

Power Meter Monitor

**Business and Mission-**

**Critical Solutions Provider** 

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(12 – 60) x Digital Input 110V DC/AC Stand Alone – Mini PLC





Model: PMM0620-110 Document: Data Sheet Document version: 1.1 Date: January 2023



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#### **DECLARATION OF CONFORMITY**

This restriction is subject to protect the operational process of the system in the business environment, which will produce, use, and transmit radiofrequency energy. Harmful interference to radio communication could result if instructions to the correct installation and usage were not applied. The interference prevention cannot be guaranteed even with proper installation according to the manual. If the device causes a bad effect on the radio / TV signal. The user could preclude that by turning the device on/off.

When this device produces some harmful interference, the user can use the following measure to solve the interference problem:

1-Setting the receiving antenna's direction or location to increase the distance between this device and receiver.

2-Plug in the device's power connector into different circuits of the power outlet with the receiver.

3-If any technical support is needed, the dealer or experienced radio/TV technical personnel must be informed.

#### **TECHNICAL SUPPORT AND SERVICE**

Visit <u>Pmm-usa.us</u> to browse FAQs and get further details. User should collect the following information before submitting technical support and service requests:

- Product name, model and serial number.
- Installed software (operating system, OS version, installed applications and so on).
- Full description of the problem

-Detailed information about every error.

#### SAFETY INSTRUCTIONS

- Only trained and qualified personnel can install, operate, or maintain the device.
- Before starting the installation, all safety precautions must be read, and warning labels affixed to the device must be observed. Doing so protects the device from damage and ensures your safety.
- Safety precautions provided in this document may not cover all safety aspects, note to always remain mindful of safety.
- PMM is not liable for any consequence that results from violation of regulations pertaining to safe operations or safety codes pertaining to design, production, and equipment usage.
- DO NOT use liquids or decontamination spray to clean the device surface and assure that it is totally disconnected while cleaning.
- Take all measures to prevent device drop before or during installation.
- Prior to connecting the device to power source, ensure the source and device voltage and power are 100% matched.
- Keep the cables in a suitable covered place.
- If the device is not used for a long time, shut off the power to avoid the damages by transient overvoltage.
- DO NOT allow any liquid flow into the device; to avoid fire or short circuit.
- The recommended storage temperature range should NOT be less than 30°C OR higher than 85°C.

# 🗥 Warning:

- Read the power source and device inlet carefully.
- Handle device with both hands.
- Clean and maintain the device using recommended, safe and suitable methods.

# Caution:

If any unauthorized changes of settings or repairs are done without PMM approval; then user's rights of controlling this device will be canceled.

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# **KEY FEATURES**

- Simple to set up and cost effective
- (12-60) x Isolated Digital Input 110V DC/AC
- Isolation is provided on all 12x input channels with opto-couplers
- 32-bit ARM core CPU with 48 MHz clock
- High speed data processing and rapid communications turnaround times
- Hot swap redundancy exchange and fail safe ready
- Stand-alone programming or Modular operation modes
- Optional RTC module upon order.
- Issuing alarm for the CPU in case of power losses under 22VDC
- 1x Ethernet 10/100 port
- 1x Serial RS485 port with power surge ±2.5kV isolation protection
- Overvoltage and reverse polarity protected
- Onboard Termination resistor via dip switch
- Wide range of power supply options (10-60V DC or 10-40 V AC)
- 5000V system/field isolation
- EMI, EMS, EMC and shock protected
- -40 to 80 °C Operating temperature
- 5% to 90% Non-condensing Relative Humidity
- Standard 35mm din rail mounting bracket

# DESCRIPTION

PMM0620-110 is a reliable, and simple to set up digital Input module that has 12 isolated channels basically and can be extended to 60 channels using PMM0620 extensions.

This opto-coupled architecture makes each input channel rather rugged, capable of isolating the CPU from transient voltage "spikes" and other electrical phenomena capable of causing damage. In addition, the module can keep the saved data for almost a month in case of power disconnection as it remains in a sleep mode.

The module receives digital signals from sensors and field devices of 110V DC/AC range. The LED indicators indicate the instantaneous status of the field devices whether ON or OFF. PMM0620-110 is widely used in signal interface switching of PLC, single chip or other industrial control board.

Moreover, PMM0620-110 operates under three operational modes:

- Modular operation mode: the module is connected to a PLC by RS485 and implement specific function assigned by the PLC.
- Fail Safe mode: the module should be preprogrammed in case of lost connection with the PLC to carry on its function effectively.
- **Stand-alone**: the module can be programmed to work as PLC and control the field devices.

In addition, PMM0620-110 industrial grade IO module can function under harsh environmental conditions of any site. It is reliable, easy to configure and has an extreme accuracy.

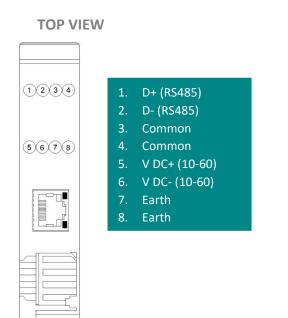


# **TECHNICAL SPECIFICATIONS**

#### **Input Specifications**

Signal type	Voltage
Voltage signal type	110V DC/AC
Input characteristic	High-Side switching
Input current per channel	10mA
Isolation	5000V system/field
Degree of protection	IP45
Interfaces	
Serial	1x RS485 port
Ethernet	1x 10/100
DI/DO	(12 – 60) digital inputs 110V DC/AC
USB	1x USB2.0 Type micro-B
LED Indicators	2x LED for communication over RS485 port indication
	12x LED for input signal indication
Power Parameters	
Input Power Supply Options	10-60 VDC (10-48 VAC)
Power Connector	Phoenix Contact 4 pins 3.5mm
Physical Characteristics	
Housing	Polyamide (Nylon 6.66)/PA
Dimensions	3.91x4.37x0.99 inch (99.4x111.2x22.6 mm)
Mounting Options	DIN Rail

# **PINS ASSIGNMENTS**



#### **BOTTOM VIEW**



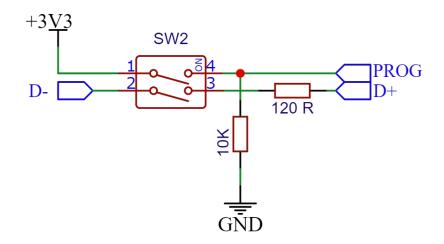
- 1. Digital Input 01
- 2. Digital Input 02
- 3. Digital Input 03
- Digital Input 04
   Digital Input 05
- Digital Input 05
   Digital Input 06
- Digital Input 00
   Digital Input 07
- 8. Digital Input 08
- 9. Digital Input 09
- 10. Digital Input 10
- 11. Digital Input 11
- 12. Digital Input 12

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# HARDWARE CONFIGURATION

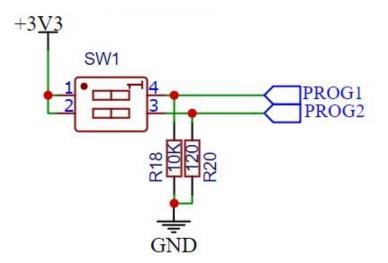
Termination resistor is needed to avoid data-corrupting reflections and expand the network between D+ and D- lines for the RS485.

- Turn on the dip switch (closed circuit) to have a termination resistor of 120Ω between D+ and D- lines.
- The other dip switch is for PROG mode, it is used to switch between two customized modes. As shown in the figure below.



PMM0620-110 can be alternatively switched between two preprogrammed modes through the dip switch shown below.

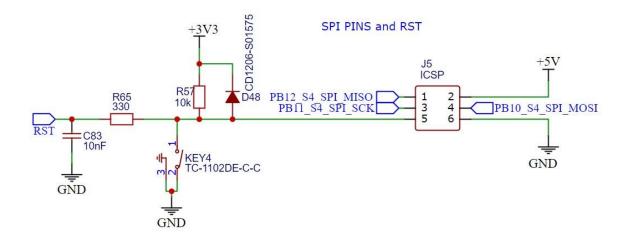
- Turn on the dip switch (closed circuit) on mode number one to enable the device to run in the first functional programmed mode.
- Turn on the dip switch (closed circuit) on mode number two to enable the device to run in the second functional programmed mode.
- In case of not choosing any modes by the user the device will run in the general/default mode.





In addition, there is a reset button enabling the user to reset the device to the default settings.

- In order to reset the device; push the reset button.
- The device will reset automatically to the default settings.



# HARDWARE CONNECTIONS

#### 1. Connecting Power

PMM0620-110 has two power supply options 10-60V DC or 10-40 V AC, the user has to connect the positive power line (+) to pin no.5 in the top view and the negative line (-) to pin no.6 as illustrated in the pin's assignments.

**Note:** the power is protected against overvoltage and reverse polarity in case of wrong connection.

#### 2. Connecting Serial Device

The unit's serial port is located on the top panel. If you are connecting an RS485 multidrop network with multiple devices, note the following:

- 1. All devices that are connected to a single serial port must use the same protocol (i.e., either Modbus RTU or Modbus ASCII).
- 2. Connect the D+ with pin no.1 and D- with pin no.2 and Earth with pin no.4 as illustrated in the pin's assignments to complete the connection successfully.
- 3. Turn on the dip switch to have 120  $\Omega$  termination resistor between the D+ and D- lines. Refer hardware configuration section.

#### 3. Connecting to a Host or the Network

There is a 10/100 Ethernet port at the module's top panel. This port is used to connect the module with a host or Ethernet network.

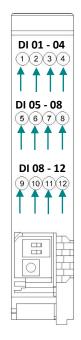
# 4. Connecting Digital Input

Connect the signal line with one of the twelve digital input pins on the bottom view (01-12) and the common line with pin no.3 or 4.



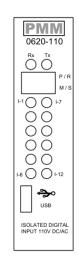
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There are 14x LED indicators at the front panel. 2x LED are for communication indication through RS485 port and 12x LED for indicating the inputs status.

LED No.	Indication
Rx, Tx	Indicating the communication through
	RS485 port
	OFF: No Data is being transmitted or
	received through the port
	Steady-Green: Data is being transmitted
	or received through the port
lx-l12	Indicating the status of Input x
	OFF: Input x is off
	Steady-Green: Input x is on





# **BOARD EXTENSIONS**

PMM0620-110 has a fixed amount of digital input channels capability built into the unit (12 DI), while the extension bords are used to provide customized digital input capability up to 60 isolated channels.

# 1. 0620-110 X (16 Digital Input)

#### Description

PMM0620-110X is a reliable, and simple to set up extension for PMM0620-110 digital Input module that adds 16 additional digital isolated input channels basically. This opto-coupled architecture makes each input channel rather rugged, capable of isolating the CPU from transient voltage "spikes" and other electrical phenomena capable of causing damage.

In addition, the module can keep the saved data for almost a month in case of power disconnection as it remains in a sleep mode.

PMM0620-110X is widely used in signal interface switching of PLC, single chip or other industrial control board.

# D620 D620 - X 0620 - X 0620 - X 0</t

#### **Key Features**

- Simple to set up and cost effective
- 16x additional Isolated Digital Input 110V DC/AC
- Isolation is provided on all 16x input channels with opto-couplers
- Optional RTC module upon order.
- 1x Serial RS485 port with power surge ±2.5kV isolation protection
- Overvoltage and reverse polarity protected
- Onboard Termination resistor via dip switch
- Wide range of power supply options (10-60V DC or 10-40 V AC)
- 5000V system/field isolation
- EMI, EMS, EMC and shock protected
- -40 to 80 °C Operating temperature
- 5% to 90% Non-condensing Relative Humidity



# **PINS ASSIGNMENTS**

#### **TOP VIEW**

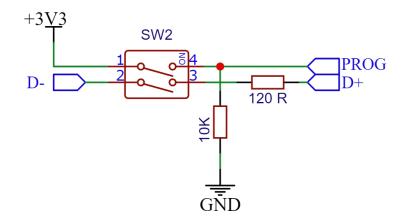
#### **BOTTOM VIEW**

1234	1. Digital Input 13	1 2 3 4 1. Digital Input
	2. Digital Input 14	2. Digital Input
	3. Digital Input 15	3. Digital Input
5678	4. Digital Input 16	(5) 6) 7(8) 4. Digital Input
	5. COM 1	5. Digital Input
	6. COM 2	6. Digital Input
	7. COM 3	7. Digital Input
9101112	8. COM4	9 10 11 12 8. Digital Input
	9. V DC+ (10-60)	9. Digital Input
	10. V DC- (10-60)	10. Digital Input
	11. D+ (RS485)	11. Digital Input
	12. D- (RS485)	12. Digital Input

# HARDWARE CONFIGURATION

Termination resistor is needed to avoid data-corrupting reflections and expand the network between D+ and D- lines for the RS485.

- Turn on the dip switch (closed circuit) to have a termination resistor of 120Ω between D+ and D- lines.
- The other dip switch is for PROG mode, it is used to switch between two customized modes. As shown in the figure below.

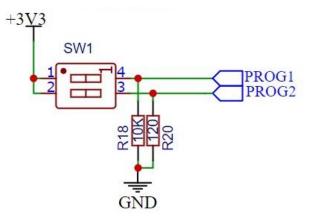


PMM0620-110X can be alternatively switched between two preprogrammed modes through the dip switch shown below.

• Turn on the dip switch (closed circuit) on mode number one to enable the device to run in the first functional programmed mode.

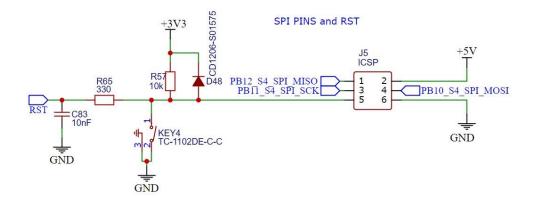
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- Turn on the dip switch (closed circuit) on mode number two to enable the device to run in the second functional programmed mode.
- In case of not choosing any modes by the user the device will run in the general/default mode.



In addition, there is a reset button enabling the user to reset the device to the default settings.

- In order to reset the device; push the reset button.
- The device will reset automatically to the default settings.



### HARDWARE CONNECTIONS

#### **1. Connecting Power**

PMM0620-110X has two power supply options 10-60V DC or 10-40 V AC, the user has to connect the positive power line (+) to pin no.9 in the top view and the negative line (-) to pin no.10 as illustrated in the pin's assignments.

**Note:** the power is protected against overvoltage and reverse polarity in case of wrong connection.

#### 2. Connecting Serial Device

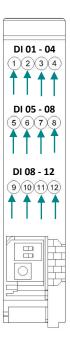
The unit's serial port is located on the top panel. If you are connecting an RS485 multidrop network with multiple devices, note the following:

- 1. All devices that are connected to a single serial port must use the same protocol (i.e., either Modbus RTU or Modbus ASCII).
- 2. Connect the D+ with pin no.11 and D- with pin no.12 as illustrated in the pin's assignments to complete the connection successfully.
- 3. Turn on the dip switch to have 120  $\Omega$  termination resistor between the D+ and D- lines. Refer hardware configuration section.

# 5. Connecting Digital Input

Connect the signal line with one of the twelve digital input pins on the bottom view (01-16) and the common line with pin no.5, no.6, no.7 or 8.





There are 16x LED indicators at the front panel for indicating the inputs status.

LED No.	Indication
lx-l16	Indicating the status of Input x
	OFF: Input x is off
	Steady-Green: Input x is on



# 2. 0620-110 XP (24 Digital Input)

#### **Description**

PMM0620-110XP is a reliable, and simple to set up extension for PMM0620-110 digital Input module that adds 24 additional digital isolated input channels basically. This opto-coupled architecture makes each input channel rather rugged, capable of isolating the CPU from transient voltage "spikes" and other electrical phenomena capable of causing damage.

In addition, the module can keep the saved data for almost a month in case of power disconnection as it remains in a sleep mode.

PMM0620-110XP is widely used in signal interface switching of PLC, single chip or other industrial control board.



# **Key Features**

- Simple to set up and cost effective
- 24x additional Isolated Digital Input 110V DC/AC
- Isolation is provided on all 24x input channels with opto-couplers
- Overvoltage and reverse polarity protected
- Onboard Termination resistor via dip switch
- Powered internally, hence there is no need for external power supply
- 5000V system/field isolation
- EMI, EMS, EMC and shock protected
- -40 to 80 °C Operating temperature
- 5% to 90% Non-condensing Relative Humidity





# **PINS ASSIGNMENTS**

#### **TOP VIEW**

1234	1.	Digital Input 13
	2.	Digital Input 14
	3.	Digital Input 15
5678	4.	Digital Input 16
	5.	Digital Input 17
	6.	Digital Input 18
	7.	Digital Input 19
9101112	8.	Digital Input 20
	9.	Digital Input 21
	10.	Digital Input 22
1234	11.	Digital Input 23
0.000	12.	Digital Input 24
	1.	COM1
	2.	COM2
	3.	COM3
	4.	COM4

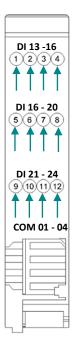
#### **BOTTOM VIEW**

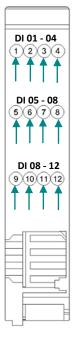
1234	1. Digital Input 01
	2. Digital Input 02
	3. Digital Input 03
5678	4. Digital Input 04
	5. Digital Input 05
	6. Digital Input 06
	7. Digital Input 07
9101112	8. Digital Input 08
	9. Digital Input 09
	10. Digital Input 10
	11. Digital Input 11
	12. Digital Input 12

# HARDWARE CONNECTIONS

# **Connecting Digital Input**

Connect the signal line with one of the twelve digital input pins on the bottom view (01-16) and the common line with pin no.5, no.6, no.7 or 8.





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There are 24x LED indicators at the front panel for indicating the inputs status.

LED No.	Indication
lx-I24	Indicating the status of Input x
	OFF: Input x is off
	Steady-Green: Input x is on

# **ORDERING INFORMATION**

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PMM0620-110	-X	-09xx	Extension -20X, X
Power supply			
10-56 VDC	-1		
COM Port 1			
RS485		-0912	
Extensions			
No Extension			
16x Additional isolated digital input			-20X,16
24x Additional isolated digital input			-20XP,24
32x Additional isolated digital input			-20X,32
48x Additional isolated digital input			-20XP,48
40x Additional isolated digital input			-20X,20XP,40

# **CONTACT INFORMATION:**

For direct inquiries or any customized orders, contactus on <u>sales@Pmm-usa.us</u>

www.Pmm-usa.us

# Appendices

# Appendix 1: PMM USB Configuration

### 1.1. Description

The user can use USB configuration utility which is only compatible with Microsoft Windows 10 operating system for the configuring the device's parameters for the first time such as Ethernet, Modbus and serial settings for PMM devices instead of using the web server configuration for more control and advanced features. In addition to upgrading the firmware and factory reset.

# **1.2. Key Features**

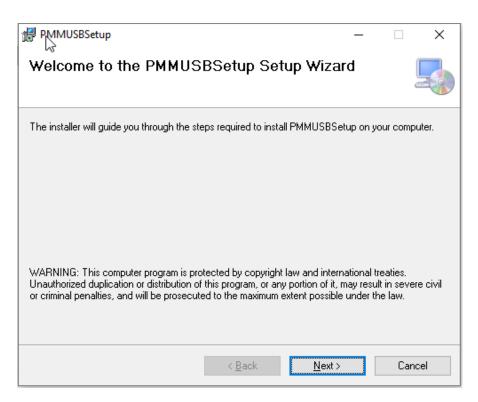
- Configure PMM Products with USB Port
- Restore and Backup user Setting
- Upload/download online Setting for process tuning
- Firmware downloading/updating
- Factory reset and more ...

#### 1.3. Set Up Instructions

- Before installing the USB configurator, the user must install .NET 5.0 SDK (v5.0.408) run time. <u>Click here</u> to start downloading.
- Click on "<u>PMM USB Configurator</u>" then click on <u>download</u>.

Follow the downloading instructions to complete installing the application successfully.

- Once the user clicks on "Setup" the following window appears.
- Click on "Next"

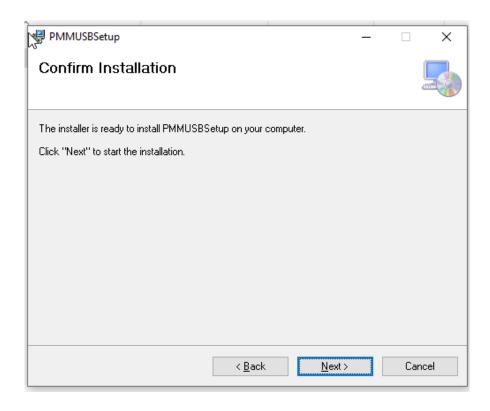


- Browse for the desired installation folder that is saved in your PC.
- Choose whether the setup is for yourself or everyone uses the PC by clicking on the desired choice.
- Click on "Next".

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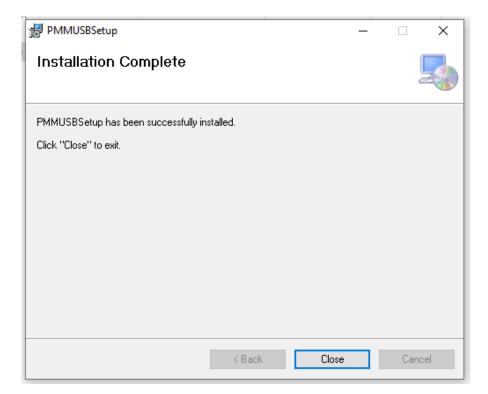
🖟 PMMUSBSetup				-		×
Select Installation Folde	r					
The installer will install PMMUS BEtup to	the following fo	lder.				
To install in this folder, click "Next". To in	stall to a differe	nt folde	er, enter it be	low or	click ''Bro	wse''.
<u>F</u> older: C:\Program Files (x86)\PMM\PMMUS	BSetup\				Browse.	
					Disk Cost	
Install PMMUSBSetup for yourself, or fo	or anyone who i	uses th	is computer:			
C Everyone						
<ul> <li>Just me</li> </ul>						
	< Back		Next >		Can	cel

• Confirm the installation by clicking on "Next"



- When the installation is completed, the following window appears for confirmation.
- Click on "Close".





# **1.4. USB CONFIGURATION UTILITY**

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The following Instructions aim to let the user able to complete device configuration successfully:

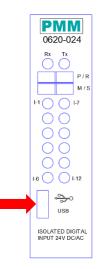
1. Table of requirements:

No.	Requirements
1.	USB type: Micro-USB
2.	Personal computer with Windows 10 operating system.

2. USB connecting instructions:

• Connect the Micro-USB type to the device through the USB port which is located in the front panel of PMM0620.

See the figure below for more clarification:



• Connect the other side with personal computer (PC).

Once the USB is connected between the device and the PC, the user can start the configuration as shown in the figures and instructions below:

• Click on "Select device" drop list as shown below.

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Connect				
Select Device		~		
Search	Connect			
Update Firmware				

• All the connected devices will be displayed based on which of COMs are connected.

onnect	
	N
COM1	
COM49	
Search	Connect
Undete	<b>F</b> :
Update	Firmware

• Click on the connected PMM0620 device that needs settings configuration.

Connect		~
Search	Connect	
Update	Firmware	

• Click on "Connect", the light indicator will be turned into green.

Connect COM49		~
Search	Disconnect	
Update	Firmware	

• Once the device is connected, the settings by default are not editable as shown below.

Connect		Modbus Setti	ngs		Ethernet Config	guration	
COM49	~	Device Type	: Select Device	$\sim$			
		Slave ID	: 1		IP Address :	192.168.	1.200
Search	Disconnect	Serial Settings			NetMask :	255.255.	255.0
Upda	te Firmware	Select Port :	Select Port		DNS :	8.8.8.8	
		Baud Rate :	Baud Rate		Gateway :	192.168.	1.1
				~	Remote IP :	192.168.	1.5
Device Type	Device Type 🗸 🗸	DataBit :	Data Bit	~	UDP PORT 1 :	91	
Hardware Version	1.0 🗸	Stop Bit :	Stop Bit	$\sim$	UDP PORT 2 :	92	
Software Version	V1.0	Parity :	Parity	~	UDP PORT 3 :	93	
Serial Number	252525252551	Interface :	Interface		UDP PORT 4 :		
Mac Address	252525252551	intenace :	interface		0011010141		
Web Server	Select 🗸			Save			
					Control		
					Upload Setti	ngs	Download Settin
					Factory Res		Reset Device

Click on "Upload settings" to enable editing the default settings, and upload them on the device. •

Control	
Upload Settings	Download Settings
Factory Reset	Reset Device

• The Modbus, serial and Ethernet settings are now editable as shown below.

PMM USB Configur	ration					×
Device Configuration	About					
Connect	1 1	- Modbus Settir	ngs	Ethernet Confi	guration	
COM49	~	Device Type	TCP			
		Slave ID :	1	IP Address :	192.168.1.200	
Search	Disconnect	- Serial Settings		NetMask :	255.255.255.0	
Updat	te Firmware	-		DNS :	8.8.8.8	
		Select Port :	Select Port ~	Gateway :	192.168.1.1	
		Baud Rate :	Baud Rate 🗸 🗸	Remote IP :	192.168.1.5	
Device Type	0632 PMM 08x Analog 🗸	DataBit :	Data Bit 🗸 🗸	UDP PORT 1 :		
Hardware Version	1.0 ~	Stop Bit :	Stop Bit 🗸	UDP PORT 2 :		
Software Version	1.0	Parity :	Parity ~			
Serial Number	062012010801			UDP PORT 3 :		
Mac Address	2525252501	Interface :	Interface $\lor$	UDP PORT 4 :	94	
Web Server	Enable $\lor$		Save			
				Control		
				Control		
				Upload Setti	ngs Download Settings	
				Factory Res	et Reset Device	



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#### **Ethernet Settings**

Parameters which are required when configuring Ethernet port are: IP address, Net Mask, Gateway, an DNS Server.

- Type the desired IP address in the specified space (1) which uniquely identifies each computer on the network and the computers use it to communicate with each other.
- Type the desired NetMask in the specified space (2) which identifies an octet in the IP address which is part of the subnet address (network address). Using Net Mask, we know which part of IP address the network address and which part is the host address.
- Type the desired DNS in the specified space (3)
- Set the gateway and remote IP address in the specified spaces (4,5) to be compatible with the network.
- Set the UDP port in the specified space (6).

Ethernet Configuration		
	192.168.1.200	1
NetMask :	255.255.255.0	2
DNS:	8.8.8.8	3
Gateway :	192.168.1.1	4
Remote IP :	192.168.1.5	5
UDP PORT 1 :	91	6
UDP PORT 2 :	92	
UDP PORT 3 :	93	
UDP PORT 4 :	94	

#### **Modbus Settings**

- Select the device type: Modbus TCP or RTU from the "Device Type" drop list.
- Type the device slave ID; the ID must be unique. The slave ID is set by default to 1.

Modbus Settings		
Device Type :	Select Device	$\sim$
Slave ID :	1	

#### **Serial Settings**

Each PMM device has different number of serial ports; select the port to edit the settings for from "Select Port" drop list.

Select Port : Baud Rate :	Select Port Port One Baug Kate		¢
- Serial Settings			
Select Port :	Select Port		~
Baud Rate :	Baud Rate		~
DataBit :	Data Bit		~
Stop Bit :	Stop Bit		~
Parity :	Parity		~
Interface :	Interface		~
		Save	

Parameters (that can be configurated) used during serial communication include:

- Select from the drop list the **baud rate**; baud rate is the communication speed, which is the number of times per second a serial communication signal changes states; a state being either a voltage level, a frequency, or a frequency phase angle.
- Select from the drop list the **data Bit**: Number of bits to represent one character of data 8 (default)
- Select from the drop list the **stop Bit**: The stop bits are used in asynchronous communication as a means of timing or synchronizing the data characters being transmitted.
- Select from the drop list the **parity**: The parity bit is to determine if the data character being transmitted is correctly received by the remote device.
- Select from the drop list the Interface.

Example of Serial settings configuration for port one:

Select Port :	Port One 🗸
Baurd Rate :	9600 ~
DataBit :	8 ~
Stop Bit :	1 ~
Parity :	None ~
Interface :	RS485 ~
	Save



- Click on "Save" to save the new settings of the serial port.
- Click on "Download settings" to download the new settings on the device.
- Click on "Reset" to restore the default settings.

### Appendix 2:

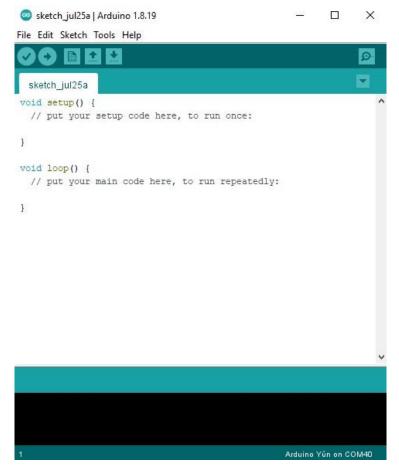
# **PMM06 Integration with Arduino IDE**

### 2.1 Description

The open-source Arduino Software (IDE) is the most used IDE for Arduino and makes it easy to write code and upload it to PMM06 series. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software. In order to work on Arduino (IDE) Make sure you install the libraries first as stated in the instruction manual.

# 2.2 Integration Guidelines

1. Open open-source Arduino Software (IDE), the following main layout will be displayed as shown below.





2. Click on "File" in the main tabs and choose "Preferences" or press on the keyboard "Ctrl+Comma".

	New	Ctrl+N				Ø
	Open	Ctrl+0				
	Open Recent		>			
	Sketchbook		>			
	Examples		>	re, to run once:		
	Close	Ctrl+W				
	Save	Ctrl+S				
	Save As	Ctrl+Shift+S		e, to run repeatedly:		
	Page Setup	Ctrl+Shift+P				
	Print	Ctrl+P				
2	Preferences	Ctrl+Comma				
	Quit	Ctrl+Q				

- 3. The preferences window will be displayed as shown below, the user can edit the settings as needed.
- 4. At the "Additional Boards Manager URLs" place the following link in order to download the PMM boards.

PMM Boards Definition on Arduino Link: https://raw.githubusercontent.com/Israr-Engineering/PMM/main/custom\_Board/package\_PMM\_index.json

5. Click on "OK".

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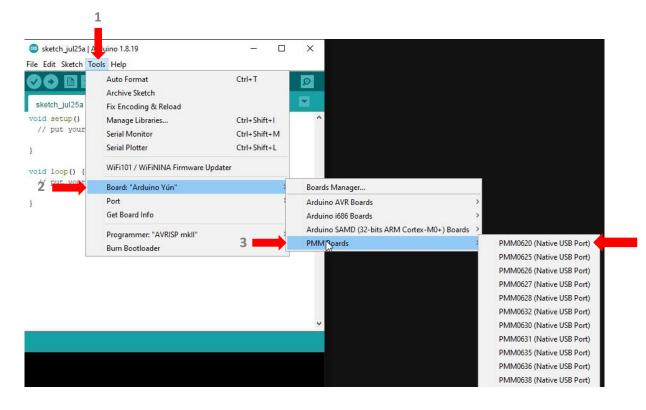
ettings Network		
Sketchbook location:		
C:\Users\Israr 03\Documents	Varduino	Browse
Editor language:	System Default v (requires restart of Arduino)	
Editor font size:	12	
nterface scale:	Automatic 100 + % (requires restart of Arduino)	
'heme:	Default theme v (requires restart of Arduino)	
how verbose output during:	Compilation upload	
Compiler warnings:	None 🗸	
Display line numbers	Enable Code Folding	
Verify code after upload	Use external editor	
Check for updates on star	rtup Save when verifying or uploading	
Use accessibility features		
Additional Boards Manager UR	Ls: bs://raw.githubusercontent.com/Israr-Engineering/PMM/main/custom_Board/package_PMM_index.json	
lore preferences can be edite	ed directly in the file	
:\Users\Israr 03\AppData\Lo	ocal\Arduino 15\preferences.txt	
edit only when Arduino is not	running)	



6. The "Boards Manager" displays all the PMM board that are included in the downloaded package.

Boards Manag	er	×
ype All	∼ pmm	
Boards include	rrsion <b>0.0.26 INSTALLED</b> d in this package: 40625, PMM0626, PMM0627, PMM0628, PMM0630, PMM0631, PMM063 40612,	A2, PMM0635, PMM0636, PMM0638,
		Remove
		,
		Close

- 7. To choose PMM060 board to update its code; click on "Tools" in the main tab.
- 8. Click on "Board".
- 9. Click on "PMM Boards".
- 10. All the downloaded PMM board will be displayed in the list, choose PMM0620.





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# Appendix 3: PMM06 Integration with Visuino

# 3.1 Description

PMM PLC Systems are built to be Arduino compatible programming environment, where PMM's PLCs Range is not just compatible with Arduino IDE, but with lots of other Arduino-compatible programming software such as Visuino.

Visuino is a **graphical integrated programming environment** which helps user program Microcontrollers and Microprocessors with the help of easy-to-use visual interface. It is paid software but you can download a free version which is enough at a beginner level

# **3.2 INTEGRATION GUIDELINES**

#### 3.2.1 Visuino Installation Guidelines

- 1. <u>Click Here</u> to get to the installation page.
- 2. Once the main page is opened, click on "click here to download".



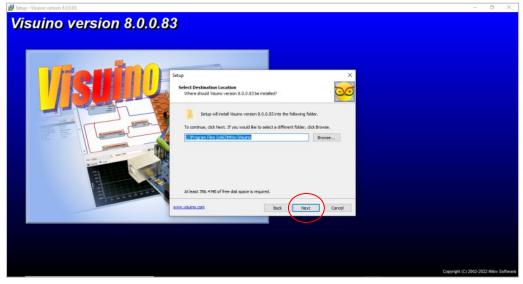
3. Click on "open file" to proceed to installation.



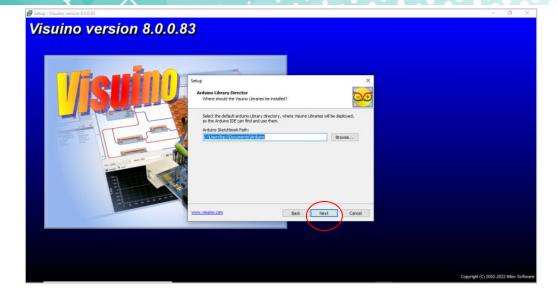
							 0			• A			
Visuino_8_0	0_0_83.zip (evalu	uation copy)									-	0	×
ile Comma	ands Tools F	avorites Option	ns Help										
103			İ 🔍	🔨 🛈	0 6	) 📇							
Add Ex	ctract To Tes	t View	Delete Find	Wizard Info	VirusScan Comn	ient SFX							
<b>ث 🚾 ۱</b>	Visuino_8_0_0_8	3.zip - ZIP archiv	e, unpacked size	157,296,741 bytes									
Name		Si	ze Packed	I Туре	Modified	CRC32							
<b>.</b>				File folder									
📧 setup.exe		157,296,7	41 156,544,282	Application	9/18/2022 9:53	EA8F6A35							

4. Visuino setup process will start, click on "Next" to continue the setup to the completion as shown in the figures below.





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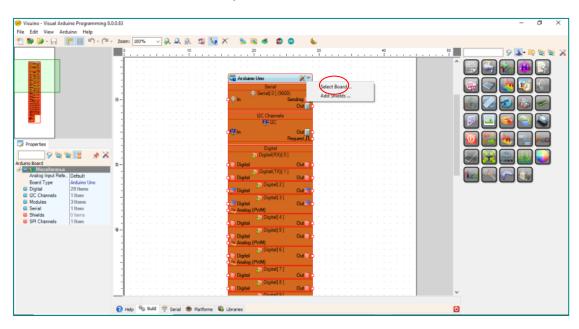
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5. Now everything is setup and the user can start with the device.

🤓 Visuino - Visual Arduino Programming 8.	1.0.83 (Not Responding)	- 0 ×
File Edit View Arduino Help		
💾 🔛 🖓 • 🔂 📑 📰 🏷 • 🍽	· Zoom: 100% 🗸 🔍 🔍 🌠 🗽 🗙 🗞 🗟 🐗 🧔 🐵 🖕	
		93-888 %
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		🔤 💙 🚾 🔛 💟
		la 🕢 🔝 🚳 🛹
	9- ····································	
Properties	· · · · · · · · · · · · · · · · · · ·	💽 🛃 😽 🛃 🛲
	🖓 Arduino Uno 🔗 🖓 🖓	, 🧠 🚾 🔤 💌
	🕐 Heb 🧠 Buld 😌 Serial 🍩 Platforms 🖏 Libraries	u 🗠 🐑 💽
	💽 🔄 🖗 🧐 👳 🛄 🖨	
	This is a free version of Visuino. Some of the components in this version are locked, and a project can contain no more than 20 components. The project contains 0 component(s). You can unlock the components, and the project restrictions by purchasing Visuino license from: www.visuino.com or click here to <u>Register</u>	
	Log in	
	Main Page Discussion Read View source View history Search Visuino Q	
	VISUIND Main Page	*

#### 3.2.2 Integration Guidelines

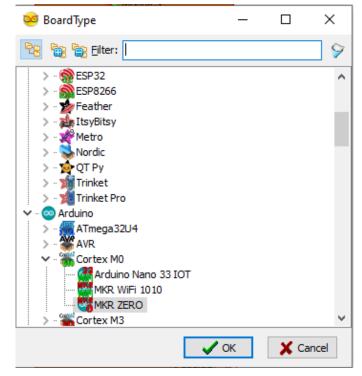
Connect the USB to the device through the USB port in the front panel (Micro-USB type), and connect the other side with personal computer (PC). Once the USB is connected correctly between the device and PC, the user can start the integration as explained in the Integration Guidelines:



1. To select our board, click on "select board".

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2. Choose the Arduino zero board



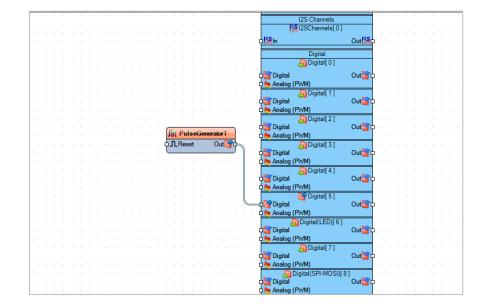
3. Search for you desired function



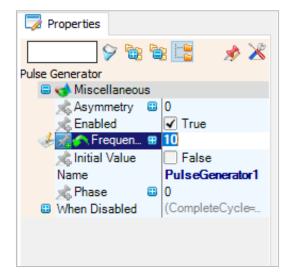
 Drag and drop the selected function to the left of the desired pin and connect it by clicking on the out pin and dragging the wire to the other side
 Note: the example aims to define Pin No.5 as an input and monitor its status between

ON/OFF when a power is connected to it, as shown in the figure below

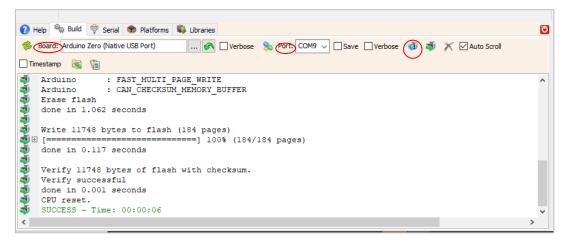
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 Press on the function to adjust values to desiring <u>Note</u>: here we adjusted the frequency



6. From the bottom of the screen reselect the board and the port then press on the compile button.



7. Now your program should be running.

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# Appendix 4: PMM06 Integration with Node-RED

# 4.1 Description

PMM PLC Systems are built to be Arduino compatible programming environment, where our PLC Range is not just compatible with Arduino IDE, but with lots of other Arduino-compatible programming software such as Node-RED.

**Node-RED** is a flow-based programming tool, ideal for Internet of Things applications. It wires together hardware devices, APIs and online services It provides a browser-based editor that makes it easy to wire together flows using the wide range of nodes in the palette that can be deployed to its run time. - 100% Free software license - Ready for Industrial and home IoT systems based on Node.js - Very active community.

# 4.2 INTEGRATION GUIDELINES

#### 4.2.1 Node-RED Installation Guidelines

- 1. <u>Click Here</u> to get to the installation page.
- 2. Once the main page is opened, go to "Quick Start" section and click on "<u>Nodes.js home page</u>" as shown in the figure below.

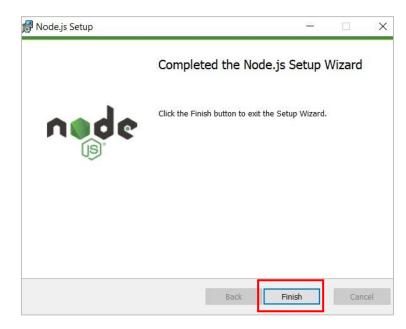
Quick Start	
1. Install Node.js	
Download the latest 14.x LTS version of Node.js from the officia Node.js hom best version for your system.	e page It will offer you the
Run the downloaded MSI file. Installing Node.js requires local administrator r administrator, you will be prompted for an administrator password on install installing. After installation completes, close any open command prompts an environment variables are picked up.	. Accept the defaults when
Once installed, open a command prompt and run the following command to installed correctly.	ensure Node.js and npm are

7. Choose which version to download. Most users download Version 16.17.0 LTS which is recommended for most users as shown below.



8. Node.js setup process will start, click on "Next" to continue the setup to the completion as shown in the figures below.

	Welcome to the	e Node.is Set	tup Wizard
nede	The Setup Wizard allov features are installed o your computer. Click Ne Setup Wizard.	n your computer or	to remove it from
	Back	Next	Cancel
Vode.js Setup		1	- 191
Repairing Node.js			
Repairing Noucija			Î)
			<u>(6</u> )
	p Wizard repairs Node.js.		6
Please wait while the Setu Status: Validating in			(B)
Please wait while the Setu			(B)
Please wait while the Setu			(B)*
Please wait while the Setu			
Please wait while the Setu			
Please wait while the Setu			



9. Once installed, open a command prompt and run the following command to ensure Node.js is installed correctly.

10. Type the command "node -v" to view the version of the installed node red. You should receive back output that looks similar to:

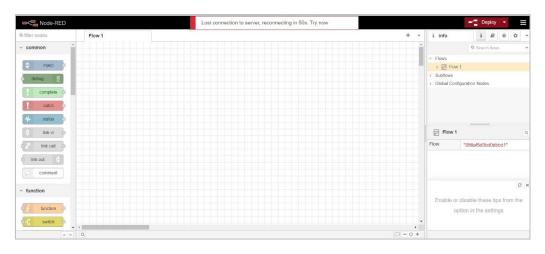
# output that looks similar to: v14.17.2.0 6.14.13 11. Installing Node-RED as a global module adds the command node-red to your system path. Execute the following at the command prompt: npm install -g --unsafe-perm node-red 12. Now close the command prompt, and reopen it. 13. To enable npm to compile binaries on the Windows platform, install the windows-build-tools module using the command prompt as an Administrator: npm install --global --production windows-build-tools 14. Type the command "node-red", a server link will be displayed as shown below. Copy and paste the link to any browser and press enter as shown in the figures below.

f the system-generated key is lost for any reason, your credentials file will not be recoverable, you will have to delete it and re-enter our credentials.
You should set your own key using the 'credentialSecret' option in Your settings file. Node-RED will then re-encrypt your credentials File using your chosen key the next time you deploy a change.
<ul> <li>Aug 13:19:05 - [warn] Encrypted credentials not found</li> <li>Aug 13:19:05 - [info] Server now running at <a href="http://127.0.0.1:1880/">http://127.0.0.1:1880/</a></li> <li>Aug 13:19:05 - [info] Starting flows</li> <li>Aug 13:19:05 - [info] Started flows</li> <li>Aug 13:19:05 - [info] [serialconfig:68aca14478b92a23] serial port COM22 opened at 9600 baud 8N1</li> <li>Aug 13:50:39 - [error] [serialconfig:68aca14478b92a23] serial port COM22 opened at 9600 baud 8N1</li> <li>Aug 13:50:54 - [info] [serialconfig:68aca14478b92a23] serial port COM22 opened at 9600 baud 8N1</li> </ul>
Attp://127.0.0.1:1880/

15. The default node names window will be displayed, click on "Next" as shown in the figure below.

Debug, Function and Link nodes.	3 Defectit neede newsee
when new instances are added to the workspace. This applies to Debug, Function and Link nodes. A new action has also been added to generate default names for	Default node names
c	when new instances are added to the workspace. This applies to
	A new action has also been added to generate default names for the selected nodes:
<ul> <li>Generate Node Names</li> </ul>	• Generate Node Names
Actions can be accessed from the Action List in the main menu.	Actions can be accessed from the Action List in the main menu.
	Next >

16. Now everything is setup and the user can start with the device.



#### 4.2.2 Integration Guidelines

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Connect the USB to the device through the USB port in the front panel (Micro-USB type), and connect the other side with personal computer (PC). Once the USB is connected correctly between the device and PC, the user can start the integration as explained in the Integration Guidelines:

 Upload the desired code on the device by using the Arduino IDE or Visual Studio or any other platform. Click here for more detailed guidelines <u>PLC Software</u>.

**Note:** the following code example aims to define Pin No.4 as an input and monitor its status between ON/OFF when an input device is connected to it, as shown in the figure below.

ile Edit	Sketch Tools Help
90	
sketch	_aug03a §
inclu	de <arduino.h></arduino.h>
int le	dPin = 4; // LED connected to digital pin 4
void se	stup()
	al.begin(9600);
	alUSB.begin(9600);
- Contractions	<pre>ode(ledPin, INPUT_PULLUP); // sets the digital pin 4 as INPUT v(2000);</pre>
	alUSB.println("hello");
	mento (172) ta sala un ten de la constante de la Colla (1 → 1-5)
void l	pop ()
	<pre>val = digitalRead(ledPin); // read the input pin val == HIGH)</pre>
{	var hron,
100	rialUSB.println(0);
}	
else	
{ 	rialVSB.println(1);
50.	
}	

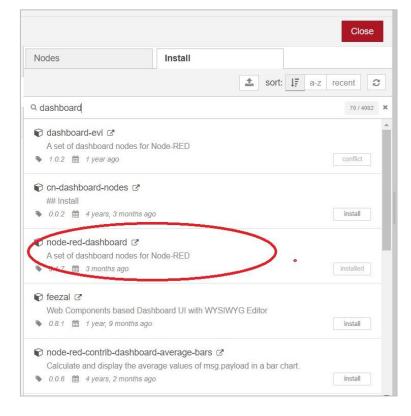
- 2. Once the code is successfully uploaded on PMM0620, close Arduino IDE or any other used platform.
  - Note: It is not possible to have two different applications sharing the same serial port connection.
- 3. Open Node-RED platform, and click on "Manage Palette" to add the needed modules as shown below.

Edit     View	
+ ✓ jît debug i D jît 🖉 🔆 ✓ Arrange	
Export	
Search flows	
Flows     Subflows	
Groups	
Manage palette	
Settings	
Keyboard shortcuts	
Node-RED website	
v3.0.2	

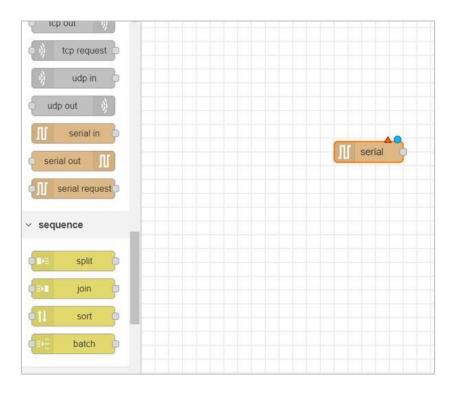
- 4. Search for "Serial" options then choose "node-red-node-serialport" as shown below.
- 5. Click on "install".

Q serial Node-red-node-serialport I2 Node-RED nodes to talk to sorial ports 1.0.1	Nodes	Install		
<ul> <li>node-red-node-serialport I<sup>A</sup> Node-RED nodes to talk to scriat ports</li> <li>1.0.1          6 months ago         ins     </li> <li>node-red-node-serialport-wildcard I<sup>A</sup> Node-RED nodes to talk to serial ports, supporting a wildcard manufacturer name</li> <li>0.7.2          3 years, 8 months ago     </li> <li>node-red-contrib-serial-iterator I<sup>A</sup> Iterate over an Array received on the input, giving the next element only after it receive feedback     <li>0.1.3          7 years, 1 month ago     </li> <li>node-red-contrib-serial-modbus I<sup>A</sup> Node to read values from a Modbus slave via RS485</li> </li></ul>			sort: IF	a-z recent
Node-RED nodes to tails to solid ports         1.0.1  muscle 6 months ago         Image: node-red-node-serial port-wildcard IP         Node-RED nodes to talk to serial ports, supporting a wildcard manufacturer name         0.7.2  muscle 3 years, 8 months ago         Image: node-red-contrib-serial-iterator IP         Iterate over an Array received on the input, giving the next element only after it receive feedback         0.1.3  muscle 7 years, 1 month ago         Image: Node-red-contrib-serial-iterator IP         Node-red-contrib-serial-iterator IP         Node-red-contrib-serial-iterator IP         Node-red-contrib-serial-iterator IP         Node to read values from a Modbus slave via RS485	Q serial			32
<ul> <li>1.0.1  min 6 months ago</li> <li>ins</li> <li>node-red-node-serialport-wildcard C<sup>4</sup> Node-RED nodes to talk to serial ports, supporting a wildcard manufacturer name</li> <li>0.7.2 min 3 years, 8 months ago</li> <li>node-red-contrib-serial-iterator C<sup>4</sup> Iterate over an Array received on the input, giving the next element only after it receive feedback</li> <li>0.1.3 min 7 years, 1 month ago</li> <li>node-red-contrib-serial-modbus C<sup>4</sup> Node to read values from a Modbus slave via RS485</li> </ul>	🗘 node-red-node-seria	lport ₽	-	
<ul> <li>node-red-node-serialport-wildcard IP</li> <li>Node-RED nodes to talk to serial ports, supporting a wildcard manufacturer name</li> <li>0.7.2 iiii 3 years, 8 months ago</li> <li>ins</li> <li>node-red-contrib-serial-iterator IP</li> <li>Iterate over an Array received on the input, giving the next element only after it receive feedback</li> <li>0.1.3 iiii 7 years, 1 month ago</li> <li>node-red-contrib-serial-modbus IP</li> <li>Node to read values from a Modbus slave via RS485</li> </ul>	Node-Red nodes to to	ile to sonial ports		
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<ul> <li>0.7.2 iii 3 years, 8 months ago</li> <li>instant of the input, giving the next element only after it receives feedback</li> <li>0.1.3 iii 7 years, 1 month ago</li> <li>instant of the input, giving the next element only after it receives feedback</li> <li>0.1.3 iii 7 years, 1 month ago</li> <li>instant of the input, giving the next element only after it receives feedback</li> <li>0.1.3 iii 7 years, 1 month ago</li> <li>instant of the input, giving the next element only after it receives feedback</li> <li>0.1.3 iii 7 years, 1 month ago</li> <li>instant of the input, giving the next element only after it receives feedback</li> <li>0.1.3 iii 7 years, 1 month ago</li> <li>instant of the input, giving the next element only after it receives feedback</li> <li>0.1.3 iii 7 years, 1 month ago</li> <li>instant of the input, giving the next element only after it receives feedback</li> <li>0.1.3 iii 7 years, 1 month ago</li> <li>instant of the input, giving the next element only after it receives feedback</li> <li>0.1.3 iii 7 years, 1 month ago</li> <li>instant of the input, giving the next element only after it receives feedback</li> <li>0.1.3 iii 7 years, 1 month ago</li> <li>instant of the input, giving the next element only after it receives feedback</li> </ul>	R node-red-node-seria	lport-wildcard <i>⊡</i> *		
<ul> <li>node-red-contrib-serial-iterator I2 Iterate over an Array received on the input, giving the next element only after it receive feedback</li> <li>0.1.3 math 7 years, 1 month ago</li> <li>node-red-contrib-serial-modbus I2 Node to read values from a Modbus slave via RS485</li> </ul>	Node-RED nodes to ta	lk to serial ports, suppor	ting a wildcard manufactu	rer name
Iterate over an Array received on the input, giving the next element only after it receive feedback         ● 0.1.3 mmode 7 years, 1 month ago         Image: Control over the input, giving the next element only after it receives feedback         ● 0.1.3 mmode 7 years, 1 month ago         Image: Control over the input, giving the next element only after it receives feedback         ● 0.1.3 mmode 7 years, 1 month ago         Image: Control over the input, giving the next element only after it receives feedback         ● node-red-contrib-serial-modbus C <sup>*</sup> Node to read values from a Modbus slave via RS485	HOGO THED HOGOS TO TO	in to sorial ports, suppor	ang a maoara manaraota	
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Node to read values from a Modbus slave via RS485	<ul> <li>0.7.2          3 years, 8 million     </li> <li>node-red-contrib-sen</li> <li>Iterate over an Array regime</li> </ul>	rial-iterator 🗗		inst
	<ul> <li>0.7.2          3 years, 8 million     </li> <li>node-red-contrib-set Iterate over an Array refeedback</li> </ul>	ial-iterator C		inst
🔊 0.0.11 🛗 3 years ago ins	<ul> <li>0.7.2          3 years, 8 million     </li> <li>node-red-contrib-set Iterate over an Array refeedback</li> <li>0.1.3          7 years, 1 million     </li> </ul>	ial-iterator II ecceived on the input, givi		inst after it receives
	<ul> <li>0.7.2 iii 3 years, 8 million</li> <li>node-red-contrib-seet Iterate over an Array refeedback</li> <li>0.1.3 iiii 7 years, 1 million</li> <li>node-red-contrib-seet</li> </ul>	ial-iterator IC ecceived on the input, givi onth ago ial-modbus IC	ng the next element only a	inst after it receives

- 6. Search for "dashboard" module that opens new blocks which display the input value (0 or 1), then choose "node-red-dashboard".
- 7. Click on "install".



- 8. The installed modules will be found in the workspace.
- 9. Drag the serial port block and drop it where it is needed.



٩٥

10. Double click on the serial module to edit the properties.

Delete		Cancel	Done
Properties			
🗴 Serial Port	Add new serial-port	~	dat.
	0		

- 11. Type the desired name in the specified space.
- 12. Click on the "pin icon" to edit the properties. The following window will be displayed.

Delete	Cancel	Updat
Properties		٥
🗴 Serial Port	COM22	Q
🖋 Settings	Baud Rate     Data Bits     Parity     Sto       ▼ 9600     8 ▼     None ▼     1	p Bits
	DTRRTSCTSDSRautoautoautoauto	• •
Dinput		
Optionally w	ait for a start character of, then	
Split input	on the character	
and deliver	ASCII strinas 🗸	
🕩 Output		
Add charact	er to output messages	
<b>≓</b> Request		
	onse timeout 10000 ms	
Donantroop		
1.50	on" character is used to split the input into separa an accept chars (\$), escape codes (\n), or hex cod	

- 13. Choose from the drop lists the desired settings based on the code such as baud rate, data bits, parity and stop bits.
- 14. Once the port configuration is completed click on "update"
- 15. Drag the dashboard block and drop it where it is needed.
- 16. To edit the "Dashboard" block name and settings double click on the block.
- 17. The following window will be displayed.

Delete			Cancel
Properties			•
I Group	[Home] Defaul	t	~
[모] Size	auto		
I Label	text		
I Value format	{{msg.payload}	}	
Layout	label value	label value	label value
	abel value	label value	
Class	Optional CSS of	lass name(s) for	widget
Name			

18. Click on the "pen icon" the following window will be displayed.

Delete		Cancel	Update
C Properties			•
Name	Default		
III Tab	Home	~	
Class	Optional CSS class	name(s) for widget	
↔ Width	6		
	Display group nat	me	
	Allow group to be	collapsed	

- 19. Make sure that "Display group name" and "allow group to be collapsed" are both enabled.
- 20. After completing the settings click on "Done".
- 21. Connect the two blocks together in the workspace.
- 22. And click on "Deploy".

Q

Ø

Node-RED			
Q filter nodes	Flow 1	+ -	e
~ common			^
🔅 inject 🍐			
(Deres)			1
o debug			
complete o			
catch		text	
👌 link in 🗇			
65 link call b			
e link out			
C comment			
✓ function			
function			
e-C switch			
Change			
	4		

- 23. Open the user interface page to monitor the status of the input.
- 24. Copy the same http address that has been used.

😪 http://127.0.0.1:1880/

25. Type "ui" after the / and press enter.



26. Connect a digital input with PMM0620 to pin no.4 to monitor its status. If the input is on the text value will be **1** if it is off the text value will be **0**.

ŀ	lome		
		Default	
		text	1

# Appendix 5: PMM06 Integration with OpenPLC

### 1.1 Description

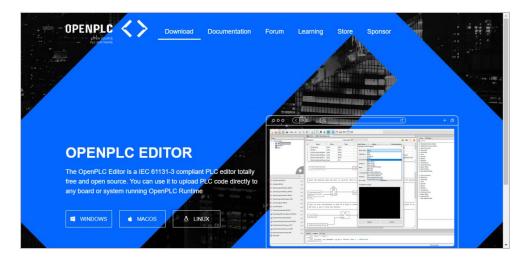
PMM PLC Systems are built to be Arduino compatible programming environment, where PMM's PLCs Range is not just compatible with Arduino IDE, but with lots of other Arduino-compatible programming software such as openPLC.

**OpenPLC** is an independent organization providing efficiency in industrial automation based on the needs of users. OpenPLC members have concentrated on technical specifications around IEC 61131-3, creating specifications and implementations in order to reduce cost in industrial engineering. The outcome for example is standardized libraries for different application fields, harmonized language conformity levels and engineering interfaces for exchange. Experts of the OpenPLC members are organized in technical committees and together with end users define such open standards.

### 5.2 INTEGRATION GUIDELINES

### 5.2.1 OpenPLC Installation Guidelines

- 1. <u>Click Here</u> to get to the installation page.
- 2. Once the main page is opened, click on the compatible link with your device.

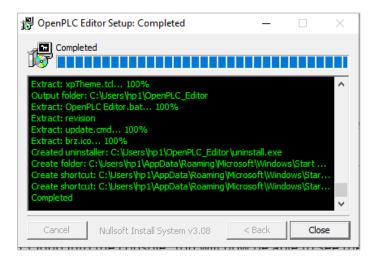


4. Click on "open file" to proceed to installation.



5. OpenPLC setup process will start, click on "Install" to continue the setup to the completion as shown in the figures below.

🔀 OpenPLC Editor Setup: Installation Options 🛛 🗌 🗙							
Check the components you want to install and uncheck the components you don't want to install. Click Install to start the installation.							
Select components to install:	☑ OpenPLC Editor ☑ Start Menu Sho						
Space required: 779.9 MB							
Cancel Nullsoft Install	5ystem v3.08		Inst	tall			



6. Now everything is setup and the user can start using the program.

<> OpenPLC Editor		-	٥	×
File Edit Display Help				
File Edit Display Help				
Project		Library Debugger		
		Q Search		
				^
				$\sim$
<b>*</b>	Search Console PLC Log			
<u></u>				

### 5.2.2 Integration Guidelines

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Connect the USB to the device through the USB port in the front panel (Micro-USB type), and connect the other side with personal computer (PC). Once the USB is connected correctly between the device and PC, the user can start the integration as explained in the Integration Guidelines:

- 1. To open a new project: select "New", then select the destination file.
  - **Note:** the folder of destination should be empty.

<> o	penPLC Editor		
File	Edit Display H	lelp	
	New	CTRL+N	
	Open	CTRL+O	
	Recent Projects		>
	Save	CTRL+S	F
	Save as	CTRL+SHIFT+S	
	Close Tab	CTRL+W	
	Close Project	CTRL+SHIFT+W	
	Page Setup	CTRL+ALT+P	
	Preview	CTRL+SHIFT+P	
	Print	CTRL+P	
	Check for updates.	CTRL+U	
	Quit	CTRL+Q	
_			

2. Name your file then choose the desired programming language.

Create a new PC	UU .	×
POU Name:	blink	
POU Type:	program ~	
Language:	~	
ОК	IL ST LD FBD SFC	

3. Now press on the green plus icon to create a variable, choose the name and the desired type.

#         Name         Class         Type         Location         Initial Value         Option         Documentation           1         blinkled         Local         BOOL	
1 blinkled Local BOOL	BOOL



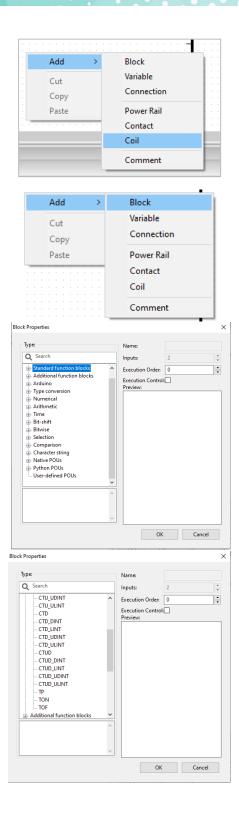
4. Now add the power rails in both left and right, and select the pin number.

	Add Cut Copy	>	Block Variable Connecti	on	
	Paste		Power Ra Contact Coil	il	
		-	Commen	t	
Power Ra	il Properties				×
⊖ Rig	t PowerRail ht PowerRa ımber:	il • OK	Preview:	 Cancel	

5. You can add the contact and coil by right clicking and pressing on the needed one.

Add > Cut Copy Paste	Block Variable Connection Power Rail Contact Coil	
	Comment	
Edit Contact value	s X	
Modifier:	Preview:	
<ul> <li>Negated</li> <li>Rising Edge</li> <li>Falling Edge</li> <li>Variable:</li> </ul>	blinkeyled 	
blinkeyled OK	Cancel	
Edit Coil Values	×	
Modifier: Normal	Preview:	
<ul> <li>Negated</li> <li>Set</li> <li>Reset</li> <li>Rising Edge</li> <li>Falling Edge</li> <li>Variable:</li> </ul>	blinkeyled -( )-	
ОК	Cancel	





 To know the location of the pins, go to the website >documentation >openPLC runtime >physical addressing >zero >digitaloutput>

OPENPLC OPENSOURCE PLC SOFTWARE	<>	Download –	Documentation Forum	n Learning	Store	Sponsor
1. Get Started  1. 1. OpenPLC Overview  1. 1. Installing OpenPLC Editor		> 1. Get Started > 1.1 OpenPLC Overvie 1.1 OPENPLC OVERVIEW	w			
		OpenPLC is an open-source Programm fully functional standardized open sour accordance with the IEC 61131-3 stand languages for PLCs.	rce PLC, both in software ar lard, which defines the basi	nd in hardware. ic software arc	The OpenPL hitecture and	C project was created in I programming
1.5 Installing OpenPLC Runtime on Microcontrollers		OpenPLC is mainly used on industrial a OpenPLC in action on the short video t		net of things ar	nd SCADA res	search. You can check
2. OpenPLC Runtime 3. OpenPLC Editor	~					
1. Get Started		> 2. OpenPLC Runtime > 2.4 Physical A	ddressing			
2. OpenPLC Runtime		2.4 PHYSICAL ADDRESS	ING			
2.1 OpenPLC Runtime Overview     2.2 Uploading Programs to OpenPLC     Runtime     2.3 Input, Output and Memory     Addressing		OpenPLC Runtime is compatible with s Internally, all I/O variables are associat Addressing. The hardware layer is the physical hardware locations. Each plat find the pinout description for each plat	ed with a PLC Address, as e component responsible for form OpenPLC supports mi	explained on <b>2</b> , r translating inf ust have a diffe	<b>3 Input, Out</b> ernal PLC Ac rent hardwa	<b>put and Memory</b> Idress variables into re layer. Below you can
2.4 Physical Addressing		Microcontroller-based boa	rds			
<ul> <li>2.5 Modbus Addressing</li> <li>2.6 Slave Devices</li> </ul>		Controllino Maxi				
3. OpenPLC Editor		Digital In	A4, A5, A6, A7, A8, A9, IN0, IN1		%IX0.0 - %IX0.7	
		pigital out	D4, D5, D6, D7, D8, D9, D10, D11 R0, R1, R2, R3, R4, R5, R6, R7 R8, R9		%qxe.e - %qxe.7 %qx1.e - %qx1.7 %qx2.e - %qx2.1	
		Analog In	A0, A1, A2, A3		XINO - XIN3	
		Analog Out	D0, D1, D2, D3		Хдмө – Хдиз	
Jno, Leonardo, Nano,	Micro,	Zero				
Digital In		2, 3, 4, 5, 6		%IX0.0 - %IX	0.4	
Digital Out		7, 8, 12, 13		%дхө.ө - %дх	0.3	
Analog In		A0, A1, A2, A3, A4, A5		%IW0 - %IW5		

7. Write down the location in the box

Analog Out

<b>1</b>		< 🔁 📰s0.insta	ince0					-
Desci	ription:			Class Filter: All		1		ŀ
#	Name	Class	Туре	Location	Initial Value	Option	Documentation	^
1	blinkedled	Local	BOOL	%QX0.3				-
2	TON0	Local	TON					~
<							>	

%Qw0 - %Qw2

8. After assembling your project press on the Arduino sign to upload the program to your device

OpenPLC Editor - ~open~									-	U X
File Edit Display Help										
🛯 🔓 🚨 🖉 😫 ( 🏎 📣 🛛 🔏	b ib	a ::	💿 🦊 😋			- wa : 🕫 🖂				
	- 1	🕫 firstproj 🔿	< 🔁 📴s0.insta	ince0						
Project		ription:			Class Filter: A		~	÷ = † J	Library Debugger	
⊕e <sup>c</sup> Unnamed	Desc	inption:			Class Filter: A			<b>•</b> • • •	Q Search	
Res0	#	Name	Class	Туре	Location	Initial Value	Option	Documentation ^	Arduino	^
HEV .	1	blinkedled	Local	BOOL	%QX0.3				Type conversion     Numerical	
	2	TON0	Local	TON				~		
	<							>	⊕ Time	
					TONO		TOFO	^ ^	Bit-shift     Bitwise	
					TON		TOF		- Selection	
					EN ENO		EN ENO		Comparison     Character string	
			blinked					linkedled	Native POUs	
	0.0				IN Q		IN Q		Python POUs	~
			T#500m		PT ET -	T#500ms	PT ET			~
			1,000	° – ° L						
The config0.Res0.instance0 v 🗸		+ • • • •						· · · · · · · · · · · · · · · · · · ·		
	-							,		~
blinkedled (BOOL)	Sea		PLC Log							
TON0 (TON)				) Dechtern) der		phaimi\open plc\op	and had he			
	Ge	enerating So	ftPLC IEC-6113	1 ST/IL/SFC	code	maini (open pic(op	Jen (bullu			
	1.1									
1										

Upload to Ard	uino Board			×			
Board Type:	Arduino Zero (nativo	rduino Zero (native USB port) OM9					
COM Port:	COM9			$\sim$			
Enable Mo	odbus Serial						
Interface:	Serial			$\sim$			
Baud:	115200			$\sim$			
Enable Mo	odbus TCP						
Interface:	Ethernet						
MAC:	0xDE, 0xAD, 0xBE, 0xEF, 0xDE, 0xAD						
IP:		DNS:					
Gateway:		Subnet:	255.255.255.0				
Wi-Fi SSID:		Password:					
Compilation	output:						
done in 0. CPU reset.	014 seconds			^			
Done!				~			
	Upload		Cancel				
. aesauver.v	OV CAULO CONTIL	0.0 ACOU.0	· · open.ull	_			

9. Now the program should be running on your device.



# **Appendix 6: PMM06 Integration with Scilab**

#### **Description** 7.1

PMM PLC Systems are built to be Arduino compatible programming environment, where PMM's PLCs Range is not just compatible with Arduino IDE, but with lots of other Arduino-compatible programming software such as Scilab.

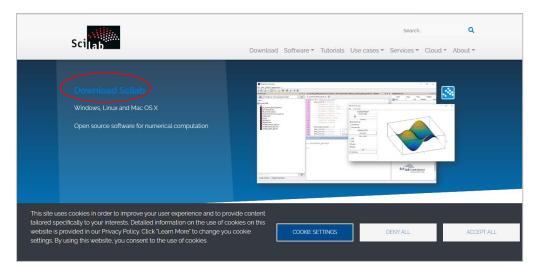
Scilab is a free and open-source, cross-platform numerical computational package and a highlevel, numerically oriented programming language. It can be used for signal processing, statistical analysis, image enhancement, fluid dynamics simulations, numerical optimization, and modeling, simulation of explicit and implicit dynamical systems and (if the corresponding toolbox is installed) symbolic manipulations.

Scilab is one of the two major open-source alternatives to MATLAB, the other one being GNU Octave. Scilab puts less emphasis on syntactic compatibility with MATLAB than Octave does, but it is similar enough that some authors suggest that it is easy to transfer skills between the two systems.

### **INTEGRATION GUIDELINES**

#### 6.2.1 Scilab Installation Guidelines

- <u>Click Here</u> to get to the installation page. 1.
- Once the main page is opened, click on "Download Scilab". 2.



7. Choose the compatible version for your device.

Sci	مرال Lab	Download Software ▼ Tutorials Use cases ▼ Services ▼ Cloud ▼ About ▼
Softwar Scilab 6 1 Scilab 6 Scilab 5 Previous	2	Released on Tue, 16 July 2021 System requirements   Change log ピ Scilab 6.1.1 is released under the terms of the GNU General Public License (GPL) v2 o 📽 Prior to version 6. o. Scilab was previously licensed under the terms of the CeCILL license v2.1, and continues to be available under such terms.
System R To donate	equirements e	Windows Vista, 7, 8, 10
		Scilab 611 - Windows 64 bits (exe)
		Scilab 6.1.1 - Windows 32 bits (exe)
		There is a good chance that you have a 64-bit machine! But the 32-bit version will work in any case.
		GNU/Linux
		Scilab 6.1.1 - Linux 64 bits, (scilab-6.1.1bin linux-x86_64.targz - 241M) (gz)
Share		macOS
		Scilab 6.1.1 - macOS Builds 🛃
in		This version has been compiled with the help of University of Technology of Compilegne (UTC)

6.2

8. Click on "open file" to proceed to installation.

م م

Downloads	þ	Q	… ☆
scilab-6,1.1_x64.exe		D	Ŵ
See more			

9. Select the desired language during installation> ok.

Select Se	etup Language	Х
	Select the language to use during the installation:	
	English	$\sim$
	OK Cancel	

10. Scilab setup process will start, click on "Next" to continue the setup to the completion as shown in the figures below.



11. Choose" I accept the agreement" and hit next.

License Agreement Please read the following important information before continuing.	
Please read the following important information before continuing.	501[8
Please read the following License Agreement. You must accept the terms of this agreement before continuing with the installation.	
Scilab is a free software, and starting with version 6.0.0 beta 1, is released under the terms of the GNU General Public License (GPL) v2.0, which you can find below.	^
Prior to this version, Scilab was licensed under the terms of the CeCILL v2.1, and continues to be available under such terms, which you also can find below. Pursuant to article 5.3.4 of the CeCILL v2.1, Scilab's entire code is now distributed under the terms of the GNU GPL 2.0.	
If during the software installation steps, you opt to select the Intel MKL library and/or the FFTW3 library provided in the Intel MKL library, the	~
Jaccept the agreement	
I do not accept the agreement	

12. Select the desired destination file location and press on "Next".

💽 Setup - sc	ilab-6.1.1 (64-bit)				_		×
	stination Location						A1114
Where :	hould scilab-6.1.1 (64	4-bit) be installe	ed?			Sc	llab
L	Setup will install scila	ab-6.1.1 (64-bit	t) into the follo	wing folder.			
To cont	nue, dick Next. If you	u would like to s	select a differe	nt folder, di	ick Brov	vse.	
C:\Prog	ram Files\scilab-6.1.1	1			Bro	wse	
At least	112.5 MB of free disk	space is requi	red.				
			< Back	(Next :	>	Cano	cel
				$\sim$	·		

13. Select which components should be installed and press on "Next".

Setup - scilab-6.1.1 (64-bit)	_		×
Select Components Which components should be installed?			Scilab
Select the components you want to install; dear the components install. Click Next when you are ready to continue.	you do not	want t	0
Full installation			$\sim$
Scilab 6.1.1	108	3.1 MB	^
Graphic User Interface	129	.2 MB	
··· 🗹 Graphics Module	33	3.8 MB	
🛄 🗹 Xcos	21	1.7 MB	
	0	).7 MB	
🔤 Java Runtime (1.8.0_292)	94	1.6 MB	
CPU Optimization for Scilab	80	).9 MB	
<ul> <li>Intel Math Kernel Library (subject to Intel EULA)</li> </ul>		).8 MB	
🛄 🔿 Blas, Lapack Reference libraries for Scilab		).2 MB	<b>*</b>
Current selection requires at least 548.4 MB of disk space.			
About modules < Back	Vext >	С	ancel

14. Select start menu folder," where should setup place the program shortcuts?" and press on "Next".

📓 Setup - scilab-6.1.1 (64-bit)	_			×
Select Start Menu Folder Where should Setup place the program's shortcuts?			s	cilab
Setup will create the program's shortcuts in the following St	tart i	Menu f	folder.	
To continue, click Next. If you would like to select a different folder,	click	Brows	se.	
scilab-6.1.1 (64-bit)		Brow	vse	
< Back Nex	t >)		Car	ncel

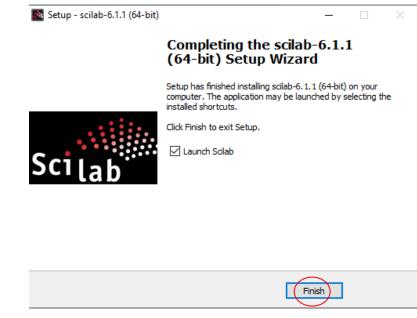


15. Select additional tasks you wish to be performed and press "Next".

Setup - scilab-6.1.1 (64-bit)	_		×
Select Additional Tasks Which additional tasks should be performed?		Sc	aliab
Select the additional tasks you would like Setup to perform while inst (64-bit), then click Next.	alling sci	ab-6.1.1	
Additional icons:			
Create a desktop icon			
Files Association:			
Associate *.sce, *.sci files with Scilab			
Associate *.tst files with Scilab			
Associate *.xcos *.cos *.cosf *.zcos files with Scilab			
Associate *.sod files with Scilab			
< Back Next	1>	Can	cel

16. Now the program is ready to install, click on the "install" button.

	Setup - scilab-6.1.1 (64-bit) —	×
	Ready to Install Setup is now ready to begin installing scilab-6.1.1 (64-bit) on your computer.	Scilab
	Click Install to continue with the installation, or click Back if you want to review or change any settings.	
	Destination location: C:\Program Files\scilab-6.1.1	^
	Setup type: Full installation	
	Selected components: Scilab 6.1.1 Graphic User Interface Graphics Module	
	Xcos Scinotes: Text editor for Scilab Java Runtime (1.8.0_292) <	>
	< Back Install	Cancel
nstallation is	s done press on "Finish".	





18. Now everything is setup and the user can start using the program.

The Drover's Closer's	T > X Variable Browser Name Value Type Visbil	
Name Descriptions		
Counterts     A     Ioading initial environment     Descuperts	ans Ix1 Boolean	
Counterts     A     Ioading initial environment     Descuperts		local 213
in Production in the second seco		
Arduno     T=>		
Autodesk Application Manager		
3 martin Avatar		
e 💼 CyberLink		
- Downloads	Command History	2.2
🕀 💼 dodad	// - 16/10/2022 16:41:38 //	
To applications, package, appdata     José and the second se	-11 - and million an array - 11	
<ul> <li>Instruction participation of the state of th</li></ul>		
Investor Server SDX ACAD 2016		
Inventor Server SDK ACAD 2017		
Inventor Server SDK ACAD 2018		
TapiceXVII		
MATLAB		
e 👝 Mega		
m MEGAsync Downloads		
My Music     My Videos		
er my videos ⊕ en uni	-	
e un	News feed	7 7 3
West Stude 2012	Sciab 6.1.1 has been released!!!	
Kyuai Studio 2017		
Youcam	Scilab 6.1.1 has been release	
Zoom	Schab 0.1.1 has been releas	Jedili
- 2 12079318_10206550205826498_8757806496311843943_n.jpg		
212079576_10206550223946951_612255971015378520_n.jpg	Dear fellow users,	
Badup Of exp3.2.pdsbak Badup Of exp3.3.pdsbak	We have the pleasure to announce the release of t	1000
Badup Of exp3. 3.pdbbak Badup Of exp3. 1.pdsbak	version of Sciab. Check here to download and find	more details
I-dill Babua Di exol. Lossoak	about Sclab 6.1.1.	
Case sensitive Regular expression	Wishing you a great journey in Scilab!	

#### 6.2.2 Integration Guidelines

Connect the USB to the device through the USB port in the front panel (Micro-USB type), and connect the other side with personal computer (PC). Once the USB is connected correctly between the device and PC, the user can start the integration as explained in the Integration Guidelines:

8. To connect our board with Scilab from the tool bar select "applications" then "Module manager-ATOMS".

App	lications ? Toolboxes				
2	SciNotes				
-	Xcos				
	Matlab to Scilab translator				
8	Module manager - ATOMS				
$\langle$	Variable Browser				
	Command History				
	File Browser				

9. Double click on" All modules".

🚍 All modules - ATOMS	-
File ?	
a All modules	
Bioinformatics	
Contributed Scilab builds	
🛅 Data Analysis	
🛅 Data Handling	
Differential Equations	
Documentation	
🛅 Domain-Specific	
Education	
🛅 GUI	
Graphics	
🛅 Graphs	
image Processing	
instruments Control	
🖿 Linear algebra	
🛅 Manuals	
🛅 Modeling	
Numerical Maths	
Optimization	
Parallel Computing	
Physics	
Real-Time	
Scilab development	
Signal Processing	
Windows Tools	
Xcos	

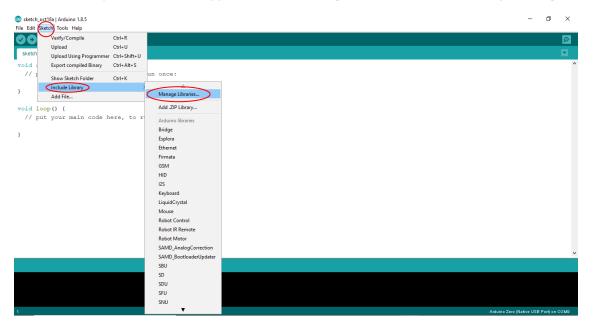


م ہ

10. Select Arduino and press on" Install".

م ه

11. Now open the Arduino app from the tool bar go to "sketch>include library >manage libraries".



12. Now search for the following libraries (servo.h and mpu6050) and install them.

🚳 Library Manager	Х
Type All Filter your search	
Arduino Cloud Provider Examples by Arduino Examples of how to connect various Arduino boards to cloud providers More info	^
Arduino Low Power by Arduino Power save primitives features for SAMD and nRF52 32bit boards With this library you can manage the low power states of newer Arduino boards <u>More info</u>	
Arduino SigFox for MKRFox1200 by Arduino Helper library for MKRFox1200 board and ATAB8520E Sigfox module This library allows some high level operations on Sigfox module, to ease integration with existing projects <u>More info</u>	
Arduino Uno WiFi Dev Ed Library by Arduino This library allows users to use network features like rest and mqtt. Includes some tools for the ESP8266. Use this library only with Arduino Uno WiFi Developer Edition. More info	~
Updating list of installed libraries Canc	:el

13. Once they are successfully installed, <u>click here</u> then copy the code and compile it on the Arduino app to your device.

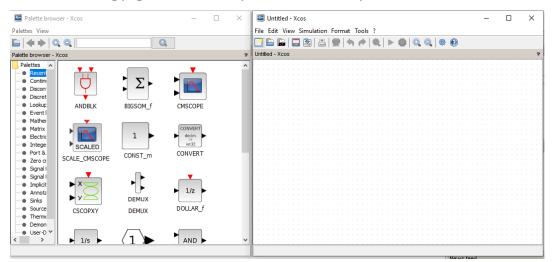


14. Now that the compiling is done go back to Scilab and from the tool box > applications>Xcos.

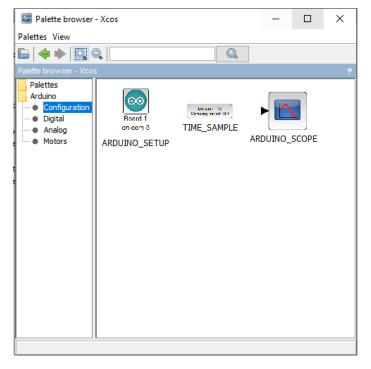
Scilab 6.1.1 Console							
File Edit Control Applications ? Toolboxes							
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Start Arduino		Command History					
Load Load		File Browser					

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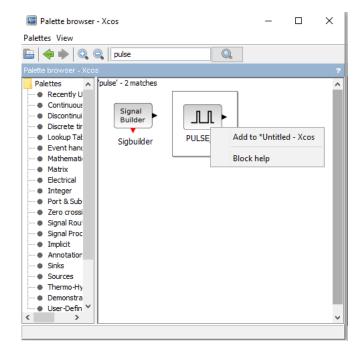
15. The following pages should be on your screen, to add your circuit.



- 16. To select your desired functions >select Arduino > Arduino setup.
- 17. to add you board right click on the desired item > "add to untitled-xcos".



From the search option type your desired function.
 Note: in this example we made a led blink.



19. Do the same for pin options.

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🔤 Palette browser	- Xcos			_		×
Palettes View						
🖹   🔶 🔶   🔍 🤅	pulse					
Palette browser - Xcos	-					?
Palettes Arduino Configuration Analog Motors	Digital READ Fin 3 on board 1 DIGITAL_READ Cr pp 2 on 3200 1 INTERRUPT_SB	Light Well IF Hin 13 or board 4 DIGITAL_WRIT	<u> </u>		ed - Xcos	

20. After adding your functions, double click on each one to edit and connect them by pressing on each item and dragging a line to the other.

4-	*Unt	itlec	I - X	cos																				-	-		$\times$
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21. From simulation > compile >start And the program should be running

🚾 *Untitled - Xcos	_		—	×
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	Setup	> 🎯   Q, Q,   🏶 🔞		
*Untitled - Xcos	Execution trace and Debug			
	Set Context			
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	Modelica initialize Compile	pling period : 0.1		
	Start	· · · · · · · · · · · · · · · · · · ·		
	Stop			
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		Digital WRITE		
		Pin 9 on board 1		
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# Appendix 7: PMM06 Integration with PlatformIO

## 7.2 Description

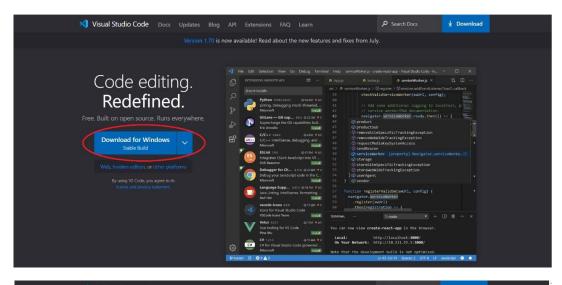
PMM PLC Systems are built to be Arduino compatible programming environment, where our PLC Range is not just compatible with Arduino IDE, but with lots of other Arduino-compatible programming software such as Visual Studio Code + Visual Micro.

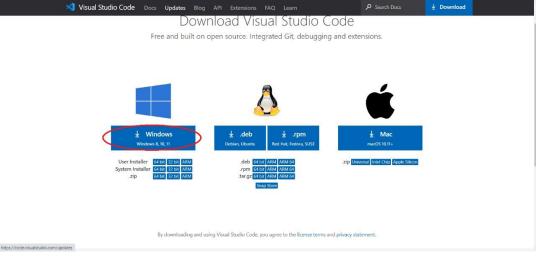
PlatformIO is an ultimate customizable white-label DSP that enables transparent, resourceefficient, and profitable advertising operations for digital ad agencies, networks, and brands. Manage your campaigns effectively in real time, eliminate disruptions, and minimize time-to-value with low startup costs and full customizability.

### 7.2 INTEGRATION GUIDELINES

### 7.2.1 PlatformIO Installation Guidelines

- 1. <u>Click Here</u> to get to the installation page.
- 2. Once the main page is opened, click on "Download for windows".







3. Continue the setup process. Click on "Next" and when the application is ready for installation click on "Install".

5	g.		1
Please read the following License Agreement. You must accept t continuing with the installation.	he terms of thi	is agreement be	efore
This license applies to the Visual Studio Code (	product. So	urce Code j	for ^
Visual Studio Code is available at <u>https://githu</u> under the MIT license agreement at	b.com/Mic	crosoft/vsco	<u>de</u>
https://github.com/microsoft/vscode/blob/mai		. <u>txt</u> . Additio	nal
license information can be found in our FAQ a https://code.visualstudio.com/docs/supporting			
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MICROSOFT VISUAL STUDIO CO	JDE		~
I accept the agreement I do not accept the agreement			
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	r computer.		
etup is now ready to begin installing Visual Studio Code on you lick Install to continue with the installation, or click Back if you		/ or change any	/ settings.
etup is now ready to begin installing Visual Studio Code on you lick Install to continue with the installation, or click Back if you		v or change any	v settings.
Setup is now ready to begin installing Visual Studio Code on you Click Install to continue with the installation, or click Back if you Additional tasks:		v or change any	r settings.
Setup is now ready to begin installing Visual Studio Code on you Lick Install to continue with the installation, or click Back if you Additional tasks: Other:		v or change any	/ settings.
Setup is now ready to begin installing Visual Studio Code on you Lick Install to continue with the installation, or click Back if you Additional tasks: Other:		v or change any	/ settings.
Click Install to continue with the installation, or click Back if you Additional tasks: Other:		v or change any	/ settings.
Click Install to continue with the installation, or click Back if you Additional tasks: Other:		/ or change any	v settings.
Click Install to continue with the installation, or click Back if you Additional tasks: Other:		v or change any	r settings.
Setup is now ready to begin installing Visual Studio Code on you Lick Install to continue with the installation, or click Back if you Additional tasks: Other:		v or change any	/ settings.
Click Install to continue with the installation, or click Back if you Additional tasks: Other:		v or change any	/ settings.
etup is now ready to begin installing Visual Studio Code on you lick Install to continue with the installation, or click Back if you Additional tasks: Other:		v or change any	' settings.
etup is now ready to begin installing Visual Studio Code on you lick Install to continue with the installation, or click Back if you Additional tasks: Other:		v or change any	r settings.

4. Enable the option "Launch Visual Studio Code" then click on "Finish".



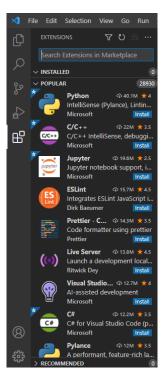


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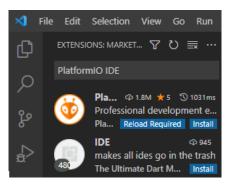
5. Click on "Extensions" as shown below.

Q

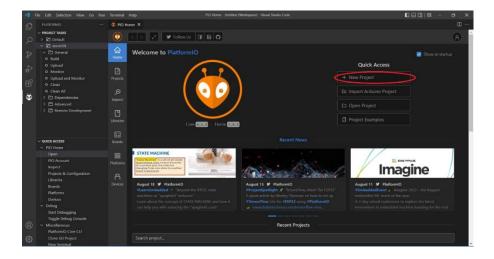
O



- 6. Type in the search space "PlatformIO IDE"
- 7. Click on "Install" as shown below.



8. To start writing the code, click on "new project" to open a new one.



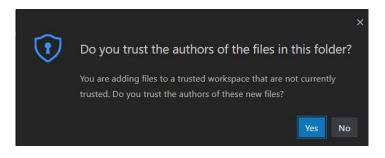
- 9. The project wizard window will be displayed.
- 10. Type the project name in the "Name" field.
- 11. Choose "Arduino Zero (USB Native Board)"
- 12. Framework is "Arduino"
- 13. Click on "Finish"

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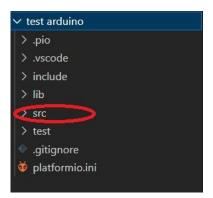
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Project Wiza	rd	
	ws you to <b>create new</b> PlatformIO project or <b>update existing</b> . In the la to uncheck "Use default location" and specify path to existing project.	
Name:	test arduino	
Board :	Arduino Zero (USB Native Port)	
Framework:	Arduino	
Location:	✓ Use default location ⑦	
	Cancel	nish

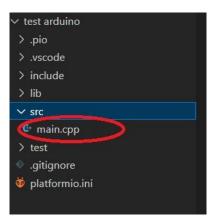
14. A security confirmation message will pop up, click on "Yes".



15. After completing the previous instructions, your project is created now as shown below.



16. To start writing your code click on "src" then click on "main.cpp" as shown below.



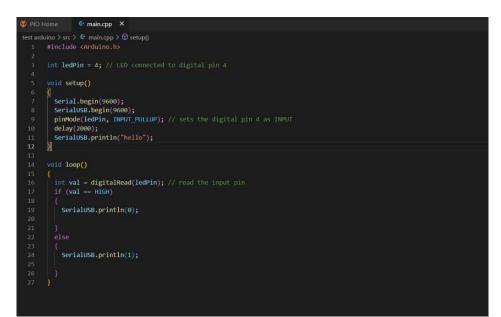
17. The coding page will be opened as shown below.

tes		∙ src ≻ 🔮 main.cpp >
	1 #inc	clude <arduino.h></arduino.h>
		<b>1 setup() {</b> / put your setup code here, to run once:
		i loop() {
		/ put your main code here, to run repeatedly:
	9 }	

#### 7.2.2 Integration Guidelines

Connect the USB to the device through the USB port in the front panel (Micro-USB type), and connect the other side with personal computer (PC). Once the USB is connected correctly between the device and PC, the user can start the integration as explained in the Integration Guidelines:

1. Write the desired code in the specified space.



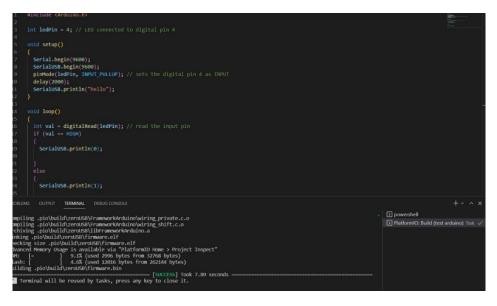


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2. Click on " icon; PlatformIO: build" to auto check the code to ensure nothing is wrong in the syntax.



3. After checking the code, if the code is correct then "SUCCESS" is displayed.



4. Click on "-> icon " that Connects the board to the USB ports to enable the user to upload the code.



5. The uploading process will take a minute, the uploading is completed successfully when "**SUCCESS**" is displayed.

test arduino > src > 🔄 main.cpp > 🗘 setup()	
1 #include <arduino.h></arduino.h>	
2	Same and Same
3 int ledPin = 4; // LED connected to digital pin 4	
5 void setup()	
6 (	1
7 Serial.begin(9600);	
8 SerialUSB.begin(9600);	
9 pinMode(ledPin, INPUT_PULLUP); // sets the digital pin 4 as INPUT	
10 delay(2000);	
11 SerialUSB.println("hello");	
12 }	
13	
14 void loop()	
15 {	
<pre>16 int val = digitalRead(ledPin); // read the input pin</pre>	
17 if (val == HIGH)	
19 SerialUSB.println(0);	
20	
21	
22 else	
23 {	
24 SerialUSB.println(1);	
25	
PROBLEMS OUTPUT TERMINAL DEBUG CONSOLE	+~ ^ ×
	D powershell
[] 34% (64/188 pages)	▶ PlatformIO: Build (test arduino) Task √
[] 66% (128/188 pages)	PlatformIO: Upload (test arduino)
done in 0.093 seconds	[2] PlatformiO: Opioad (test arduino) V
Verify 12016 bytes of flash with checksum.	
Verify successful done in 0.009 seconds	
done in 0.009 seconds CPU rest.	
[SUCCESS] Took 4.73 seconds	
Terminal will be reused by tasks, press any key to close it.	

**Note:** the previous code example aims to define Pin No.4 as an input and monitor its status between ON/OFF when a power is connected to it, as shown in the figure below

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- In order to verify that the code is uploaded on the device and working properly: 6.
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Click on "  $\clubsuit$  serial monitor icon". When the input status is OFF "O" will be displayed. •



When the input status is changed to **ON** the reading will change to "1" automatically. 



# Appendix 8: PMM06 Integration with Visual Studio

### 8.1 Description

PMM PLC Systems are built to be Arduino compatible programming environment, where PMM's PLCs Range is not just compatible with Arduino IDE, but with lots of other Arduino-compatible programming software such as visual studio.

Visual Studio is an integrated development environment (IDE) from Microsoft. It is used to develop computer programs, as well as websites, web apps, web services and mobile apps.

Visual Studio uses Microsoft software development platforms such as Windows API, Windows Forms, Windows Presentation Foundation, Windows Store and Microsoft Silverlight. It can produce both native code and managed code.

### 8.2 INTEGRATION GUIDELINES

#### 8.2.1 Visual Studio Installation Guidelines

- 1. <u>Click Here</u> to get to the installation page.
- 2. Once the main page is opened, click on "professional".

Download	12			
00				
Visual Studio 2022   The best comprehensive IDE for .NET and C++ developers on Windows. Fully packed with a sweet array of	Community Powerful IDE, free for students, open-source contributors, and individuals	Professional Professional IDE best suited to small teams	Enterprise Scalable, end-to-end solution for teams of any size	Preview Get early access to latest features not yet in the main release
tools and features to elevate and enhance every stage of software development.	Free download	Free trial	Free trial	Learn more > Release notes >

3. Click on "continue" to install the visual studio installer.

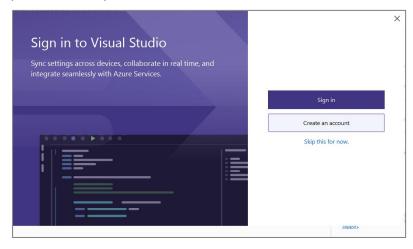
	×
Visual Studio Installer	
Before you get started, we need to set up a few can configure your installation.	things so that you
To learn more about privacy, see the Microsoft Privacy S By continuing, you agree to the Microsoft Software Lice	
	Continue
Visual Studio Installer	
Getting the Visual Studio Installer ready.	
Downloading: 8.64 MB of 13.6 MB	1.85 MB/sec
Installing	
	Cancel



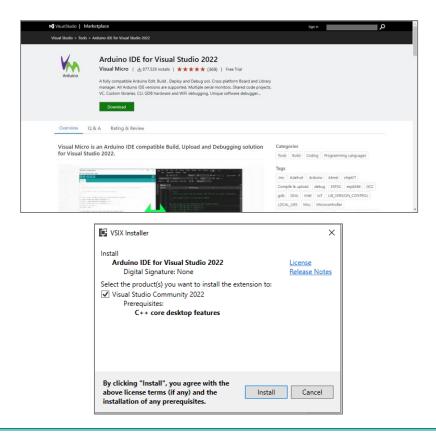
4. Visual studio installation process will start, click on "install" to continue after choosing the workloads you need.

eb & C	Cloud (4)			Installation details
	ASP.NET and web development Build web applications using ASP.NET Core, ASP.NET, HTML/JavaScript, and Containers including Docker supp		Azure development Azure SDKs, tools, and projects for developing cloud apps and creating resources using .NET and .NET Framework	Visual Studio core editor     The Visual Studio core shell experience, including     syntax-aware code editing, source code control an     work item management.
2	Python development Editing, debugging, interactive development and source control for Python.		Node.js development Build scalable network applications using Node.js, an asynchronous event-driven JavaScript runtime.	
sktop	& Mobile (5)			
	.NET Multi-platform App UI development Build Android, iOS, Windows, and Mac apps from a single codebase using C# with .NET MAUI.		.NET desktop development Build WPF; Windows Forms, and console applications using C#, Visual Basic, and F# with .NET and .NET Frame	
	Desktop development with C++ Build modern C++ apps for Windows using tools of your choice, including MSVC, Clang, CMake, or MSBuild.	-	Universal Windows Platform development Create applications for the Universal Windows Platform with C#, VB, or optionally C++.	
ation	Files\Microsoft Visual Studio\2022\Community Change			
	ing, you agree to the license for the Visual Studio edition you		27 AL 1995 AL 1 AL 1997 AL 1997 AL 1997 AL	Total space required 1.0

5. Sign in to your account if you have one or create a new account. You can choose to skip this step.



6. In order to work with Arduino you have to <u>Click here</u> to download Arduino IDE for visual studio.





7. Now everything is setup and the user can start with the device.

Open recent     Get started       As you use Visual Studio, any projects, folders, or files that you open will show up here for quick access.     Image: Concern a respository Get colle from an enline repository Concern a local Visual Studio project or and file       Vou can pin anything that you open frequently so that it's always at the top of the list.     Image: Concern a respository Get colle from an enline repository like Gitthub or Abure DevOps       Open a project or solution Open a local folder Navigate and edit code within any folder     Open a dedit code within any folder	dis, any projects, folders, or files that you open will show up here for quick access. that you open frequently so that it's always at the top of the list. Clone a repository Clone a	Visual Studio 2022	- 0
You can pin anything that you open frequently so that it's always at the top of the list.	that you open frequently so that it's always at the top of the lat.	Open recent	Get started
Open a local folder	Open a local Visual Studio project or .dln life         Image: Studio project or .dln life         Open a local folder         Navigate and edit code within any folder.         Image: Create a new project         Choose a project template with code scattfolding		Get code from an online repository like GitHub or
	Navigate and edit code within any folder.		Open a project or solution Open a local Visual Studio project or .sin file
	Choose a project template with code scaffolding		
Chopse a project template with code scaffolding			Choose a project template with code scaffolding
Continue without code →	Continue without code $\rightarrow$		Continue without code $\rightarrow$

#### 8.2.2 Integration Guidelines

Connect the USB to the device through the USB port in the front panel (Micro-USB type), and connect the other side with personal computer (PC). Once the USB is connected correctly between the device and PC, the user can start the integration as explained in the Integration Guidelines:

1. To start working click on "create a new project".

			_
Visual Studio 2022			
Open recent	Get st	arted	
Search recent (Alt+S) This week	→Î	Clone a repository Get code from an online repository like GitHub or Azure DevOps	
	ď	Open a project or solution Open a local Visual Studio project or .sin file	
	đ	Open a local folder Navigate and edit code within any folder	
	*0	Create a new project Choose a project template with code scaffolding to get started	

2. Choose the Arduino simple empty project.

Create a new project	X • Clear							
Recent project templates All language	- All platforms - All project types							
	10 Simple Empty Project • empty <mark>Arduino</mark> compatible project							
₩A Arduino Simple Empty Project C++ C	Arduino Visual Micro Atmel Espressif Intel Microchip M WiFI+GDB WROOM	Nordic Smart Device ST Teensy						
	se Empty Project Arduino compatible project with sub folder(s)							
c n	Arduino Visual Micro Atmel Espressif Intel Microchip M WiFi+GDB WROOM	Nordic Smart Device ST Teensy						
Adr	no Library Project n <mark>Arduino</mark> compatible library project, then click 'Add Reference" in any <mark>Arduino</mark> pro d in a standard <mark>Arduino</mark> library location then it will automatically be available to all a	sject to use the library. tip: If the library is Arduino projects.						
c.	Arduino Visual Micro Librany							
Ard Add	Addama Shared Code Project Adda <b>an Enduing</b> Aned Project then click-'Add Reference' in any Andume project. The project code files are copied to temp build and compiled advorgate the main project code. Can be used by <b>Andume</b> projects and Unit Tests.							
C	Arduino Visual Micro Shared Code							
	.ed Example ample <mark>Arduino</mark> sketch project that blinks an Led							
c.	Arduino Visual Micro Example							
		Back Next						

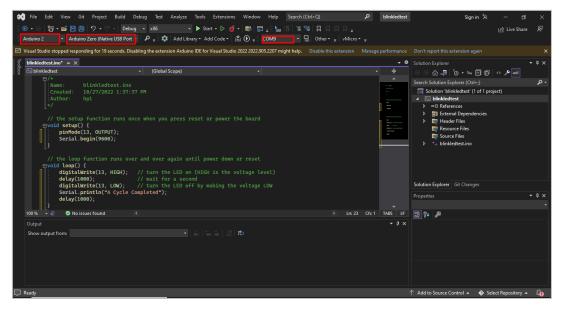


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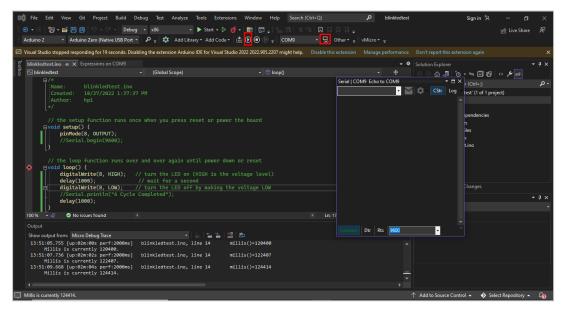
3. Name your project and select desired location.

	l .	-	ð	×
Configure your new project				
Arduino Simple Empty Project C++ Arduino Visual Micro Atmel Espressif Intel Microchip Nordic Smart Device ST Teensy TI WiFI+GDB WR	ром			
Project name				
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Location				
C/UsershpT/source/repos				
Solution name 🕥				
Place solution and project in the same directory     A solution of a solution of the same directory     A solution of the solution of				
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4. Choose the Arduino zero board, the Arduino IDE configure location and the port.

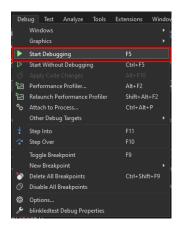


5. After writing your program, to build press on the play button and open the serial monitor by pressing on the small monitor next to the port.





6. To debug and start go to the toolbar>debug> start debugging.



7. If you wish to start without debugging go to the toolbar >debug> start without debugging

Deb	ug	Test	Analyze	Tools	Extensions	Windo			
	Win	ndows							
	Gra	phics							
	Star	rt Debug	iging		F5				
	Star	rt Witho	ut Debuggii	ng	Ctrl+F5				
ß	Per	formand	e Profiler	Alt+F2					
۵ø	Rela	aunch P	erformance	Profiler	Shift+Alt+F2				
°a	Atta	ach to P	rocess		Ctrl+Ali				
	Oth	ier Debu	g Targets						
	Step	p Into							
	Step	p Over			F10				
	Tog	gle Brea	kpoint						
	Nev	w Breakp	ooint						
ð	Del	ete All B	reakpoints		Ctrl+Sh	ift+F9			
ð	Disa	able All I	Breakpoints						
£3	Opt	tions							
ø	blin	kledtest	Debug Pro	perties					

8. Now your program should be running.

# Appendix 9: PMM06 Integration with MICROCHIP Studio 9.1 Description

PMM PLC Systems are built to be Arduino compatible programming environment, where PMM's PLCs Range is not just compatible with Arduino IDE, but with lots of other Arduino-compatible programming software such as visual studio.

MICROCHIP Studio is an Integrated Development Environment (IDE) for writing and debugging AVR<sup>®</sup> /ARM<sup>®</sup> applications in Windows<sup>®</sup> XP/Windows Vista<sup>®</sup> / Windows 7/8 environments.

MICROCHIP Studio provides a project management tool, source file editor, simulator, assembler, and front-end for C/C++, programming, and on-chip debugging. MICROCHIP Studio supports the complete range of Atmel AVR tools. Each new release contains the latest updates for the tools as well as support for new AVR/ARM devices.

MICROCHIP Studio has a modular architecture, which allows interaction with 3rd party software vendors. GUI plugins and other modules can be written and hooked to the system. Contact Atmel for more information.

### 9.2 INTEGRATION GUIDELINES

### 9.2.1 MICROCHIP Studio Installation Guidelines

- 1. <u>Click Here</u> to get to the installation page.
- 2. Once the main page is opened, click on "Download Microchip Studio".

	<b>1 Міскоснір</b>	Products	Solutions	Tools and Resources	Support	Education	About	Order Now	Q	Я Ì	
Tools and Res	sources / Develop	/ Microchip S	tudio for AVF	® and SAM Devices							
Key Features	Getting Started	l Downloa	ads								
debugging AVI functionality o give you a sear applications w Arduino® sket makerspace to You can use M support AVR a an online app	(R <sup>®</sup> and SAM microco of Atmel Studio into I amless and easy-to-u vritten in C/C++ or as ttches as C++ project o marketplace. Microchip Studio with and SAM devices. Ext	ontroller appli Microchip's we se environme ssembly code. s to provide y n the debugge tend your deve Studio plug-in	cations. It me ell-supported nt for writing Microchip St ou with a sim rs, programm elopment en	t (IDE) for developing ar erges all of the great fee portfolio of developme g, building and debuggi sudio can also import yo uple transition path fror ners and development vironment with Microch by Microchip as well as	atures and ent tools to ng your our n kits that nip Gallery,						
0				ll be able to use any exi to use Microchip Studio	0						



3. Click on "Download" (offline Installer) to install the Microchip studio installer.

MICROCHIP Products Solutions Tools and Reso	ources Support Education	About Order Now	Q & P
Tools and Resources / Develop / Microchip Studio for AVR® and SAM Device	ces		
Key Features Getting Started Downloads			
Downloads and Documents			
Downloads	Documentation		
Download Microchip Studio	Version Number	Date	Download
		Date 20 Jun 2022	Download Download
≎ Title	Number		
Title Microchip Studio for AVR and SAM Devices- Offline Installer	Number 7.0.2594	20 Jun 2022	Download

4. Microchip installation process will start, click on "I agree" then "Next" to continue.

You must agree the license terms and conditions before y install Microchip Studio.	ou can
Microchip Studio for AVR and SAM devices	•
END USER LICENSE AGREEMENT	
IT IS IMPORTANT THAT YOU READ THIS AGREEMENT CAREFULLY AND COMPLETELY. This End User License Agreement (Fagreennt') is a legally bloiding agreement between, on one hand, either your employ (of gif you are acting on your own behalt)) ("Licensee"), and on the other hand, Misrochip Technology Incorporated and its subsidiaries including Microchip Technology Ireland Limited ("Microchip"). By Clicking the "I Accept' button this page or by downloading, installing or using the aptroper Microchip For Agnology The the Tiacept' button this page or by downloading, installing or using	or on rany
I agree to the license terms and conditions.	
C:\Program Files (x86)\Atmel\Studio\	
Send anonymous information to help improve the user exp	perience.

5. Click on "Next" to continue.

Microchip Studio for AVR and SAM Devices	×
Microchip Studio	
Select Architecture	
AVR	
<b>✓</b> UC3	
SAM	
Back Next Cancel	1



6. Click on "Next" to continue.

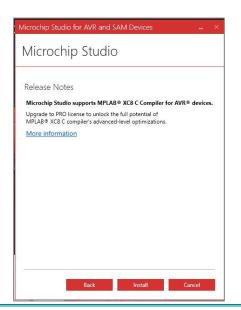
90



7. Click on "Next" to continue.



8. Press on "Install" to start the installation.





9. The MPLAB compiler will pop up, press on "Next" to proceed.

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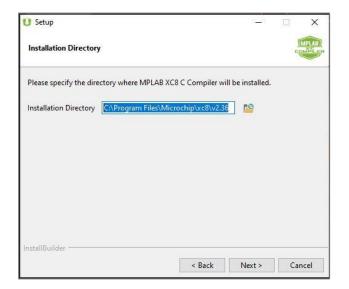
10. Choose "I accept the agreement" then click on "Next".

U Setup		_2		×
License Agreement			IC .	
Please read the following License Agreeme agreement before continuing with the inst		ot the terms of	this	
MICROCHIP IS WILLING TO LICENSE T DOCUMENTATION TO YOU ONLY ON THE THE FOLLOWING TERMS. TO ACCEPT T "I ACCEPT" AND PROCEED WITH THE D NOT ACCEPT THESE LICENSE TERMS, C NOT DOWNLOAD OR INSTALL THIS SOFT	CONDITION THAT HE TERMS OF TH OWNLOAD OR INS LICK "I DO NOT WARE.	YOU ACCEPT IIS LICENSE, TALL. IF Y ACCEPT," A	ALL O CLICK OU DO ND DO	
NON-EXCLUSIVE SOFTWARE LICENSE AG This Nonexclusive Software Licens contract between you, your heirs, ("Licensee") and Microchip Techno	e Agreement (" successors an	'Agreement") d assigns	is a	er V
Do you accept this license?	he agreement accept the agreeme	ent		
	< Back	Next >	Can	icel

11. Choose your license type and click on "Next".

U Setup	10 <b>—</b> 61		×
License Type		1	MPLAB)
MPLAB XC8 C Compiler can be installed to run in Free mode, with a workstation license, or as a network client.			
Free			
O Workstation			
O Network Client			
InstallBuilder		25-16	
< Back	Next >	Ca	ncel

12. Choose where you want your compiler to be installed, then click on "Next".



13. Choose the compiler's settings, then click on "Next".

U Setup		37 <u>-</u> 31	
Compiler Settings			MPLAB COMPLE
Apply settings to all users of this made	:hine		
Add xc8 to the PATH environment va	ariable		
nstallBuilder			

14. Now it is ready to be installed click on "Next" to proceed.

U Setup		8 <b>—</b> 8		×
Ready to Install Compiler				MPLAB OMPLEP
Setup is now ready to begin installing MPLAB X	C8 C Compile	er on your con	nputer.	
InstallBuilder	< Back	Next >		ancel
	N DACK	inext >		incer

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15. Click on "Next" and set up should be complete.

U Setup	21 <u>—</u> 22		×
Installation Complete - Licensing Information			MPLAB COMPLER
If you want to use the FREE MPLAB XC8 C Compiler, Click Next. If your Compiler is already licensed, Click Next.			
Click to purchase a PRO license			
Click here to get a free, 60-day evaluation of PRO			
If you have an Activation Key:			
Click here to activate your license			
Your Host ID is: 1cb72cef4662			
InstallBuilder Kack	vext >	С	ancel



16. Now everything is set up and microchip studio installation is completed.

Microchip Studio for AVR and SAM Devices
Microchip Studio
Installation complete Thank you for choosing Microchip Studio! Warning:
Atmel LibUSB0 Driver (x64)
☑ Launch Microchip Studio
Close



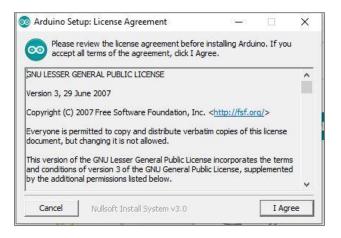
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17. You will also need to install Arduino IDE. <u>click here</u> to go to download link, and select the suitable download option.

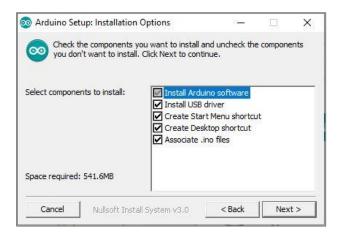
PROFESSIONAL	EDUCATION	STORE		Q Search on Arduino.cc		SIGN IN
ΘO			HARDWARE SOFTWARE CLOUD DOCUMENTATION + COMMUNITY + BLOG ABOUT			
https://www.arduino.cc/	pro		Nightly Builds Download a preview of the incoming release with the most updated features and bugfixes. Windows mecOS wreads 10.14 "Magnet" or newser, 64 bits		() I	Help

18. Press on "I Agree" to setup.

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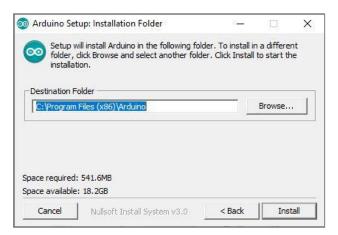


19. Choose the installation option and click on "Next".



20. Choose installation folder and click on "Next".

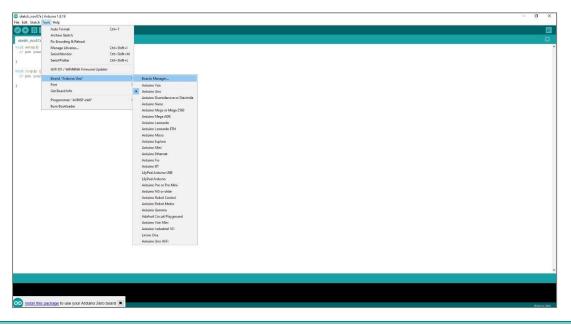
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21. Now that the app is installed the following page will open.



22. To install the boards, go to tools>board> board manager.





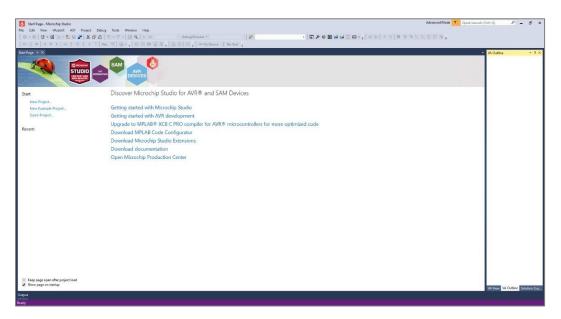
23. The board manager will open, search for the Arduino SAMD boards and install it.

Boar	rds Manage	er		
pe A		~	zero	
by An Board Ardui Ardui M0 P <u>Onlin</u>	<b>rduino</b> ds includeo ino MKR W ino MKR W	d in this IFi 1011 AN 131	Arduino Zero, Arduino MKR1000, Arduino	o MKRZERO, Arduino MKR FOX 1200, Arduino MKR WAN 1300, B 1500, Arduino MKR Vidor 4000, Arduino Nano 33 IoT, Arduino press.
				1.8.13 v Install

24. You will be able to choose the board type and the port from the menu >tools.

	Auto Format	Ctrl+T
So III	Archive Sketch	cut+1
sketch nov07a		
	Fix Encoding & Reload	
void setup() // put your	Manage Libraries	Ctrl+Shift+I
// put your	Serial Monitor	Ctrl+Shift+M
}	Serial Plotter	Ctrl+Shift+L
<pre>/oid loop() {</pre>	WiFi101 / WiFiNINA Firmware Updater	
// put your	Board: "Arduino Zero (Programming Port,	)"
e l	Port: "COM4"	
	Get Board Info	
	Programmer	
	Burn Bootloader	

25. Now that all is set up, the start page will open and you can proceed with your project.





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## 9.2.2 Integration Guidelines

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Connect the USB to the device through the USB port in the front panel (Micro-USB type), and connect the other side with personal computer (PC). Once the USB is connected correctly between the device and PC, the user can start the integration as explained in the Integration Guidelines:

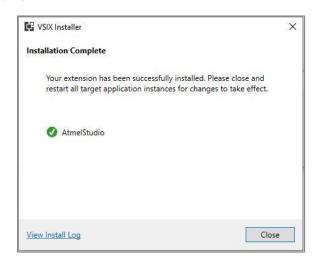
1. First you will have to install the Arduino IDE for Microchip and Atmel Studio from the menu>tools>extensions and updates.



2. Download the Arduino IDE for Microchip and Atmel Studio.

Extensions and Updates			? ×
Installed	Sort by:	Relevance -	arduino × ·
Online     Microchip     All     Device     Toolchain     Tools     Training     Utilities     Search Results      Updates	Ynn	Arduino IDE for Microchip and Atmel Studi An Arduino Compatible Edit, Build and Deployment tool. Works with or without Arduino.ino files. With or	lead Created by: Arduino Team @ Visual Micro Version: 2021.066.0 Download: 151825 Rating:
			Arduino
		1	
hange your Extensions and Updates s	ettings		
			Close

3. Name your project and select desired location.





4. Specify a micro controller IDE location.

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<b>W</b>	Please specify a micro-controller IDE location Visual Micro needs to know where, on your computer, application(s) such as the Arduino.exe are located (note: windows store versions are not supported). If an application is not already installed then please download it using the 'Download/Install' button. note: The windows store version of the Arduino IDE is NOT supported. Please install it from the arduino.cc web site.							
	Arduino 1.6/1.8 Use installed IDE (hardware, reference/help + libraries)							
	This location has been automatically discovered. Please ensure that it is correct?							
	C:\Program Files (x86)\Arduino							
	Optional sketchbook location (best to leave empty, also affects the location of libraries/hardware)							
	Optional additional boards manager urls (url1,url2,url3). Warning: Use safe urls from the link below							
	https://gthub.com/arduino/Arduino/wiki/Unofficial-list of-3rd party-boards-support-urls							
	Download/Install IDE OK Cancel							

5. To create a new project, start>new project.

Start Page - Microchip Studio	Advanced Model 🝸 Quick Launch	(Cril+Q) 🔎 🗕 🥵 :
File Edit View WassistX ASF Project E		
	ul (2・Celling (2 M) - Decontrology	
Start Page @ X		VA Outline 👻 🕫 :
	AM ARR OPPORT	w vaune 7
Start	Discover Microchip Studio for AVR® and SAM Devices	
New Project		
New Example Project	Getting started with Microchip Studio	
Open Project	Getting started with AVR development	
Recent	Upgrade to MPLAB® XC8 C PRO compiler for AVR® microcontrollers for more optimized code	
Recent	Download MPLAB Code Configurator	
1	Download Microchip Studio Extensions	
	Download documentation	
1	Open Microchip Production Center	
Keep page open after project load		
		VA View VA Outline Solution Exp
Output		
Ready		

6. Choose the Arduino sketch zero

New Project				? ×
Recent	Sort by:	Default - 🎬 📃		Search Installed Templates (Ctrl+E)
Installed	-	AVR XC8 C Library Project	C/C++	Type: C/C++
<ul> <li>C/C++ Visual Micro Assembler</li> </ul>		Convert AVR GCC to XC8 Project	C/C++	Create a new empty 32bit Arduino sketch to use with Visual Micro and/or the Arduino Ide.
Microchip Studio	Solution	GCC C ASF Board Project	C/C++	Use the 'Build' or 'Debug' menu to build and/or upload
	. 📩	GCC C Executable Project	C/C++	
	occ	GCC C Static Library Project	C/C++	
	acc	GCC C++ Executable Project	C/C++	
		GCC C++ Static Library Project	C/C++	
	2	SAM L11 Secure Solution v1.2	C/C++	
	Vm	Arduino Sketch	C/C++	
	Vien			
	$\odot$	Create project from Arduino sketch	C/C++	-
Name:	Sketch1			
Location:	c:\users\israr06\Documen	ts\Atmel Studio\7.0	*	Browse
Solution name:	Sketch1	Create directory for solution		

7. Choose the ATSAMD21G18A.

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Advanced Data Merrory Bytech EEPROM (bytes)	5470e N/A		<ul> <li>Show devices Supported Parts</li> </ul>	- Search for device P	# 🔐 Device, Startup
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Output					

8. Choose the board and port from vmicro

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File Edit View	VAssistX ASF Project Build E	lebug vMicro Tools	Window Help					
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			😓 Other • 🚬 🌣 Add Library • Add Code					
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	an.cpp			Board Arduino Zero (Pro	agramming Port) +			
Build	Configuration: Active (Debug)	· Platform A	ictive (ARM)	Visual Micro Explorer		000 0.000		
Build Events				General		Search Solution Explorer (Ctrl+ P		
Toolchain	Touchan Configuration Manager.			Compiler		Solution 'Sketch2' (1 project)		
Device*				Uploader	,	a Sketcha		
Tool	ARM/GNU Common			Debugger		🔤 Output Files		
Packs	CutourFiles	OutputFiles All Options: -mthumb - NGNU C Compiler	-mthumb -D_SAMD21G18A_	Toolbar Auto Visibility		<ul> <li>Ba Libraries</li> </ul>		
Advanced	<ul> <li>ARM/GNU C Compiler</li> <li>General</li> </ul>			Help		D imvm A imposed Startup		
	28 General 28 Preprocessor			🦗 New Ardaino Project		send21g18a flashJ		
	Symbols			% Open Existing Arduino Pro	oject	🗋 samd21g18a_sram.		
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	2 Debugging		bugging	C Project Properties		System, semazi.c		
3 Warnings Miscellantous		5		Add Library	Add Library			
	A ARM/GNU C++ Compiler	U C++ Compiler	Add Code	,				
	General Preprocessor			a Build				
	Symbols			Build & Uplead				
	Directories			Part or IP COMS				
	Debugging			View Port Monitor				
	2 Warnings							

9. Now type your code and build it.

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	+ Search Solution Explorer (Ctrie, P -
* Sketch2.cpp	
Crested: 11/8/2022 10:33:49 44	Solution 'Sketch2' (1 project)
* Author : ISRAR06	Dependencies
	🔛 Output Files
2003 - X	Þ 🔛 Libraries Þ 📴 _vm
#include "sem.h"	A Device Startup
	Samd21e18a_flash.ld
Int main(void)	samd21e18a_sram.id
/* Initialize the SAM system */	<ul> <li>startup_samdz1.c</li> <li>system_samd21.c</li> </ul>
bystealist(); ReD (PAT DESTIM-PART PAT7	🔹 😁 mein.cpp
int j	<ul> <li>Sketch2.ino</li> </ul>
/* Replace with your application code */	
<pre>/* while (1) while (1)</pre>	1 1
{ for(j=0;j=156000;j=+);	
REPORT OFFICE PARTS	
for(j=0;j=0;j=150000;j=++);	
REG_PORT_OUTCLER-PORT_PAL7;	
	Properties + 0 ×
	Properties - 🕈 🔍 🗙
	P2: 01 - 6
Output	* + X
Show subjut frame: Micro Build	
	*
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Oxput	

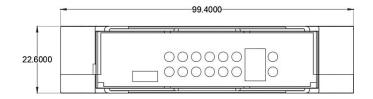
10. Now the program should be running.

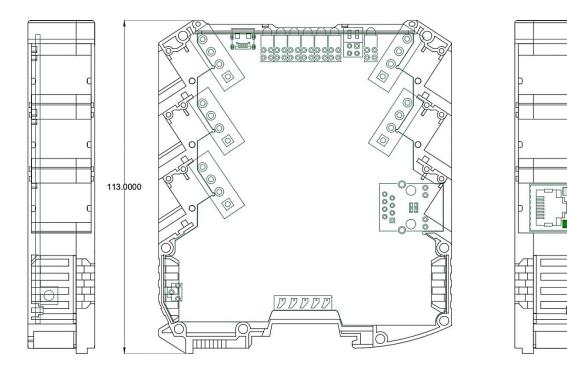


## **MECHANICAL CHARACTERISTICS**

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