SO Machine Basic 1.1

List of Supported PLC for the So machine Basic :

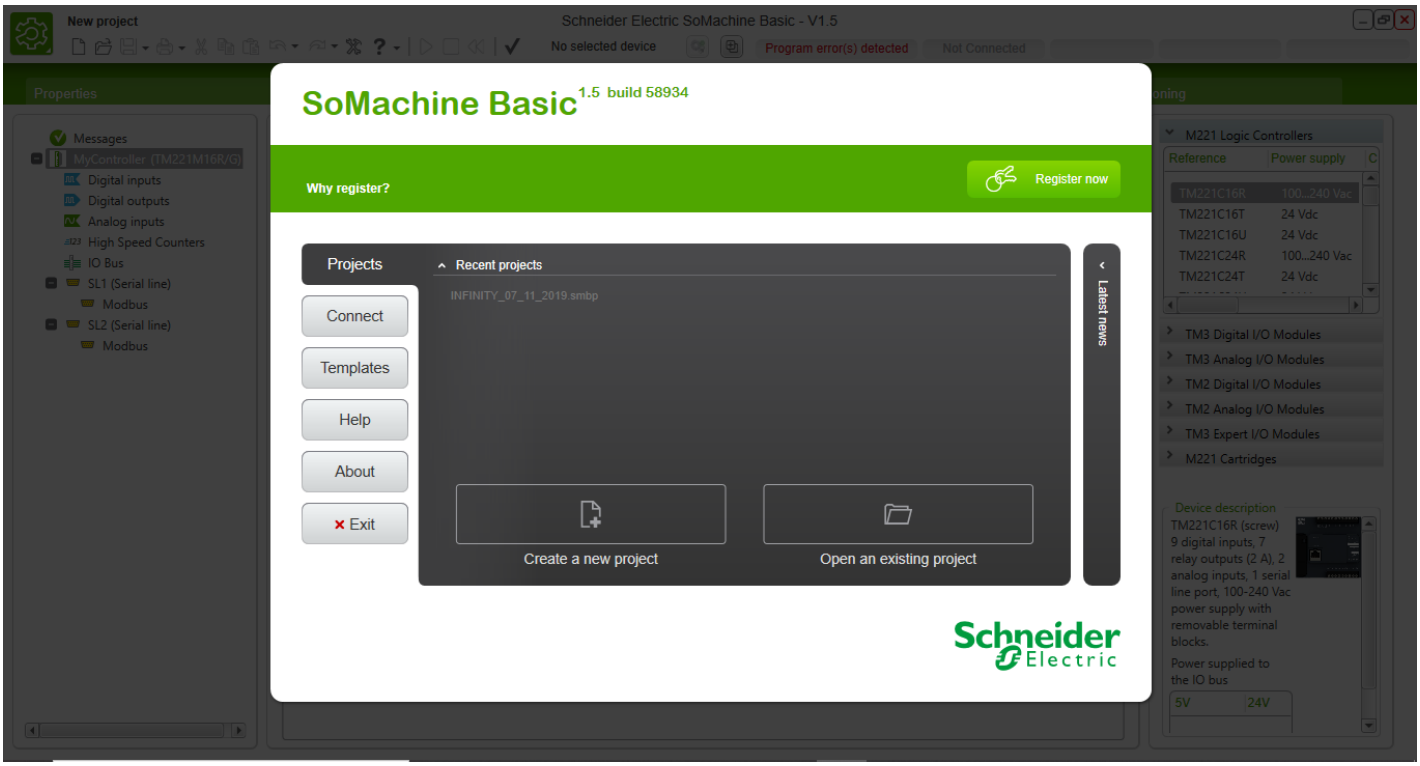
- Below PLC Models are supported in only Somachine basic.
- Different PLC models have a different property and communication protocols.

Somachine basic supported PLC Controller List

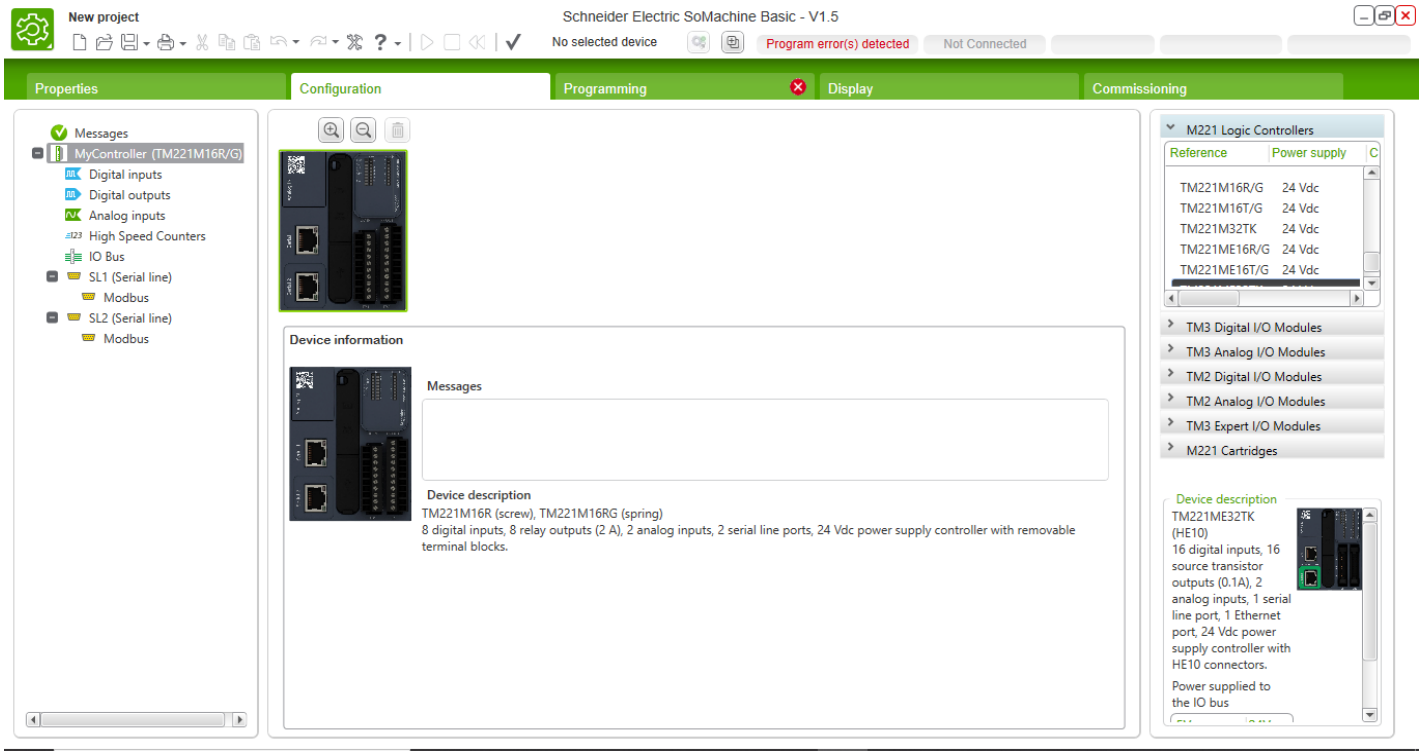
Sr. No	PLC Controller	Communication Protocol	Power Supply Rating	DI	DO	AI
1	TM221C16R	1 Serial line ports	100-240 Vac	9	7 Relay	2
2	TM221C16T	1 Serial line ports	24 Vdc	9	7 Source	2
3	TM221C16U	1 Serial line ports	24 Vdc	9	7 Shink	2
4	TM221C24R	1 Serial line ports	100-240 Vac	14	10 Relay	2
5	TM221C24T	1 Serial line port	24 Vdc	14	10 Source	2
6	TM221C24U	1 Serial line port	24 Vdc	14	10 Shink	2
7	TM221C40R	1 Serial line port	100-240 Vac	24	16 Relay	2
8	TM221C40T	1 Serial line port	24 Vdc	24	16 Source	2
9	TM221C40U	1 Serial line port	24 Vdc	24	16 Shink	2
10	TM221CE16R	1 serial line & 1 Ethernet port	100-240 Vac	9	7 Relay	2
11	TM221CE16T	1 serial line & 1 Ethernet port	24 Vdc	9	7 Source	2
12	TM221CE16U	1 serial line & 1 Ethernet port	24 Vdc	9	7 Shink	2
13	TM221CE24R	1 serial line & 1 Ethernet port	100-240 Vac	14	10 Relay	2
14	TM221CE24T	1 serial line & 1 Ethernet port	24 Vdc	14	10 Source	2
15	TM221CE24U	1 serial line & 1 Ethernet port	24 Vdc	14	10 Shink	2
16	TM221CE40R	1 serial line & 1 Ethernet port	100-240 Vac	24	16 Relay	2
17	TM221CE40T	1 serial line & 1 Ethernet port	24 Vdc	24	16 Source	2
18	TM221CE40U	1 serial line & 1 Ethernet port	24 Vdc	24	16 Shink	2
19	TM221M16R/G	2 serial line port	24 Vdc	8	8 Relay	2
20	TM221M16T/G	2 serial line port	24 Vdc	8	8 Source	2
21	TM221M32TK	2 serial line port	24 Vdc	16	16 Source	2
22	TM221ME16R/G	1 serial line & 1 Ethernet port	24 Vdc	8	8 Relay	2
23	TM221ME16T/G	1 serial line & 1 Ethernet port	24 Vdc	8	8 Source	2
24	TM221ME32TK	1 serial line & 1 Ethernet port	24 Vdc	16	16 Source	2

New Project In Somachine

- **Create new project as per attached image and select PLC version, which you have require in your project.**



Somachine Basic New Project

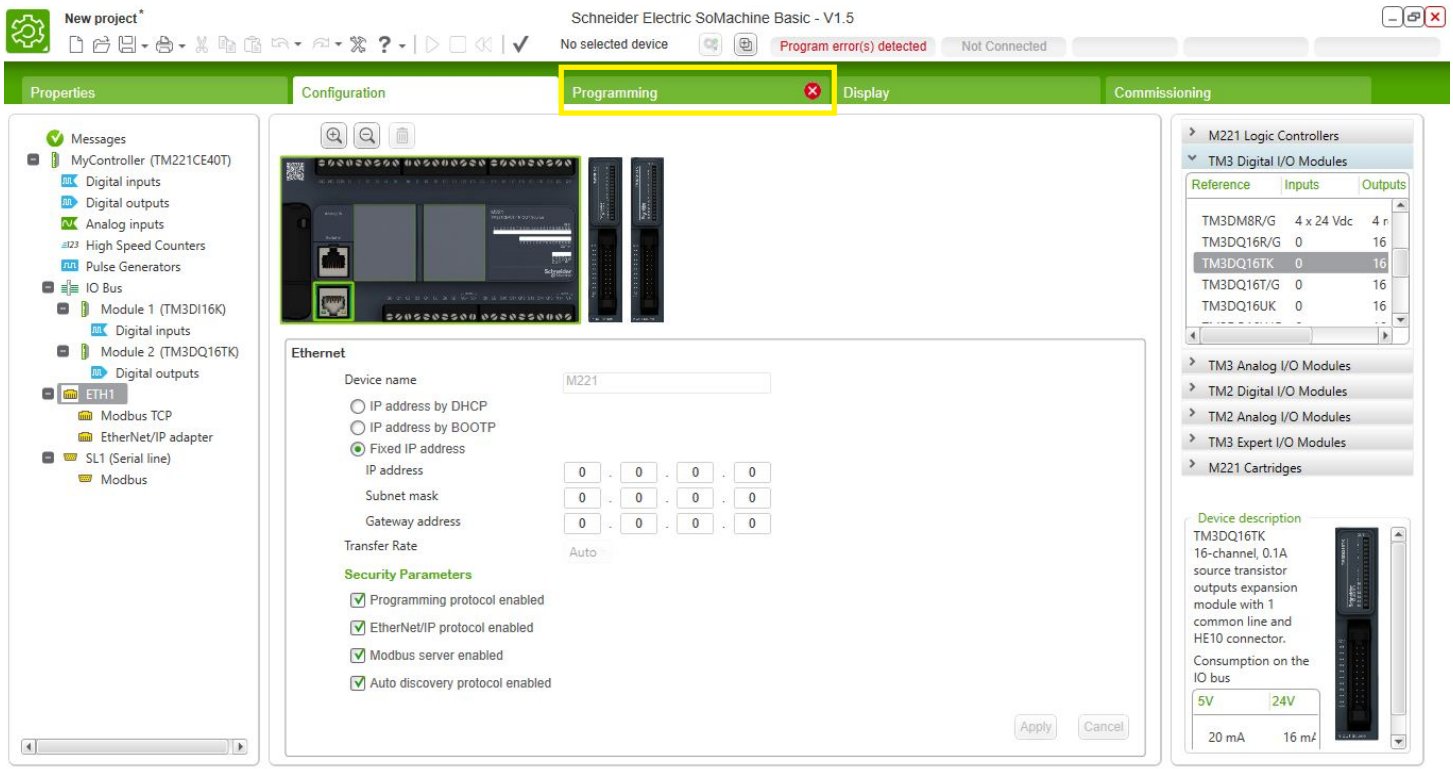


Controller Selection in Somachine Basic

- **See Image and select PLC as you have require, Simply Drag and Drop PLC controller from the right side (TM221 Controller)**
- Below the TM221 controller selection block, you are choose your extended cards/Modules **(like : Analog Modules, Digital Modules, RTD modules)**
- As per image **double click on Serial/Ethernet port**.

Programming Section in Somachine Basic :

- Double Click on Yellow indicated mark as per image (**Programming**)

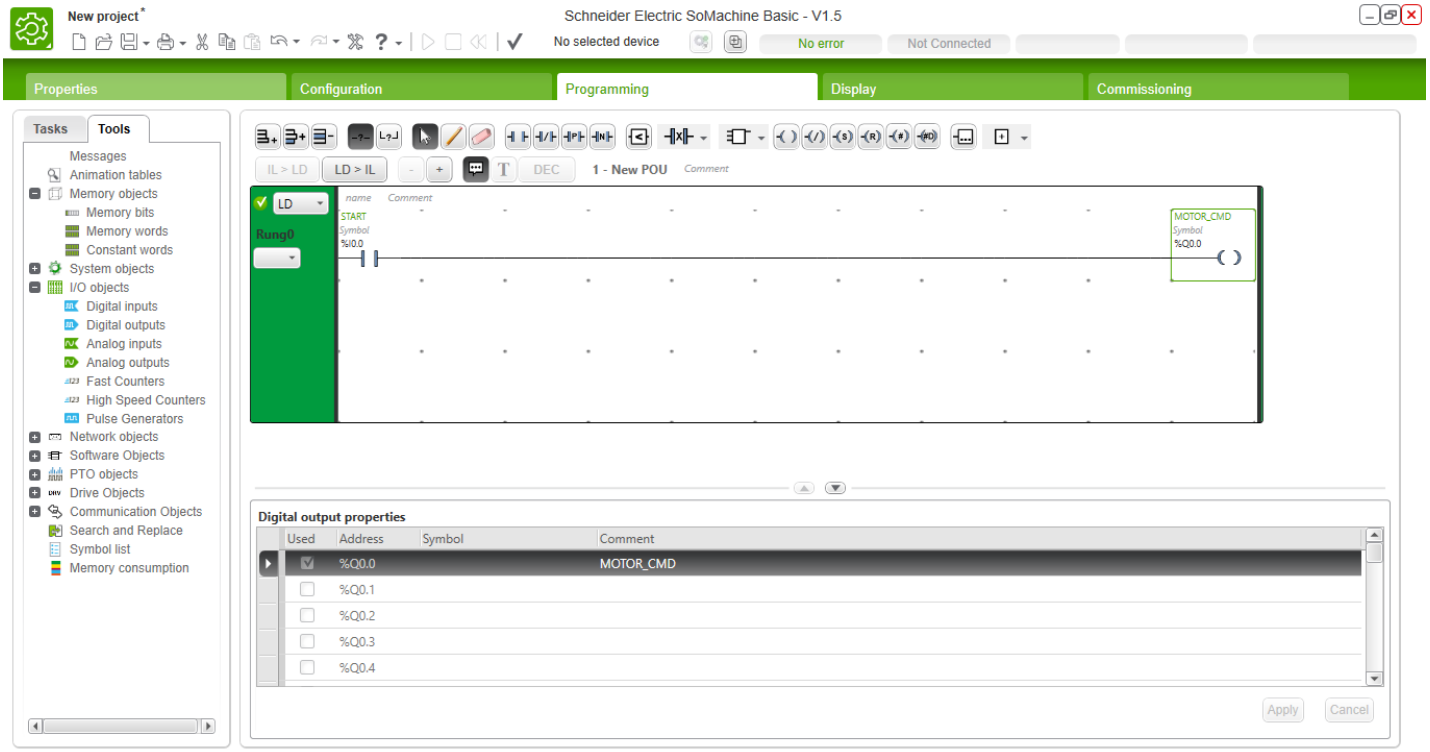


Programming Section in Somachine Basic

- This section only for the development of the PLC Logic.
- You need to developed your Logic as you have require for the project.
- Create POU's on **"Tasks"** Tab for the development of the PLC Logic, On each POU have created multiple Rungs

Example :

- Here one input channel configure for the Motor running command.
- While %I0.0 getting from the Push button (Start) then PLC generated output %Q0.0 for the motor running.



Programming Example in Somachine Basic

- On left side you have got two Tab "**Tasks and Tools**".
- In the **Task tab** you have get a PLC POU's and their Rungs.
- In the **Tools tab** you have get a **PLC controller tools**,
    1. Error Messages
    2. Animation Tables
    3. Memory Objects
    4. System Objects
    5. IO Objects
    6. Networks Objects
    7. Software Objects
    8. PTO Objects
    9. Drive Objects
    10. Communication Objects

- **Here in the Tools Tab you get a various tools of the PLC Controller**

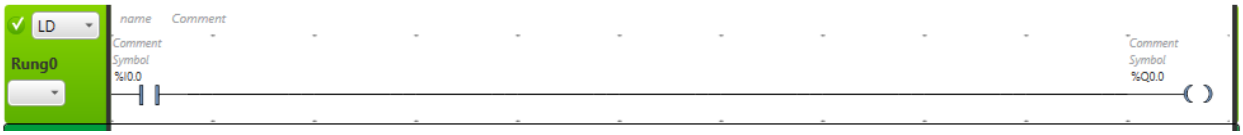
Somachine Basic – Logic Development Part

Programming Window is only for the development of Logic

Only Ladder and Instruction list option available for the development of the PLC Logic.

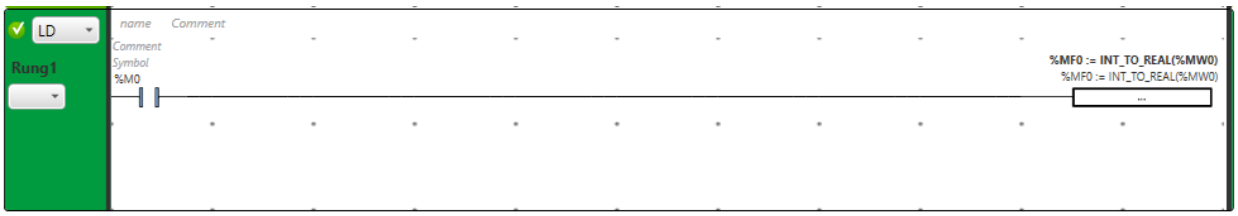
- **You have two option are there for the PLC Logic development.**
  1. **Ladder and**
  2. **Instruction List**

- **As per attached image you can select LD/IL easily.**
- **Go to** Programming section and add rung.
- **See image one input channel configured in the LD and operate one Output.**
- **%I0.0 is Eternal channel of the PLC Input Card,**
- **%Q0.0 External Channel of the PLC Output Card.**



Sample of the Input Channel and Output Channel

- **As per attached image you can develop your Logic here.**
- One more example attached in the image.



Sample of the Operational Block

- While **%M0 bit** actuated then **%MW0** value convert from **INT to Real** Value and Move result in **%MF0.**

Memory Addresses of the PLC :

- **TM221** Controller have supported %M, %MW, %MF, %MD memory addresses for the communication.

Sr. No.	INT / Word	Double INT / Word	BIT	FLOATING
1.	%MW	%MD	%M	%MF
2.	%KW	%KD		%KF

- As per attached Addresses Sheet you can able to transfer data from PLC to SCADA or HMI or Other.

PLC Memory Internal Addresses for the data Transfer :

- **%MW : Memory Word of the internal Address**
- **%M : Memory Bit of the internal Address**
- **%MD : Memory Double of the internal Address**
- **%MF : Memory Float of the internal Addresses**

PLC Memory Constant Addresses :

- **%KW : Constant Word of the Controller Address**
- **%KD : Constant Double of the Controller Address**
- **%KF : Constant Float of the Controller Addresses**

Constant Word only for the passing constant values in the particular Address

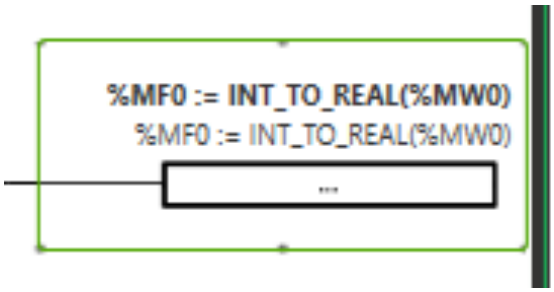
- PLC Address Mapping require as per the standard format, as per their standard format you can transfer data values to the other devices.

Sr. No.	Memory Word	Modbus Addresses
1.	%MW0	40001
2.	%MW1	40002
3.	%MW2	40003
4.	%MW3	40004

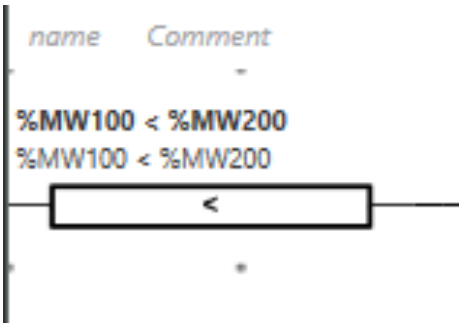
- PLC Controller can be transmit the data on this standard format and you can show PLC values on MODSCAN.
- **You have require to create a Excel file with the PLC Address Mapping as per PLC Logic.**

PLC Operational Block :

- In this operational block you have write your operation,
- Like : **Move statement, Conversion Statement**
- In operation block example, One Memory Word value converted from the **INT_TO_REAL** and move in one Memory floating address.



Comparison Block :



- **Comparison block used for the comparing both values and actuated bit on output coil.**
- **Here in this example %MW100 is less from %MW200 Then output coil generated.**

Ladder Configuration Tools :

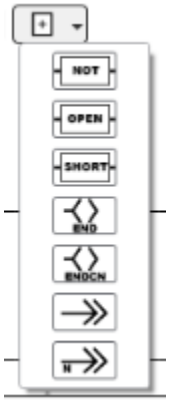
- **Ladder logic development tools**

- **Almost all the tools available in the Somachine Basic software.**
- **NOT, OPEN, SHORT,…etc. Available for the configuration of the Ladder logic.**

- **Output Coil**

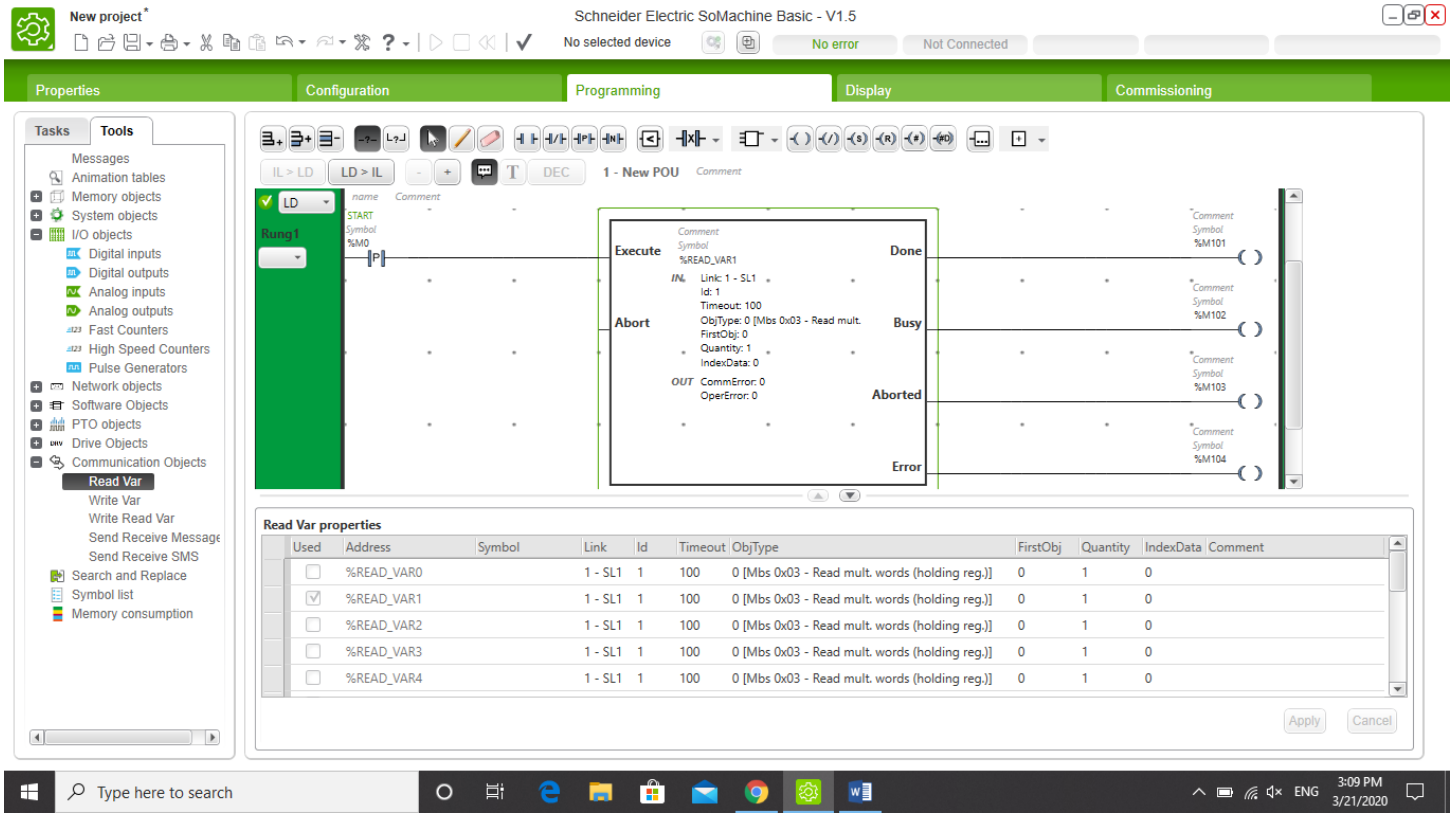
- **Ladder NO, NC, Rising Pulse, Falling Pulse**

- Conversion from **LD to IL** or **IL to LD**



READ_VAR Block Configuration :

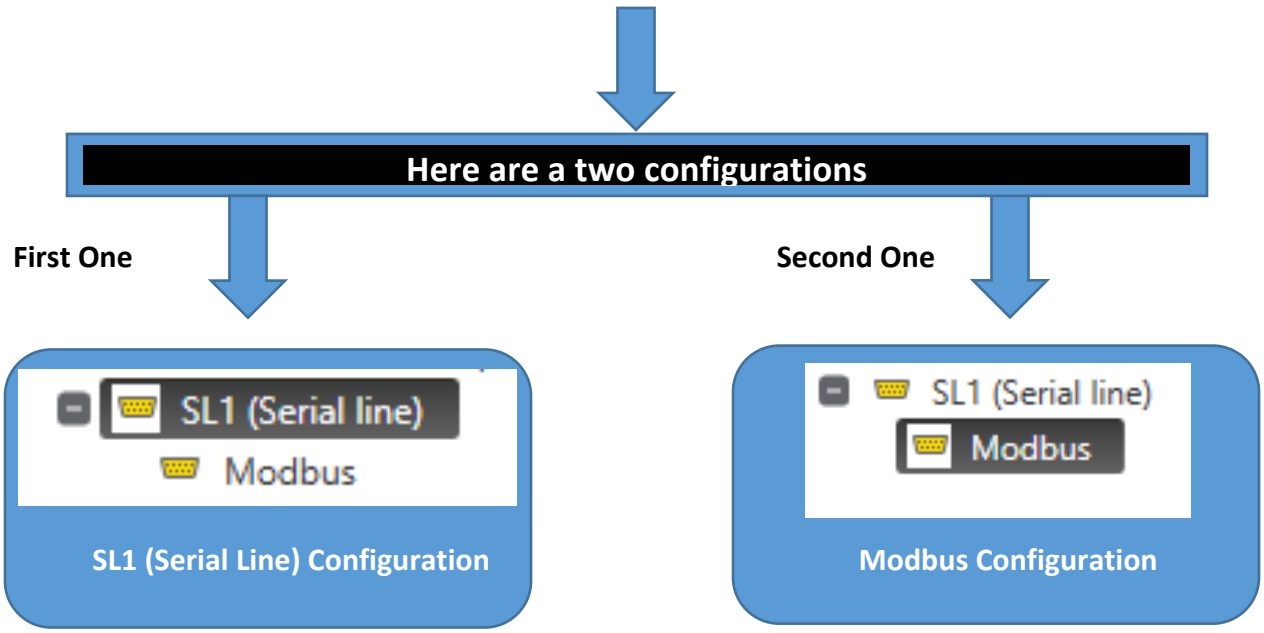
- Read_Var Function block use for the data capturing from the **Modbus RTU / Modbus Ethernet protocol**.
- If you have some slave devices like : **Weighing indicator, Kettles,…Etc.** for the data reading then you have to require Read_Var function for the capturing data.
- This data have get on **Holding Register, Input Register, Input Status and Input Coil** Format.



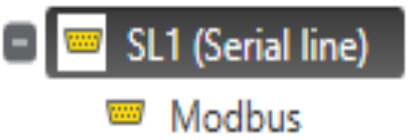
READ_VAR CONFIGURATION

- First you have select **Read_Var Function block** from the Ladder configuration Tools.
- As per attached image trigger to Execute bit of the Read_Var function.
- **Done bit** indicate, Slave device respond or Not.
- Configure your parameter as per require in **Read_Var property.**
- Link **: Serial or Ethernet Protocol**
- Id **: Slave ID**
- ObjType : **Holding Register, input Register, Input Status, Input Coil**.
- First Obj : **First object that you have to read data from the Slave device**
- Quantity : **Quantity of the read data from first object**

MODBUS Serial Configuration :



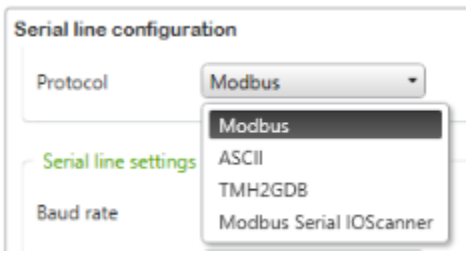
SL1 (Serial Line) Configuration



- Click on **SL1 (Serial Line)** Configuration
- Then you have an option for the **MODBUS, ASCII, TMH2GDB and Modbus Serial IO Scanner.**
- Choose what you have configure in Serial Connection.

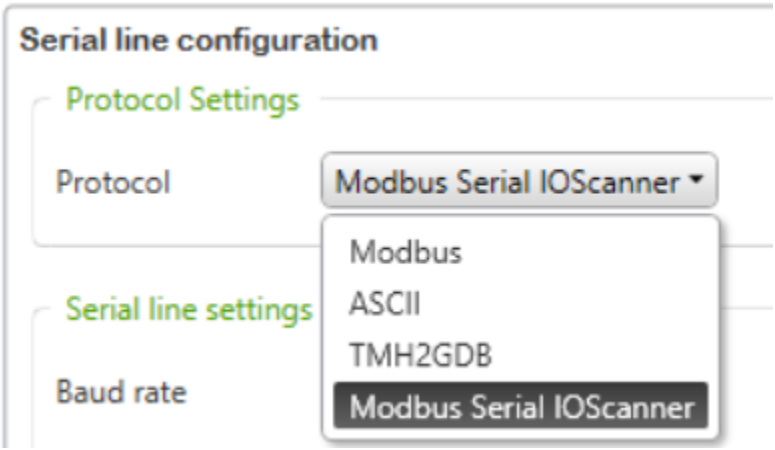
Modbus Serial line Configuration

- You can select as you have require and configure based on selection of communication.
- On all the option you have require to configure some basic options :
    1. **Baud Rate**
    2. **Parity**
    3. **Data Bits**
    4. **Stop Bit**
    5. **Physical Medium**



IO Scanner Configuration

- Select the **IO Scanner in Serial line** as per below attached image.



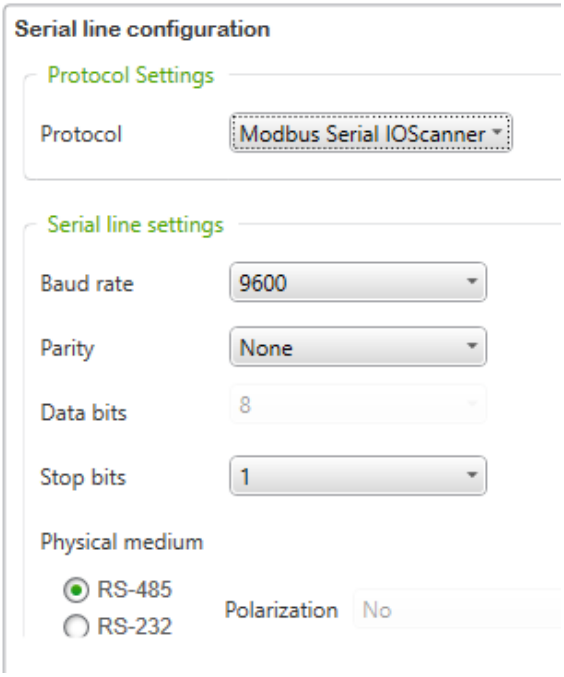
- Select Modbus Serial IOScanner In Protocol Settings.
- Change Serial line Settings as per requirements.

Serial Line Configuration

- Here, Standard settings are done,

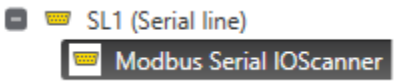
1. Baud rate : **9600**
2. Parity : **None**
3. Data bits : **8**
4. Stop Bit : **1**
5. Physical Medium : **RS-485**

- **APPLY** Changes.



Serial Line Setting

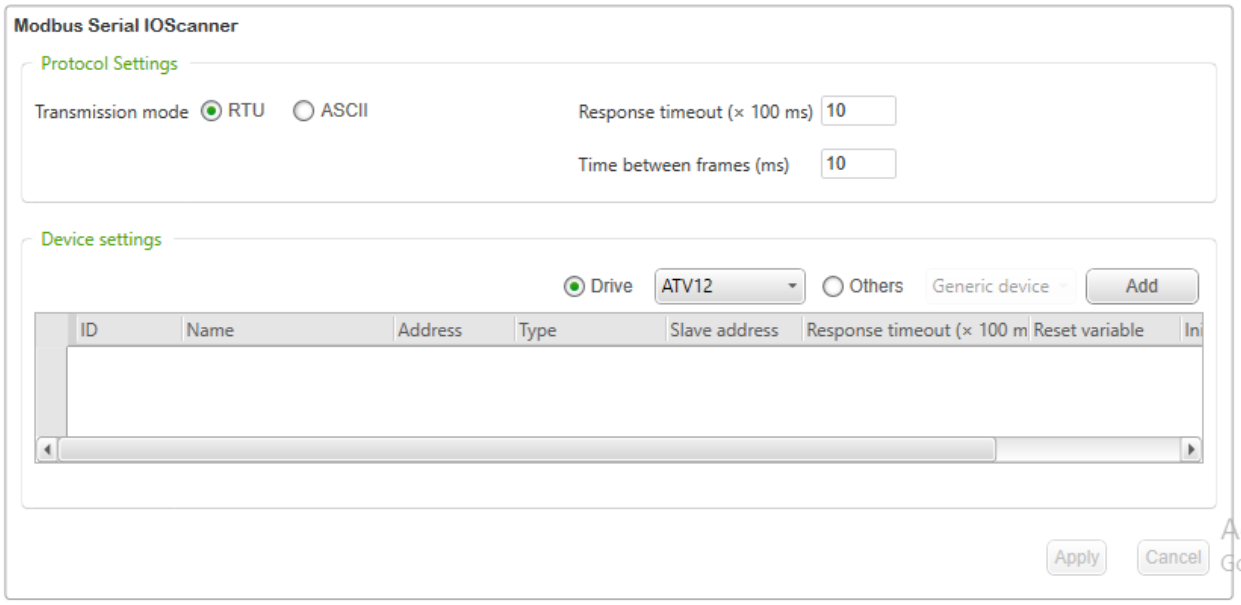
IO Scanner Configuration



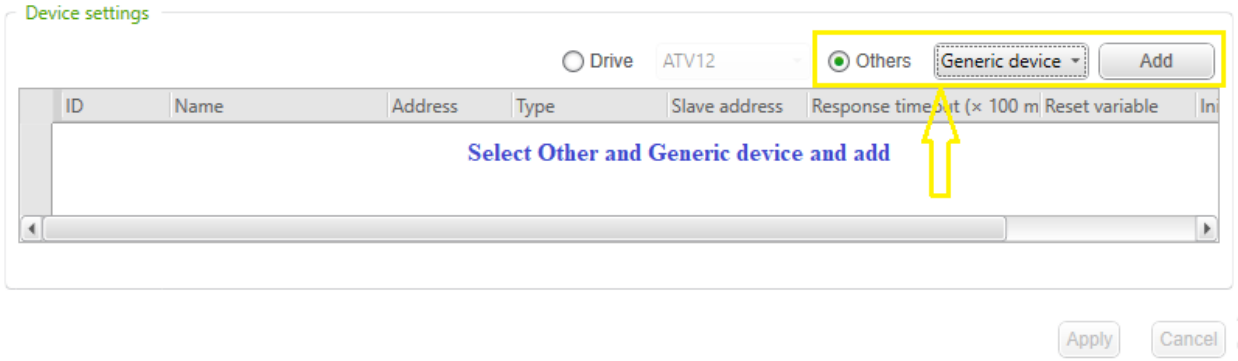
- Click on **Modbus Serial IO Scanner**

Modbus Serial IOScaner

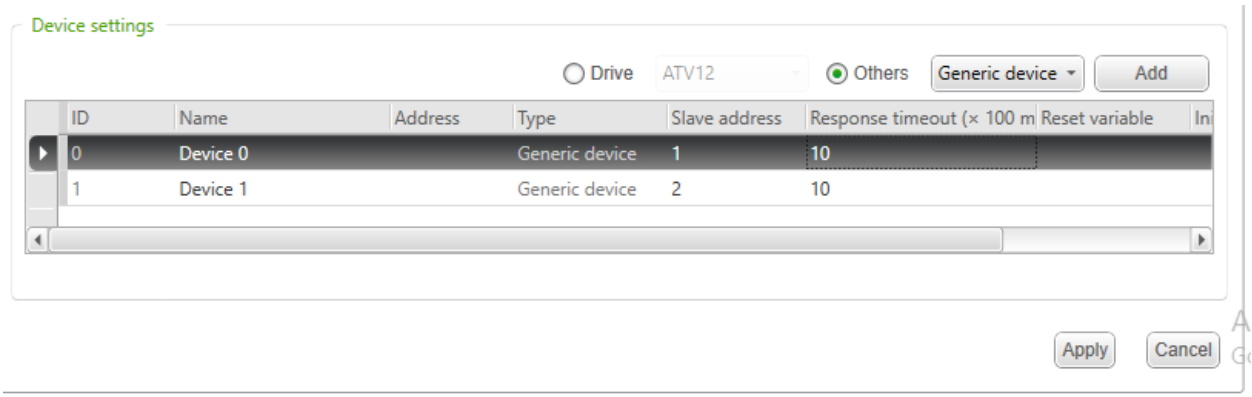
- As per attached image you have get a one page for the Adding Slave devices in IO Scanner.



Modbus Serial IO Scanner



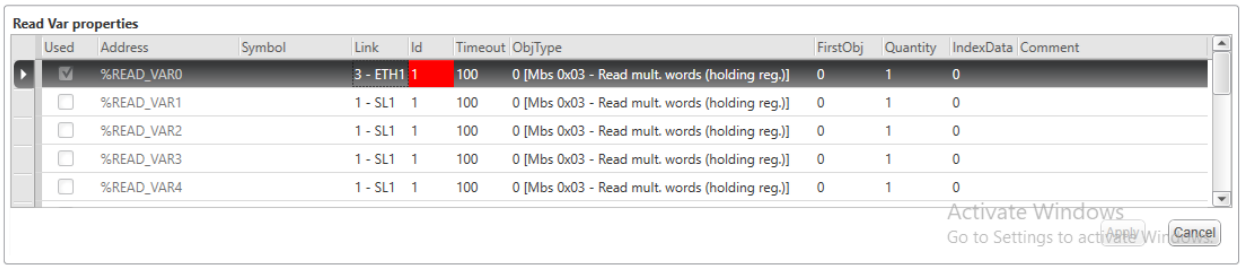
Device Settings



Slave Devices Added in Device Settings

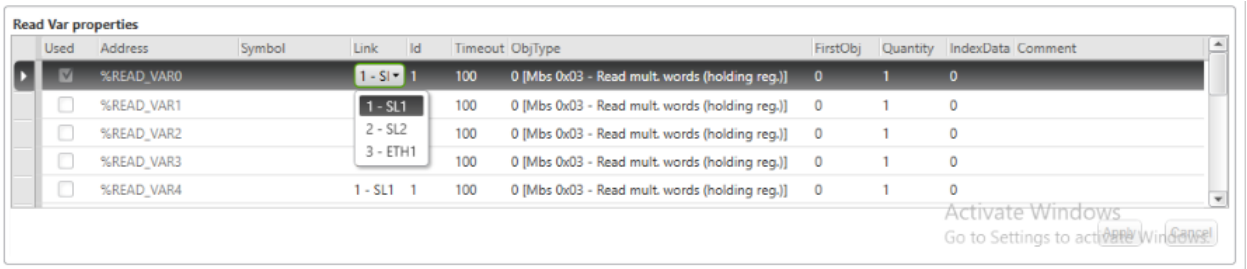
- As per attached image simply click on Add button and give a slave ID of the Slave device.
- **Simply add slave devices in IO Scanner with the particular slave ID and Apply changes.**

- **While you have not configure ETH or SL 1 that time you got a ERROR as per attached image.**



READ_VAR Configuration

- **After configuration of the ETH or SL 1 for the Slave device then READ_VAR configured completely.**

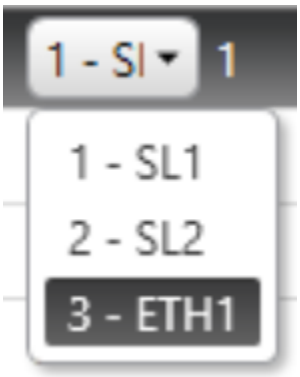


READ_VAR Configuration

- Here are a two option are available for the reading data in PLC**.**
  1. **Serial Communication**
  2. **Ethernet Communication**
- For **SL1 communication select SL 1** then go to the Configuration page and select **SL1 Serial.**
- **This protocol through data will be captured from the Slave device.**

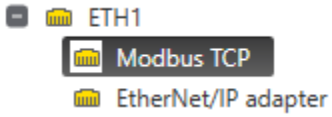
- Make a cable for the Modbus Serial **RS-485 or RS-232** and connect with controller.
- Connect Slave devices serially with controller and configure **READ_VAR** Function block as per connected slave devices.
- After Configuration of **READ_VAR Function Block,** Apply and download program.

MODBUS Ethernet Configuration :

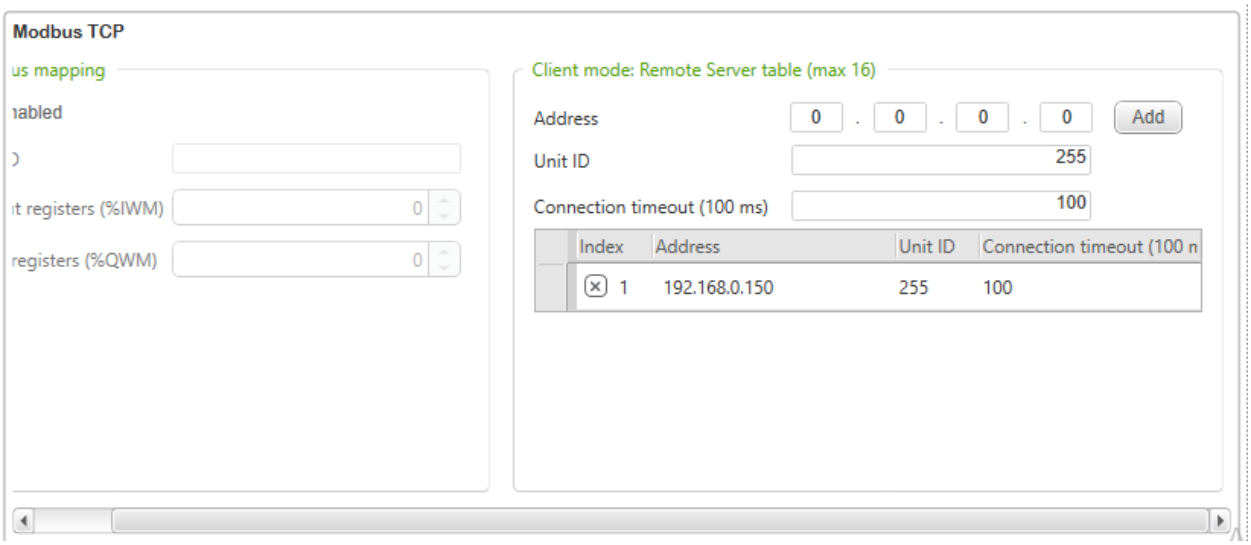


- Here are a two option are available for the reading data in PLC**.**
  1. **Serial Communication**
  2. **Ethernet Communication**
- **For the Ethernet connection you have require to select ETH 1.**
- For **ETH 1 communication** select **ETH 1** then go to the configuration Page and select **ETH 1 Serial**.
- **This protocol through data will be captured from the Slave device.**

- Connect RJ 45 pin Ethernet cable with the controller.
- Connect Slave devices on Ethernet based and data will be transfer using IP Address, Configure **READ_VAR** Function block as per connected slave devices.
- After Configuration of **READ_VAR Function Block,** Apply and download program.



- **Go to Configuration Page and select Modbus TCP.**
- **Configured IP Address of the slave devices.**
- **This Added IP based, READ_VAR Function block configured and Captured data from the slave devices.**



Modbus Slave devices connection

- **Added all the slave devices IP Addresses and configure in READ_VAR Function block.**

Example :

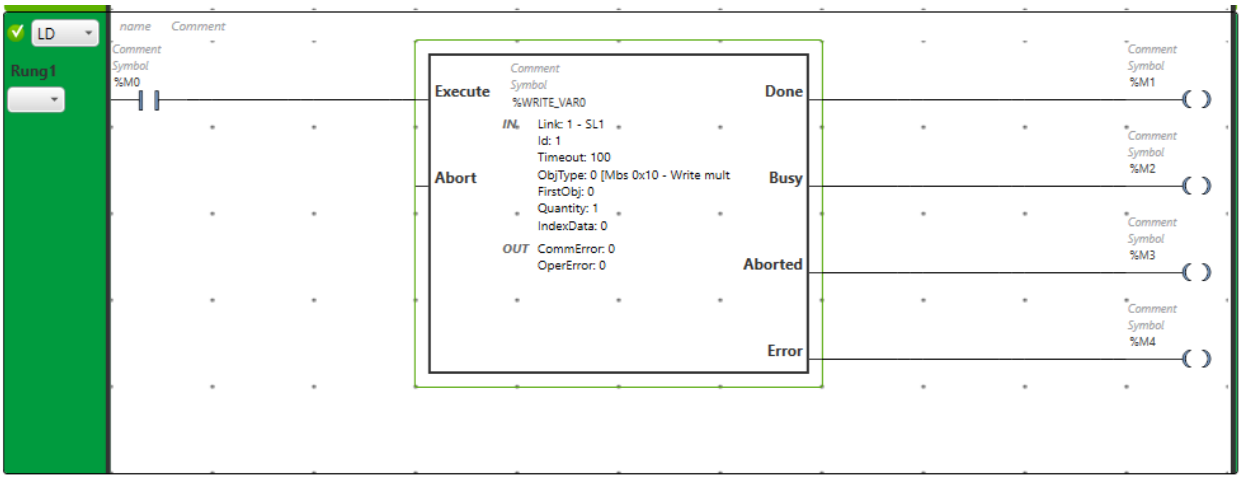
Ethernet / RS-485 Communication

1. Drum Filling Machine
2. Kettle Weighing Indicator

- **You can easily connect all the Slaves devices using RS-484 or Ethernet communication.**

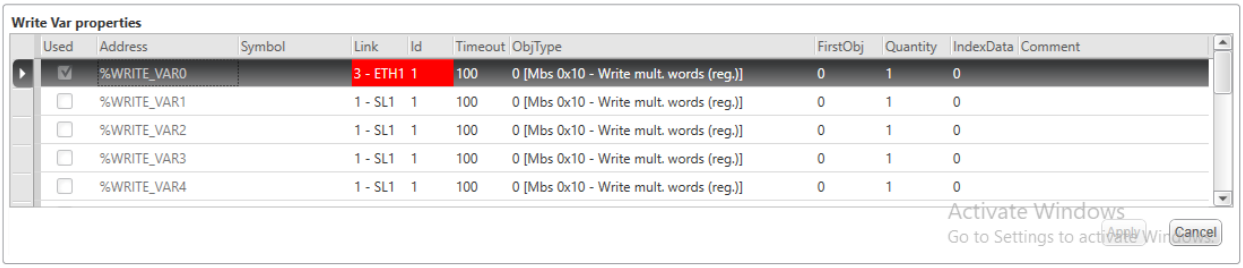
WRITE_VAR Configuration :

- **WRITE_VAR** function block configuration, Same as **READ_VAR** function block configuration.



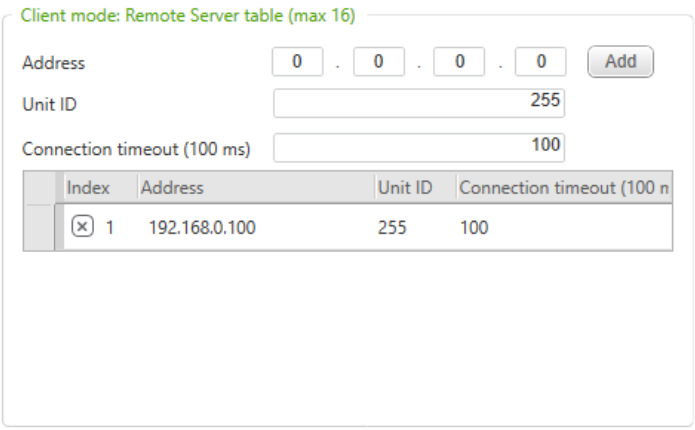
WRITE_VAR Function Block Configuration

- While you have not configured Ethernet slave device's in configuration tab then you got a RED mark as per below attached image.

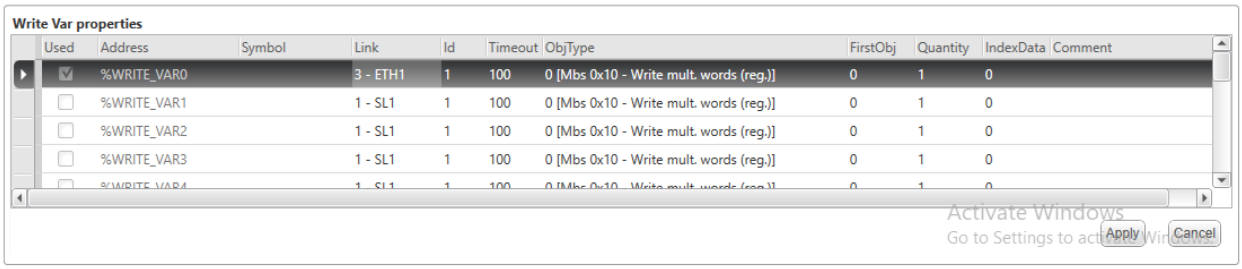


- Go to the configuration page and configure Ethernet device the after select ETH 1 on WRITE_VAR, RED indication easily remove and able to do apply on changes.

- Here on Ethernet
- Configuration one Ethernet Address on Ethernet configuration page.
- Now, Go to the READ_VAR Function block and select ETH 1.



Ethernet Configuration on configuration Page



WRITE_VAR Configuration

- **See,** here **ETH 1 selected** and also **APPLY** button enable for the save configuration.