosca	0.000	0.000	0.500	8	0.000
04	Canal	0.000	0.000	1.000	8	0.000
05	Furação	0.000	0.000	1.000	7	0.000
06	Acabamento	20.000	15.000	1.000	3	0.000
07	Desbaste	20.000	10.000	1.000	8	0.000
08	Rosca	20.000	10.000	0.500	8	0.000
09	Canal	20.000	0.000	1.000	7	0.000
10	Furação	5.000	20.000	1.000	7	0.000

END Opções

In this table the customizable parts are the fields families (field F in the tool editor) and cutting side (field Lc in the tool editor).

Related to these 2 fields are the images that are displayed when the tool is selected or being edited.

The purpose of the AKC-PPC IDE's tool editor is to create the entire customization part of the CNC tool editor. To view the source editor screen, in the "Editors" group click on the "Tools" button.



After that the following screen will appear.

Dimensão 2D

Num. Família	Descrição	Nome	Imagem	Ícone	Ícone Lc
1	Ferramenta Numero 1	Acabamento	Ttomear.png	IconTurning.png	ft_ic1.png;ft_ic2.png;ft_ic3.png;ft_ic...
2	Ferramenta Numero 2	Canal	Tcanale.png	IconChannel.png	fc_ic1.png;fc_ic2.png;fc_ic3.png;fc...
3	Ferramenta Numero 3	Desbaste	Tcanal.png	IconChannel_I...	ff_ic6.png;ff_ic8.png
4	Ferramenta Numero 4	Rosca	Trosca.png	IconThread.png	ft_ic5.png;ft_ic6.png;ft_ic7.png;ft_ic...
5	Ferramenta Numero 5	Furação	Tbroca.png	IconDrill_Lathe...	ff_ic7.png

Tamanho da Imagem: 200 x 280 pixels

5.14.1 Upper Bar

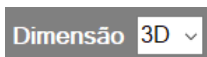
The tool editor has a top bar with 3 buttons and 1 combobox that perform specific functions, described below.

- Save



This button will save all the tool-related files, generating all the files necessary for correct operation.

- Dimension



The tools are related to the general parameters 1 "Machine type", 2 "Main machine type" and "3" "Alternative machine type" that will be used in the CNC.

If the machine type used is any of the available "Lathes" the "Dimension" of the tool used must be 2D.

If the machine type used is "Milling" or "Cutting Machine" the "Dimension" of the tool used must be 3D. This is very important for the correct functioning of the tools.

- Add Tool Family



This button will be used to add a new tool family.

- Delete Tool Family



This button will be used to delete the selected tool family.

5.14.2 Add Tool Family

With the correct dimension selected click the "Add Tool Family" button
The following window will appear

Enter the "Name" and the "Description" of the tool.
Both fields are required.
To finish click on the "Add" button.

5.14.2 Edit/Define Tool

In the tool table we have 6 columns that must be properly filled out.

-Family No.

This column is already filled out in the proper way by the editor.

- Description

Fill this column with the text that will be used to identify the tool.

- Name

Fill this column with the text that will be used in the combobox of the CNC tool editor (field F) to select the tool family.

- Image

Fill this column with the image that will be used by the CNC tool editor when the tool is being edited/selected. To do this, double-click on the field, and the "Windows Explorer" will appear to search for the image that will be used in this field.

- Icon

Fill this column with the image that will be used by the CNC to display the selected tool. To do this, double-click on the field, and the "Windows Explorer" will appear to search for the image that will be used in this field.

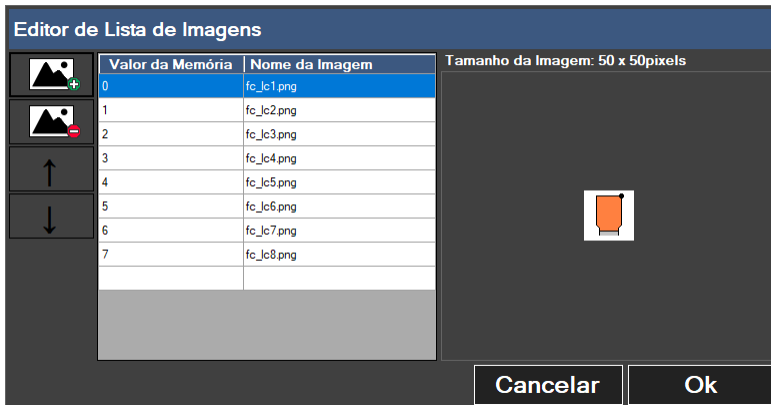
- Lc Icon

Fill this column with the list of images that will be used by the CNC tool editor when the tool is being edited/selected. This field will be covered in more detail below.

5.14.2.1 Icon Field Lc

As stated earlier, this column should be filled in with the list of images that will be used by the CNC tool editor when the tool is being edited/selected.

To do this, double click on the field, and the following screen will appear



Select on this screen all the images you need This

field has a very important peculiarity.

All images used here, must have the name ending with the number related to the cutting side (as can be seen in the picture shown above). If the images are not created in this way the CNC's tool editor will not function correctly.

By default, the CNC identifies the cut sides as follows.



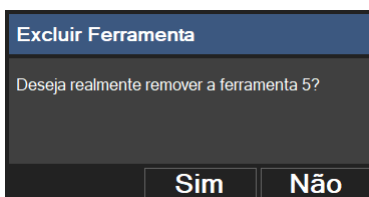
These Lc's are normally used when we select the 2D dimension.

For the 3D dimension they only need to have 1 image that must follow the same filling pattern, i.e. have the name ending with the number related to the cutting side.

5.14.3 Delete Tool Family

With the tool you wish to delete selected click the "Delete Tool Family" button

The following window will appear.



Click the "Yes" button to confirm this action.

5.15 Translation

During project development in the AKC-PPC IDE many files are generated. Many of these files contain text that will be displayed to the CNC user at certain times. If the project in question is used in more than one language all of this text will need to be translated. This editor has the function of building these files in the available languages. The editor will not do the translation itself, but it will help the project developer to do this. To see the translation editor screen, in the "Editors" group, click the "Translation" button.



After that the following screen will appear.

Índice	Texto Base	Texto Traduzido
40000	Start bloqueado	
40064	Emergência pressionada	
40065	Máquina não referenciada	
40066	Stop pressionado	
40067	Erro de jog no eixo X	
40068	Erro de jog no eixo Y	
40069	Erro de jog no eixo Z	
40070	Fim de curso X positivo	
40071	Fim de curso X negativo	
40072	Fim de curso Y positivo	
40073	Fim de curso Y negativo	
40074	Fim de curso Z positivo	
40075	Fim de curso Z negativo	
40076	Falha no inversor	
40077	Falha na pressão de ar	
40078	Erro de fim de curso	
41000	Emergência pressionada	

In the left area of this screen there are 3 comboboxes responsible for selecting the base language, the target language, and the file that will be translated.

In this area you can navigate to open existing files.

On the right side of this screen is the area for translating the texts.

In this area we have a table with 3 columns. Index, Base Text and Translated Text.

The "Table of Contents" and "Base Text" columns are not editable, only the "Translated Text" column.

5.15.1 Upper Bar

The translation editor has a top bar with 3 buttons that perform certain functions. These are

- Save



This button will save the selected file in the target language.

- Copy Base Texts



By clicking this button all the texts that are in the "Base Text" column will be copied to the computer. To facilitate the process these texts can be pasted into the translator you wish to use.

- Paste Translated Texts

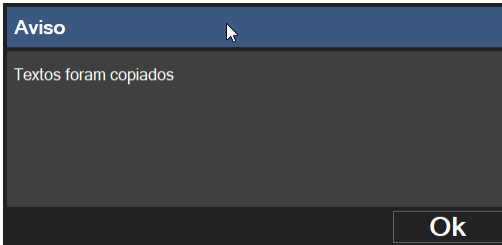


When you click this button, all the texts that are in the copy area of your computer will be transferred to the translation editor in an orderly fashion.

5.15.1 Translation Process

In the translation process we can enter the translated texts line by line in the "Translated Text" column. This is an option to generate the necessary files for the project.

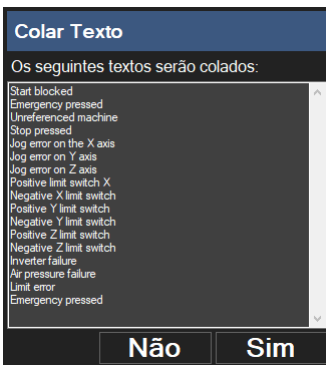
To facilitate this process we can export all the text by clicking on the "Copy Base Texts" button. This copies all the texts and displays the following screen.



Paste these texts into any translator you use, or send them to the person in charge of translation. Proofread the texts.

Select all the translated texts and copy them.

To insert the translated texts into the editor click on the "Paste Translated Texts" button, the following window will appear.



In this window you can check the texts.

To paste the texts click on the "Yes" button.

Índice	Texto Base	Texto Traduzido
40000	Start bloqueado	Start blocked
40064	Emergência pressionada	Emergency pressed
40065	Máquina não referenciada	Unreferenced machine
40066	Stop pressionado	Stop pressed
40067	Erro de jog no eixo X	Jog error on the X axis
40068	Erro de jog no eixo Y	Jog error on Y axis
40069	Erro de jog no eixo Z	Jog error on Z axis
40070	Fim de curso X positivo	Positive limit switch X
40071	Fim de curso X negativo	Negative X limit switch
40072	Fim de curso Y positivo	Positive Y limit switch
40073	Fim de curso Y negativo	Negative Y limit switch
40074	Fim de curso Z positivo	Positive Z limit switch
40075	Fim de curso Z negativo	Negative Z limit switch
40076	Falha no inversor	Inverter failure
40077	Falha na pressão de ar	Air pressure failure
40078	Erro de fim de curso	Limit error
41000	Emergência pressionada	Emergency pressed

The texts will be added to the table in the "Translated Text" column. Check that the texts are correct. To finish click the "Save" button. This will generate the translation file.

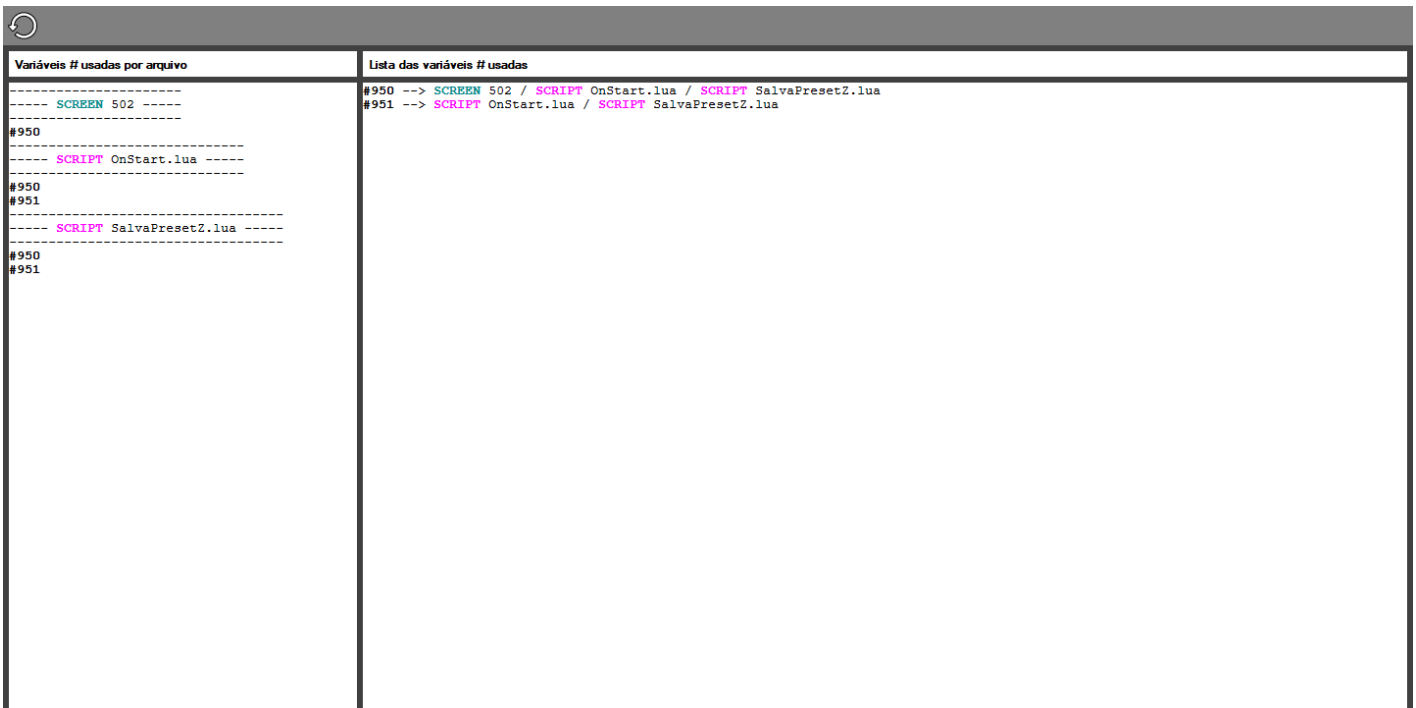
5.16 Variables

The function of this screen is to show all the H registers that are being used in the project. Whether it is screen objects, scripts or programs.

This makes the question of error avoidance easier, since we have a limit on the number of H registers. To view the project's variables screen, in the "Editors" group click on the "Variables" button.



After that the following screen will appear



In the area to the right of this screen we see the H registers listed for each file.

In the left area of this screen we see the complete list of the H registers used in order in the project and next to them the files where they are being used.

5.16.1 Upper Bar

The top bar of this editor has only one button

- **Update List**



This button will again list all the H registers used in the project files.

5.17 Materials

The purpose of this editor is to create the file with the record of all the materials that will be used by the CNC. This table will be used by the production plan and production control to display the production data and generate production reports.

To view the material editor screen, in the "Editors" group bar click on the "Materials" button



After that the following screen will appear

Índice	Nome	Densidade	Unidade de Volume	Unidade de Massa
1	Aço SAE 1010	7820	m ³	kg
2	Aço SAE 1020	7860	m ³	kg
3	Aço SAE 1045	7870	m ³	kg
4	Aço Inox	7850	m ³	kg
5	Alumínio	2700	m ³	kg
6	Alumínio Fundido	2560	m ³	kg
7	Alumínio	2700	m ³	kg
8	Cobre	8930	m ³	kg
9	Cobre Fundido/Laminado	8850	m ³	kg
10	Cobre Laminado	8950	m ³	kg
11	Cobre Recozido	8800	m ³	kg
12	Mámore/Granito 2cm	63.5	m ²	kg
13	Mámore/Granito 3cm	97	m ²	kg
14	Mámore/Granito 5cm	146	m ²	kg

5.17.1 Upper Bar

The material editor has a top bar with 3 buttons that perform specific functions, described below.

- Save



This button will save the material table. When you perform this action, 2 files are generated. One of these files is for fields that contain text and must be translated if the project is multilingual.

- Add Line



This button will add a row to the log table.

- Delete Line



This button will delete the selected row from the selected record table.

5.17.2 Table of Materials

The process of defining the materials is very simple

In the table displayed on this screen we have 6 columns that must be properly filled in.

- Index

This column is filled in automatically by the editor.

- Name

Fill in this column with the name of the material used

- Density

Fill in this column with the density of the material used

- Volume Unit

Fill in this column with the volume unit of the material used.

This column is of type combobox and has the units set to be chosen by the user.

In this field in particular, you can see that there are some units in the combobox that are not volume units. This is because some materials are traded differently.

As an example we have the stone market, where slabs are sold by thickness and the density is given in kg/m².

Another example is the rebar market, where the wires are sold by gauge and the density is given in kg/m. In the end, all this represents volume and here in this table we allow the registration in this way, to meet the standards found in the market.

- Mass Unit

Fill in this column with the mass unit of the material used.

This column is of type combobox and has the units set to be chosen by the user.

NOTE:

When creating this table, it is recommended that you normalize the units used for all registered materials, since the CNC does not do this conversion automatically.

If the units are different, no error will occur in the CNC operation, but the statistical reports may be affected.

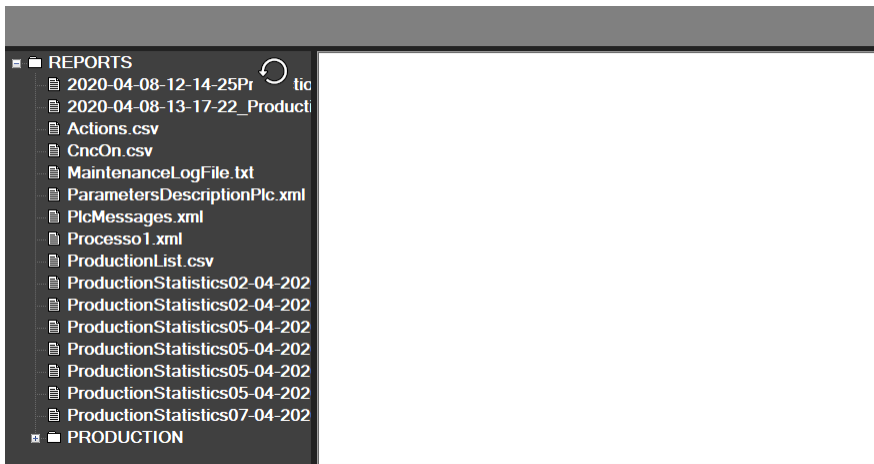
5.18 Reports

The function of this screen is to show all the reports that are generated by the CNC and are stored in the CNC's DATAREPORTS directory.

To view the reports screen, in the "Editors" group click the "Reports" button.



After that the following screen will appear



In the left area of this screen, we have the "Project" structure containing all the reports that have been generated at the CNC and downloaded to the computer.

In this area you can navigate to open existing report files.

In the right area of this screen we have the report viewer. It is in this area that the reports will be displayed.