

Lab4Schools
Lab Activity “Drill Lab”



ERASMUS PROJECT DRILL STATION

Made by:

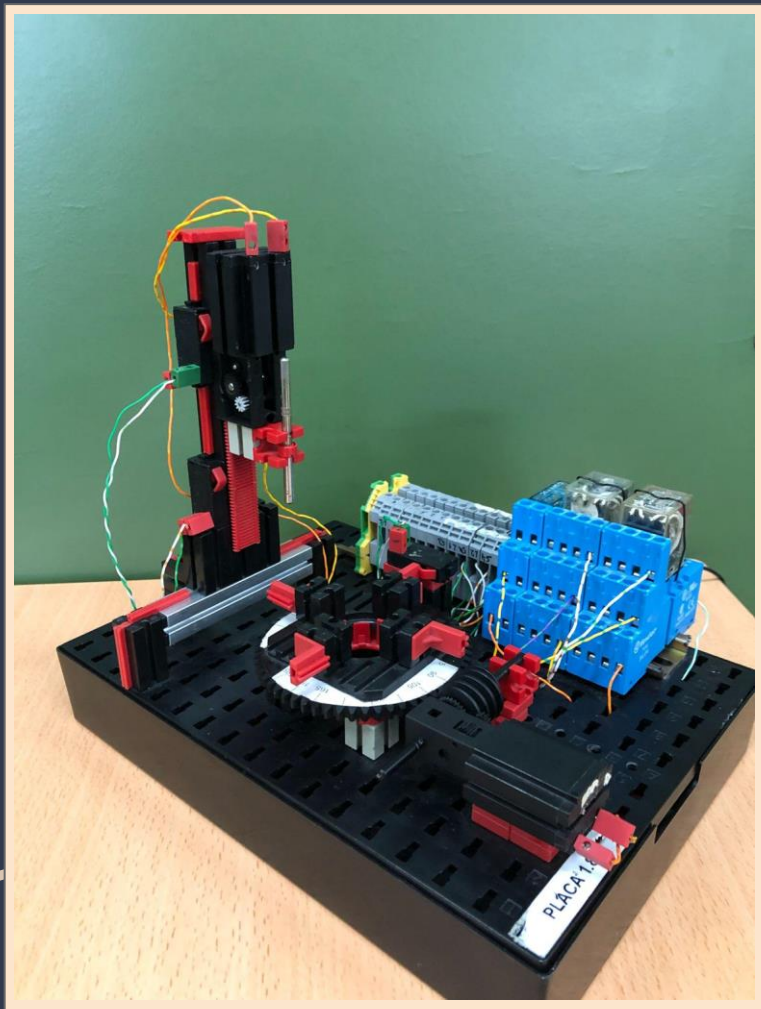
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Things that we are going to cover in this project:

- 1) What are you going to do.
- 2) Quick look at the electrical circuit.
- 3) Wiring and Connections.
 - 4.1) How to make a GRAFCET.
 - 4.2) Basic GRAFCET exercise.
- 5.1) Quick guide on how to program.
 - 5.2) Basic Drill exercise.
- 6) Quick look at the HMI.



What are you going to do

Today you are going to learn step by step how we program and make our projects.

First of all, you are going to look at the Electrical Circuit. A quick way to see the wiring of the project.

After the circuit, you will take a look at the physical wiring.

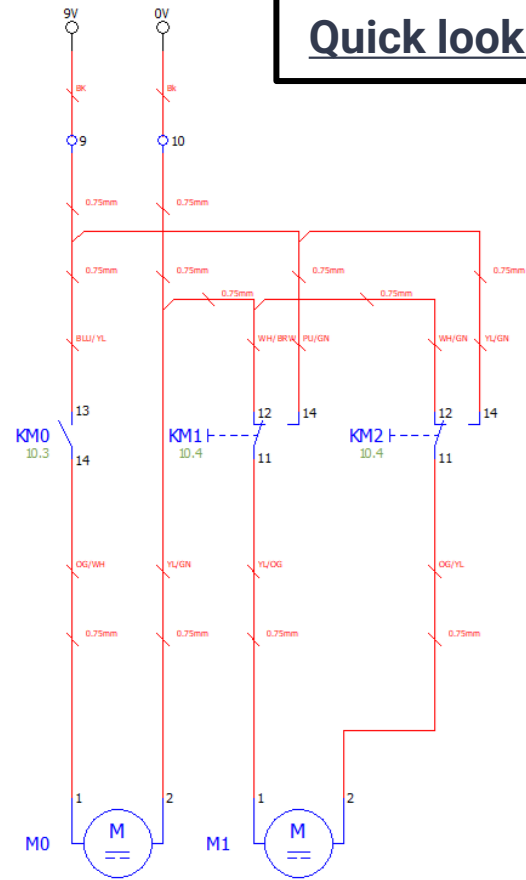
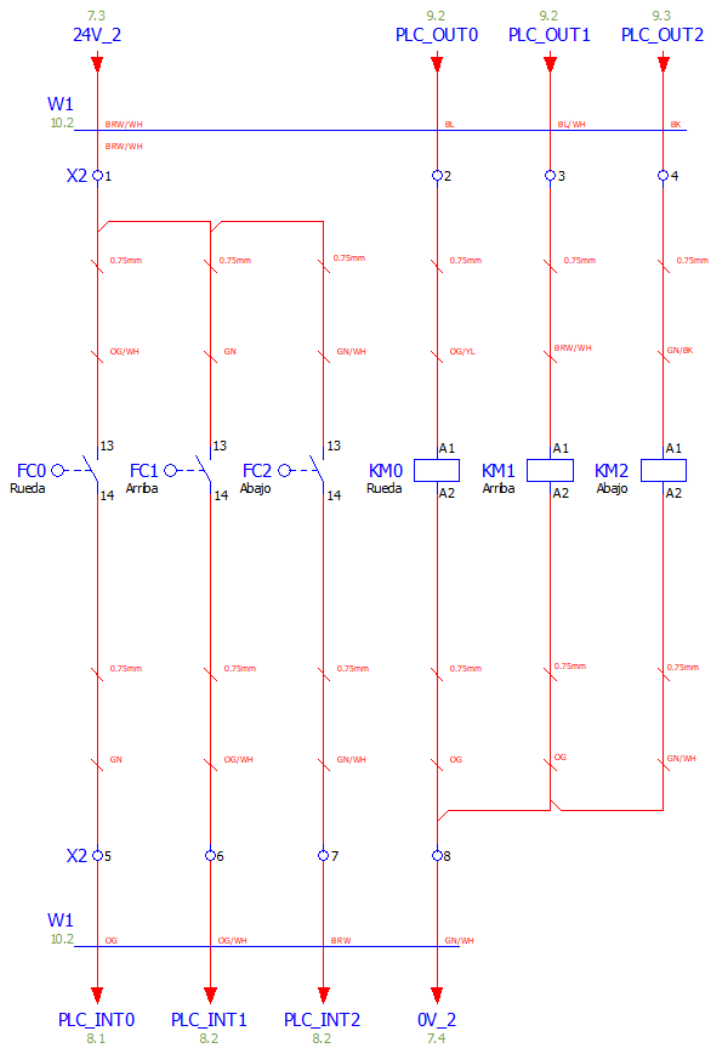
Next you will have to make your own "GRAFSET".

Now that you have your "GRAFSET", you will make your own program too.

And finally, you have to transfer your program to the PLC.

**Don't worry, if you fail to make the program work.
You can still see our own program :D*

Quick look of the Circuit



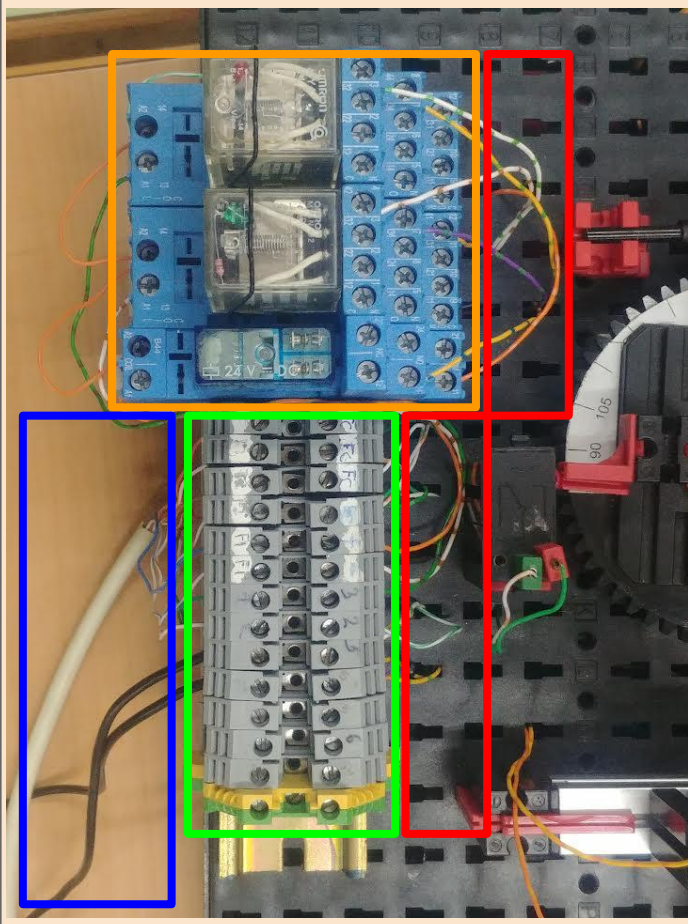
Wiring and Connections (Model)

Orange: Relays used to control the 2 motors in this Model and the 3 limit switches.

Green: Terminals that “Connect” external and internal wiring of the model.

Blue: External wiring of the model, which contains the transformer wires (black) and the “bridge cable” used to connect the external terminals of the model to the external terminals of the PLC.

Red: Internal wiring of the model, which contains all the cables connected to the relays and limit switches.



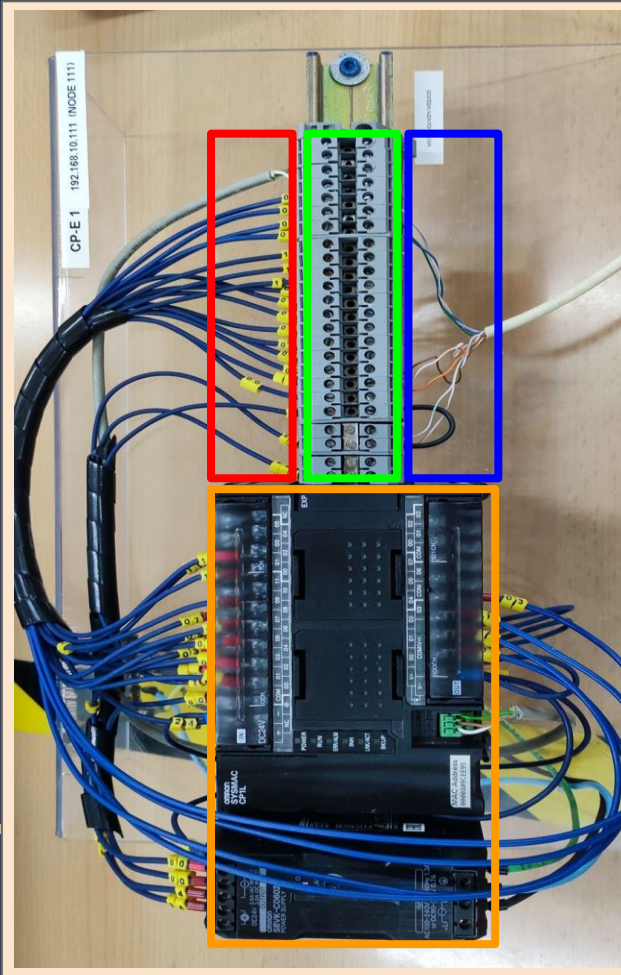
Wiring and Connections (PLC)

Orange: PLC (Programmable Logic Controller) and Power Supply.

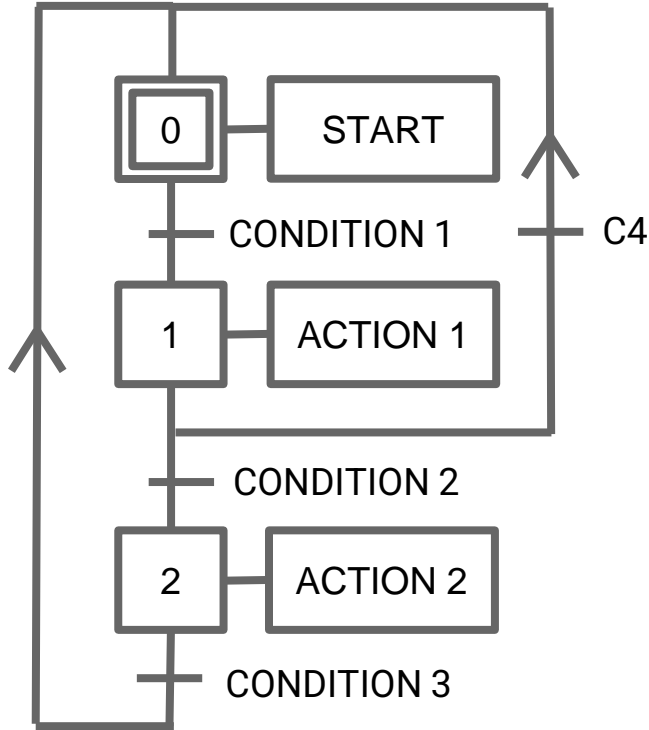
Green: Terminals that “Connect” external and internal wiring of the PLC.

Blue: External wiring of the PLC, which contains the “bridge cable” used to connect the external terminals of the PLC to the external terminals of the Model.

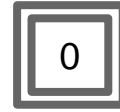
Red: Internal wiring of the PLC, which contains all the cables connected to the internal relays (inputs and outputs).



Example of GRAFCET



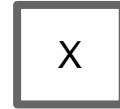
How to make a GRAFCET



Starting condition/step of your Grafcet.



This condition must be met in order to proceed to the next stage.



The number inside indicates the current stage of your program.



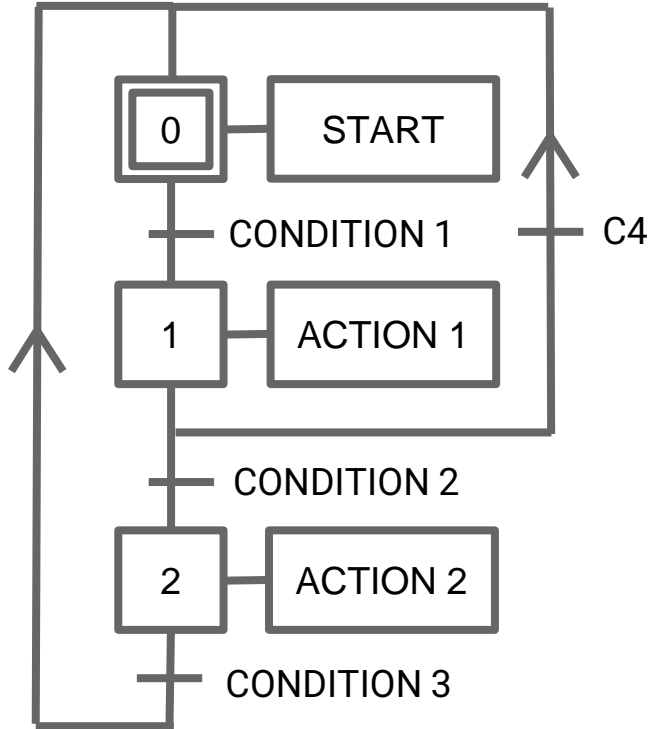
While you program is in "X" stage, it will perform the indicated action next to the "X" stage.



This line indicates the order of the next step to perform.

**You can make an horizontal line before a condition is met with a different condition. This line can jump Downwards or Upwards States. (We will use this for the S0).*

Example of GRAFCET



Drill working description

1. Using the following Outputs(Actions) and Inputs(Conditions) to make the sequence listed below:

- **Outputs:** **KM0** (Rotate the table), **KM1** (Drill Down), **KM2** (Drill Up).
- **Inputs:** **FC0** (Table Limit Switch), **FC1** (Drill Down Limit Switch), **FC2** (Drill Up Limit Switch), **S0** (STOP Button), **S1** (Start Button).

The **sequence** we need to make is the following one:

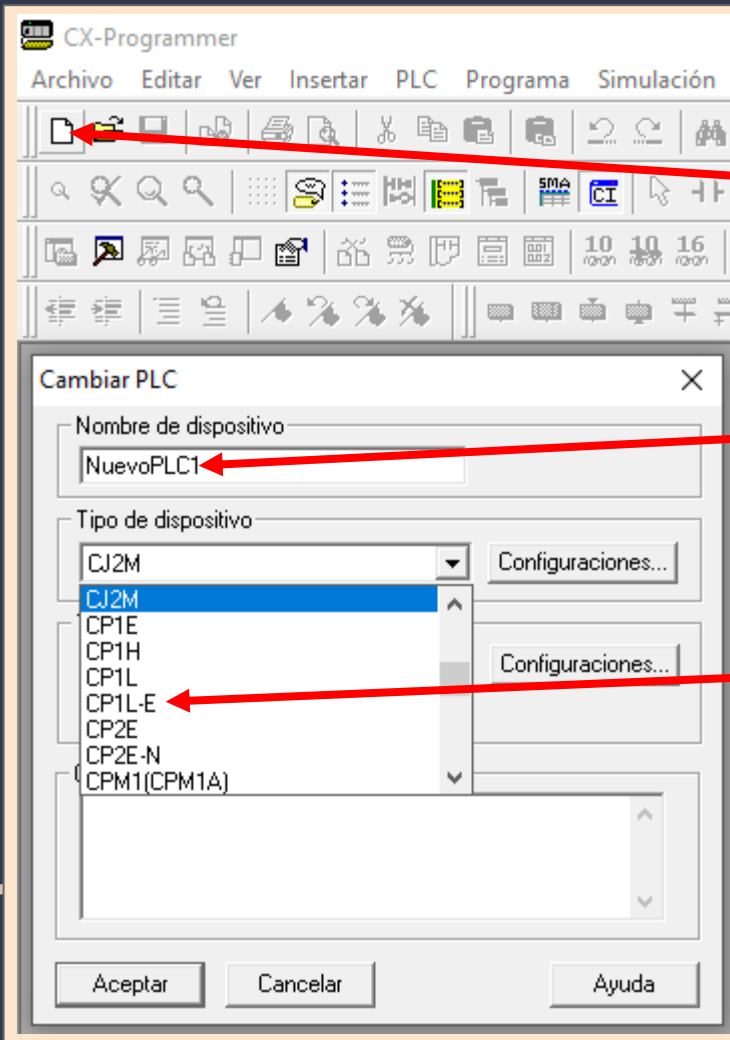
1. When we press **S1** (START button), the table will rotate (**KM0**) until **FC0** is touched.
2. After the table stops, make the drill go downwards (**KM1**) until it hits the **FC1** limit switch.
3. Right after the drill touches the **FC1**, make it go upwards (**KM2**) until it hits the **FC2**.
4. After that, the table rotates again as in step 1.

This sequence will continue until we press **S0** (STOP Button). And start from the beginning when we press **S1** (START Button) again.

TAGS

- These are the tags that you have to use.

Nombre	Tipo de datos	Dirección / Valor	Ubicación d...	Uso	Comentario
∩ FC0	BOOL	0.00		Entra...	Rotary table Limit Switch
∩ FC1	BOOL	0.01		Entra...	Limit Switch DOWN
∩ FC2	BOOL	0.02		Entra...	Limit Switch UP
∩ KM0	BOOL	100.00		Salida	Rotary table contactor
∩ KM1	BOOL	100.01		Salida	Ascend contactor
∩ KM2	BOOL	100.02		Salida	Descend contactor
∩ START	BOOL	W0.01		Trab...	Start button
∩ STOP	BOOL	W0.00		Trab...	EMERGENCY STOP



Quick guide of how to program (1)

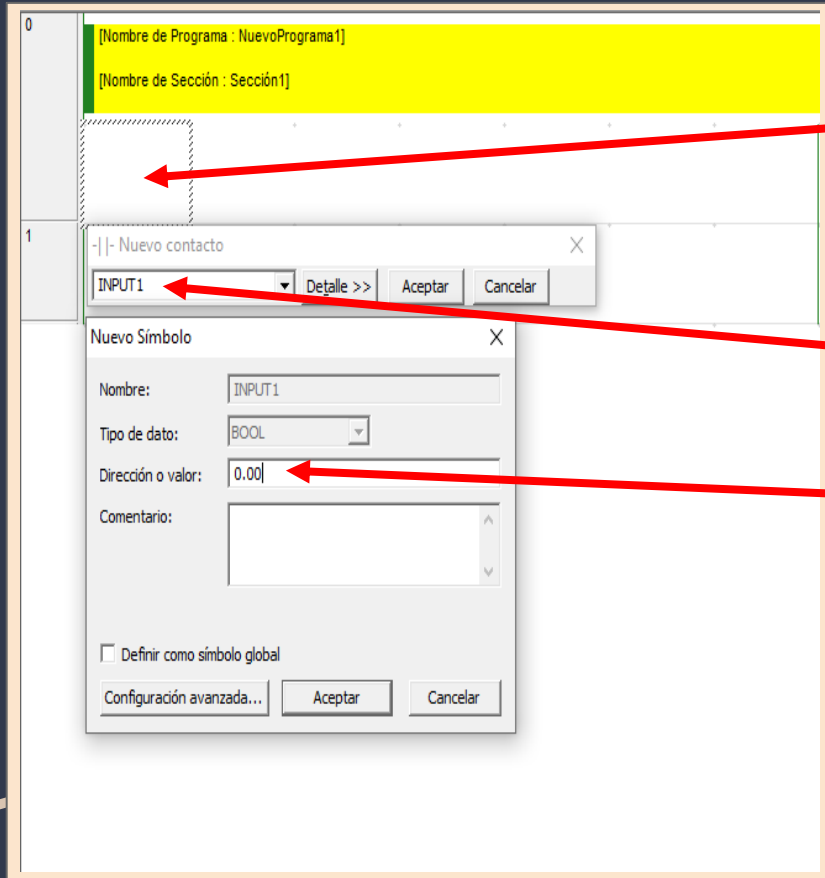
1. Create a new Program.

1. Write the name of your Project.

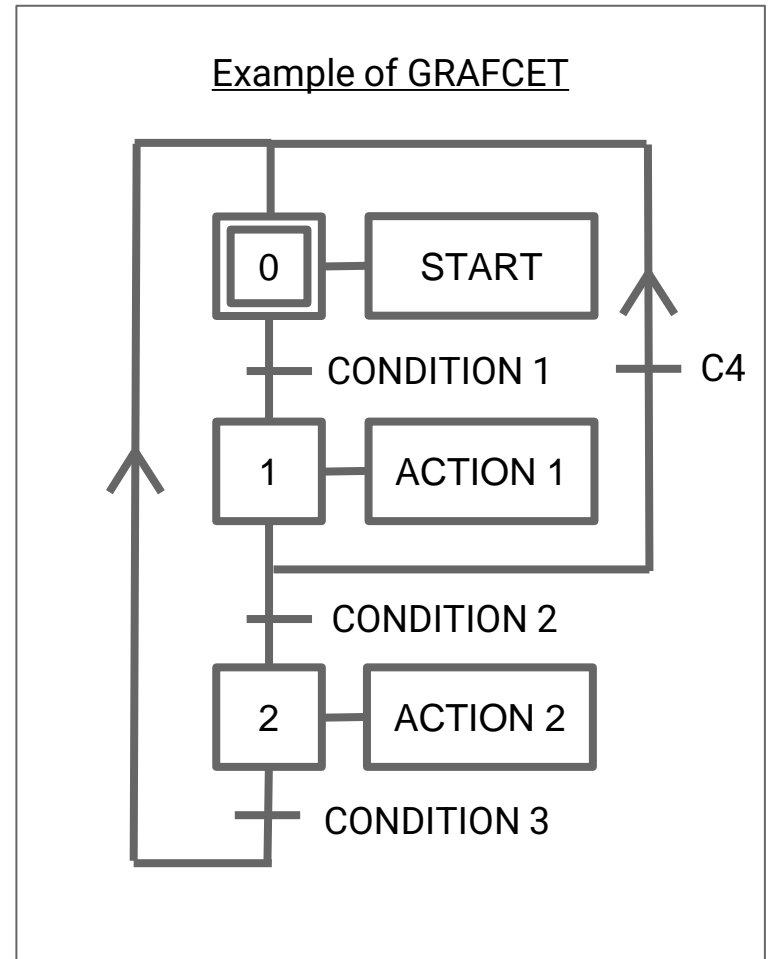
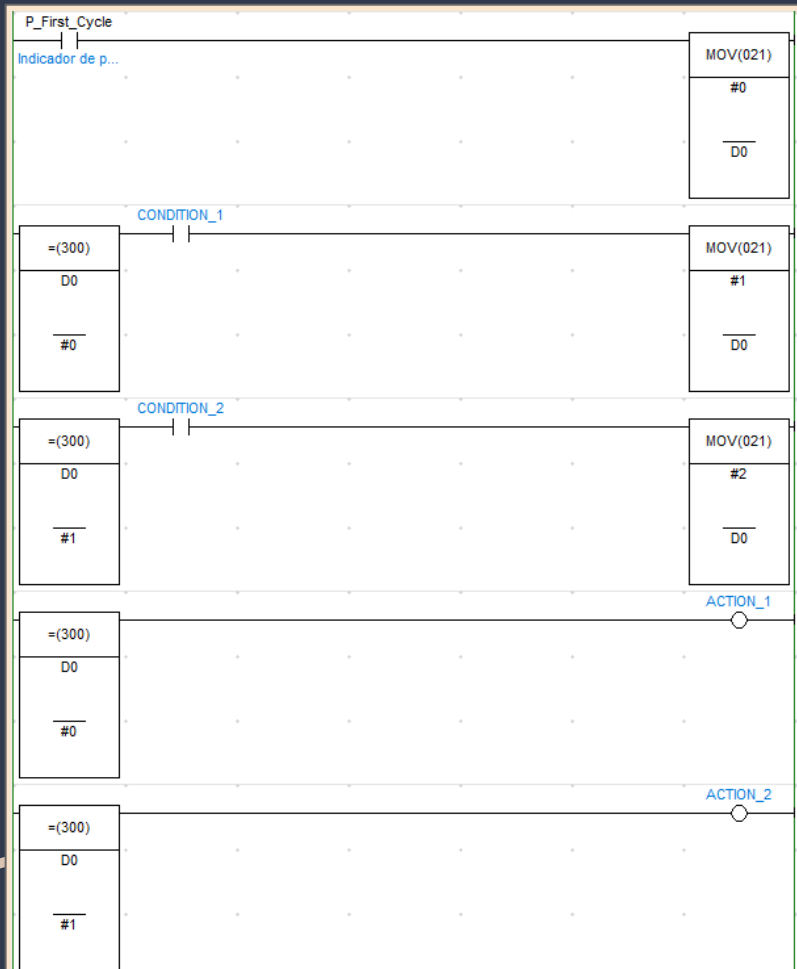
1. Select the CP1L-E device. ("E" stands for Ethernet)

1. Accept and start programming.

Quick guide of how to program (2)



1. Press in your keyboard "C" (For Contacts), "O" (For OutPuts or Coils) and "I" (For Instructions).
1. Write a name to label it.
1. Place a direction/value for it.
 - For "C" or inputs you can use numbers from 0.00 to 99.99.
 - For "O" you can use number from 100.00 to X. (If you place a "W" before the number it becomes a "Mark/Memory".
 - For "I" you will use the Channel "D" followed by a number. There you will keep the value you introduce.



Once you finish,
you can test your
program in the HMI
and see it move
with the model

Basic Drill exercise

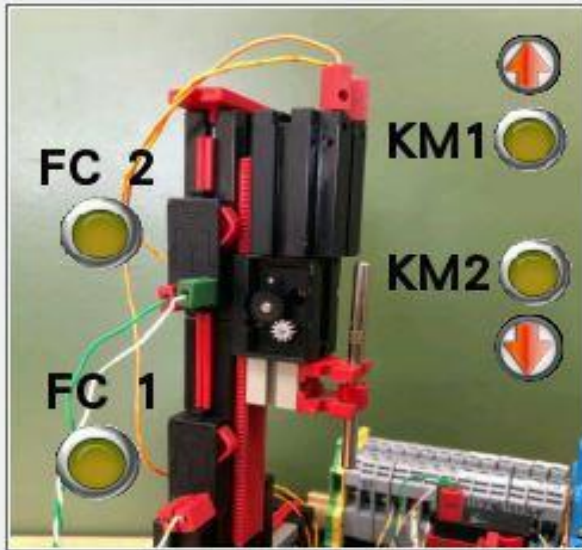
The sequence we need to make is the following one:

- When we press **S1** (START button), the table will rotate (**KM0**) until **FC0** is touched.
- After the table stops, make the drill go downward (**KM1**) until it touches the **FC1** limit switch.
- Right after the drill touches the **FC1**, make it go upwards (**KM2**) until it touches the **FC2**.

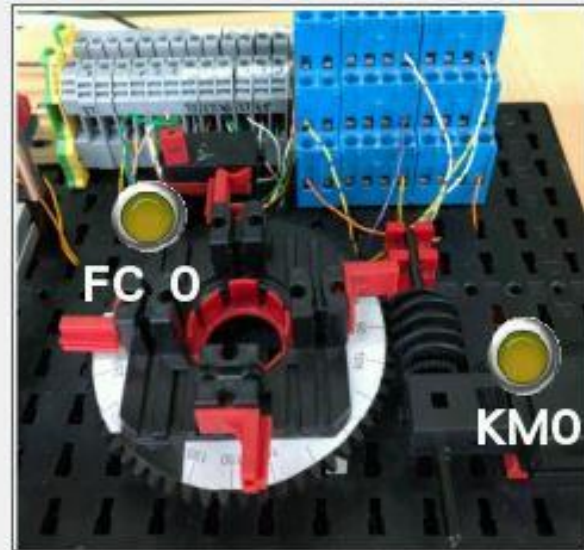
This sequence will continue until we press **S0** (STOP Button). And start from the beginning when we press **S1** (START Button) again.

DRILL SUPERVISOR

DRILL



TABLE



MACHINE STATUS

MACHINE STOPPED



EMERGENCY
STOP



START

Quick look of the HMI