

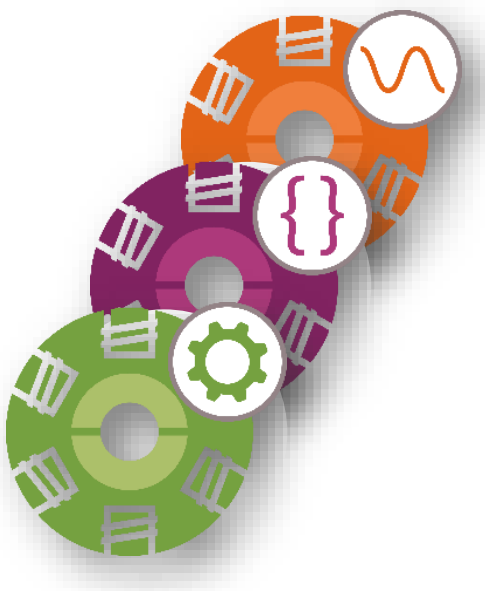
# Getting Started with iMOTION™ Solution Designer

Infineon Technologies AG

January 2024

# iMOTION™ Solution Designer (iSD)

## iMOTION™ Solution Designer



.. is an **integrated GUI-based tool** for iMOTION™ motor control solutions entire development process to replace MCEWizard and MCEDesigner

.. **simplifies** the use and design of inverterized drives through **catalog files**

.. includes **configuration, customization, programming,** and **tuning** for users during the development phase

.. supports **in-app updates** for **SD packs** (FW / GUI definition, board database…) and **configuration files**

.. contains an **oscilloscope tool** to debug/tune motors and is **not an IDE** like Keil, IAR, or a multi-platform development tool with GitHub-hosted firmware libraries like Modus Toolbox


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4 Firmware upgrade and downgrade between release 5.x.x and 1.3.7 58

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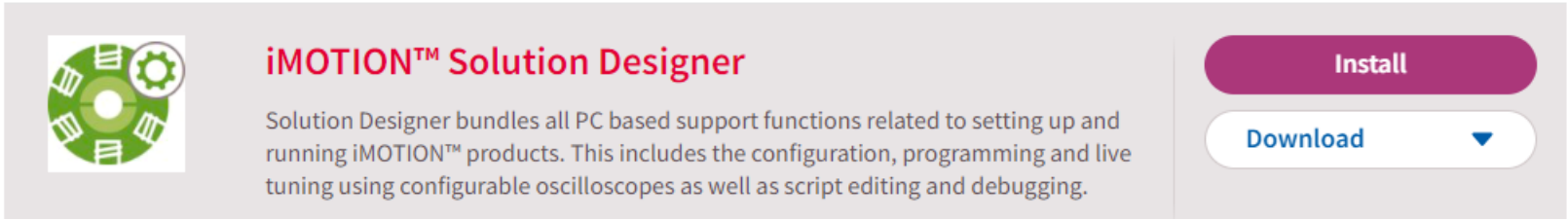
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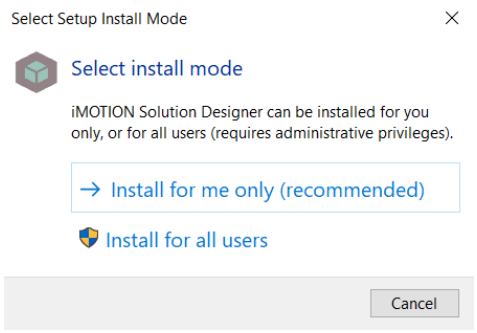
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# Installing iMOTION™ Solution Designer

- Infineon Developer Center Launcher (to manage Infineon tools)
  - https://www.infineon.com/cms/en/tools/landing/infineontoolbox.html
  - Please **register here** at myInfineon for exclusive information and tips for projects
- iMOTION™ Solution Designer installation executable.
  - https://softwaretools.infineon.com/tools/com.ifx.tb.tool.imotionsolutiondesigner

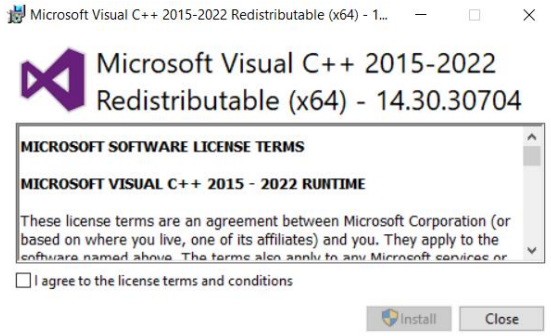



- Follow installation directions and unzip software package
  - It is recommended users shall enable local administrator rights to ensure smooth installation process.
  - Installation tool will automatically install the driver for J-link and Microsoft Visual C++ during the installation process.







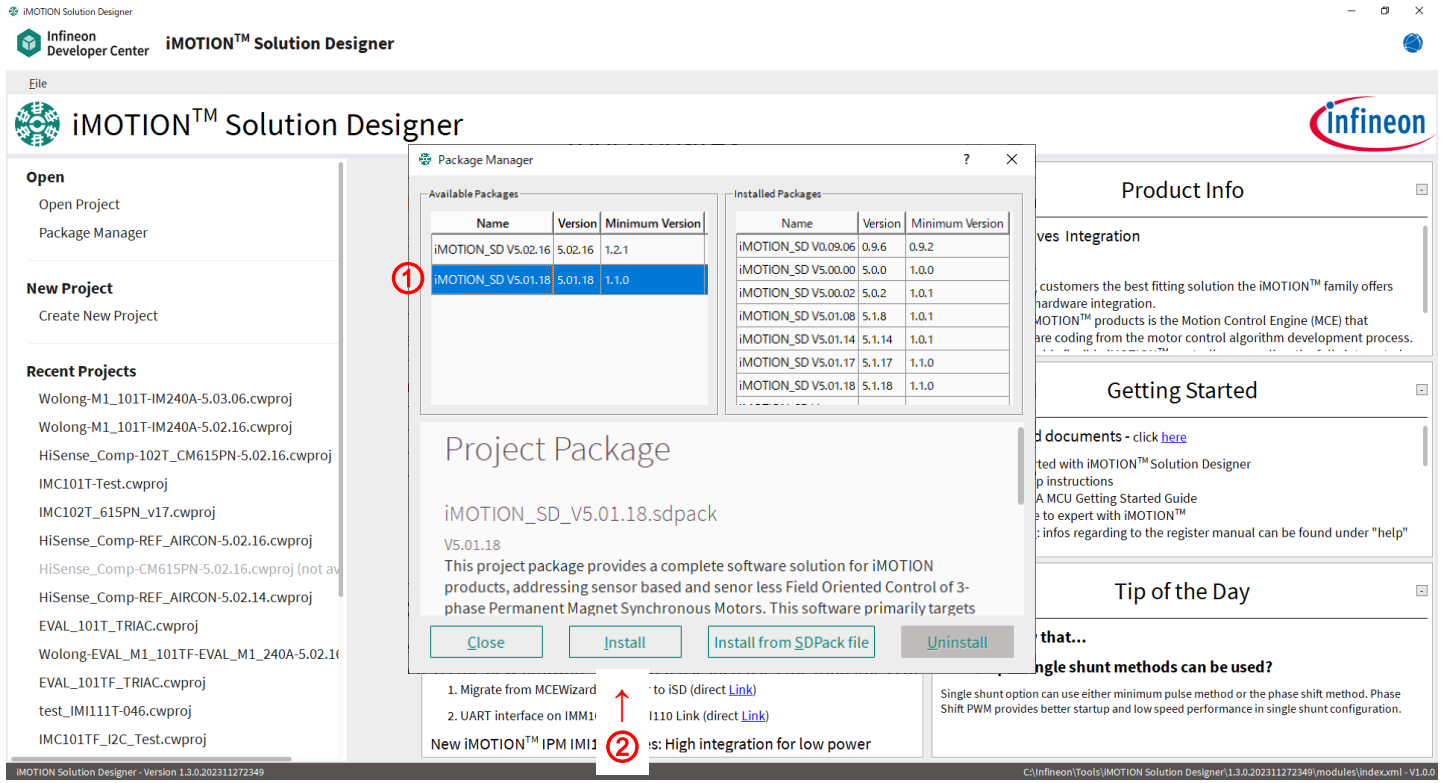




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# Installing SD pack

- Open the **iMOTION™ Solution Designer**, then press the **Package Manager.**
- Check and update the necessary SD pack(s).
  ① Select the latest package from **Available Package**
  ② Press **Install** button to install the package





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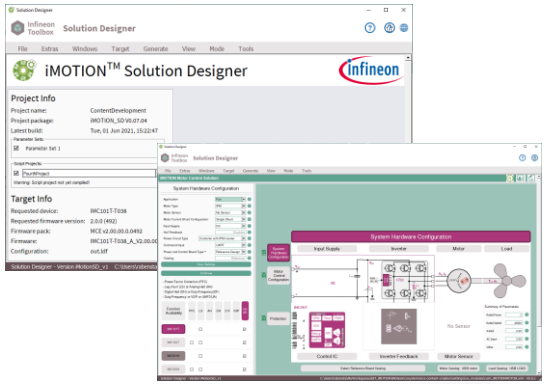
Downloading firmware 34

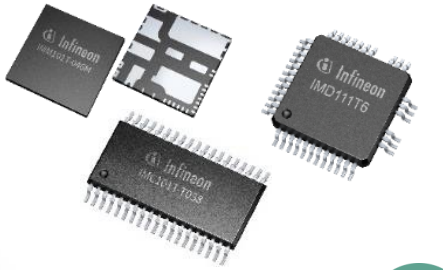
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# iMOTION™ Solution Designer Workflow



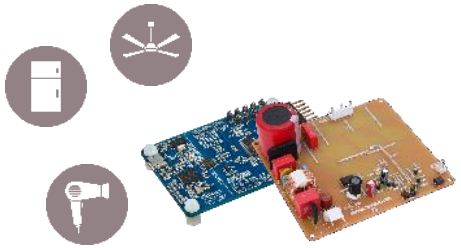
1. Define your setup by Application/Board/...

2. Configure the System

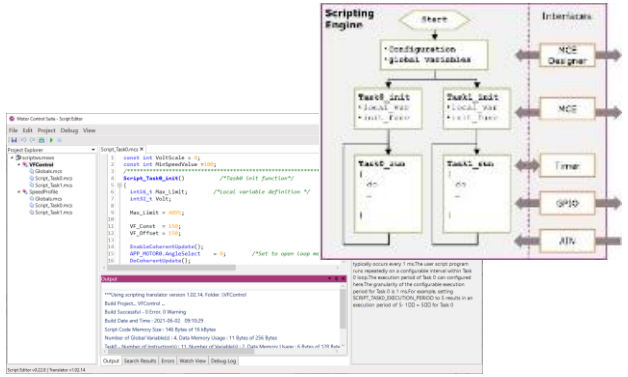
3. Develop a Script (optional)

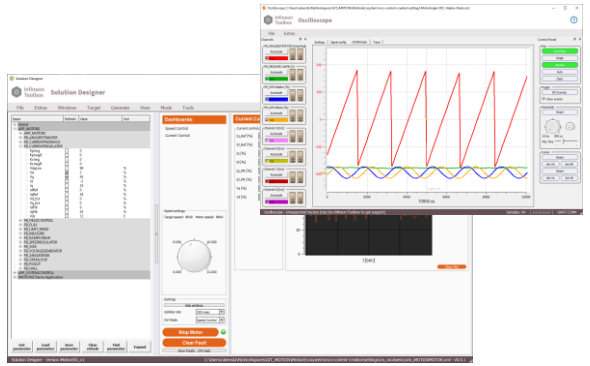
4. Load the Firmware to the Target

5. Tune the Control Loop



Poles,
R, L,…




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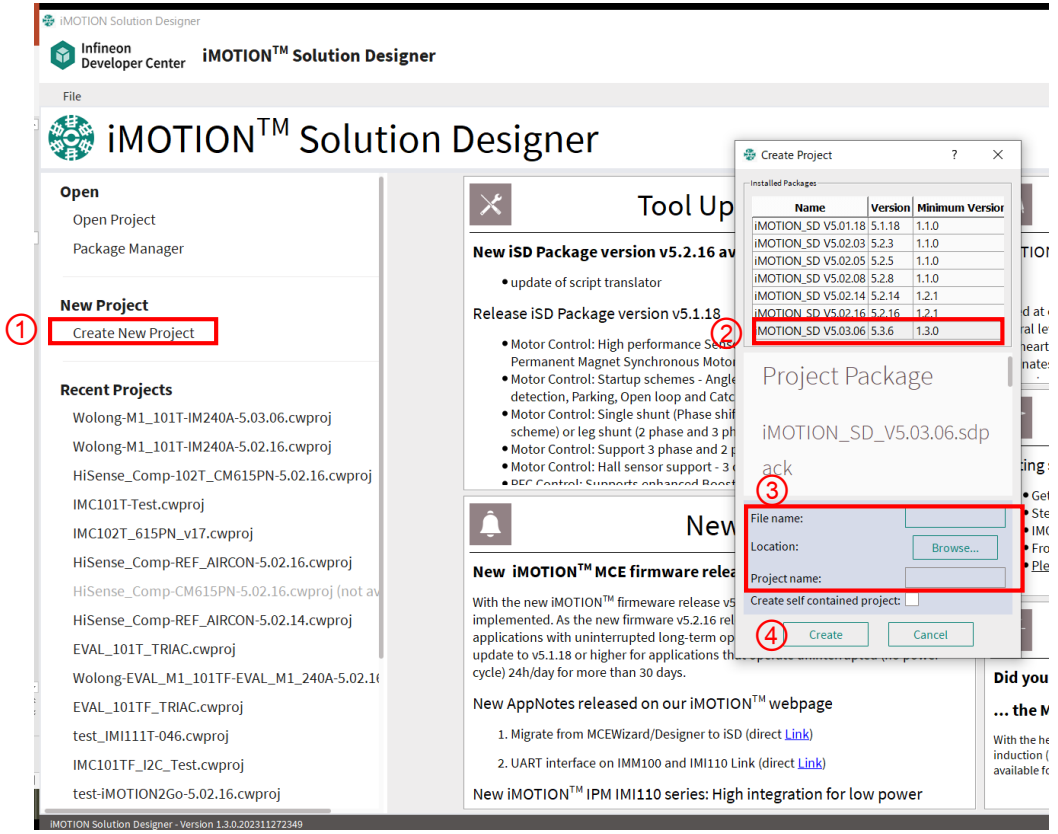
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# Create new Project

- Create a new project based on the installed SD pack and enter the following information
  - ① Select **Create Project** under **New Project**
  - ② Select SDpack to be used in the project
  - ③ Input File name / Location / Project name
    - File name: File name of the new project
    - Location: Folder where the project to be created
    - Project name: Project name
  - ④ Press **Create** button

- (Optional) Check **Create self contained project,** allowing easier distribution of the project files to other iSD users.
  - Self contained project includes system files, so project size becomes larger than the ordinary project.



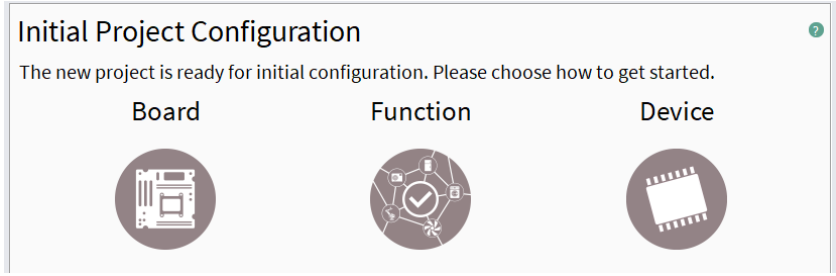


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# Initial project configuration
# Overview

## 3 ways to start a new project

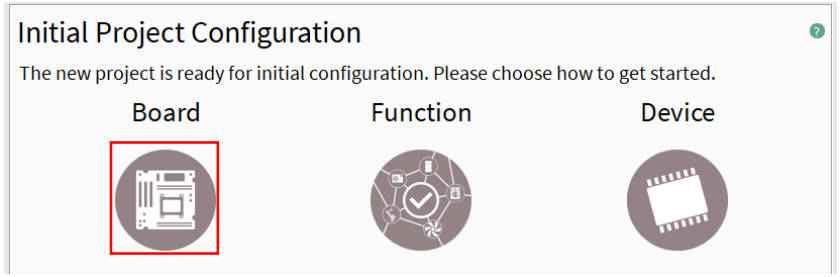
1. **Board catalog files**
   - MADK boards
   - Reference design boards
   - Customer's boards
2. **Function selection**
   - Communication interface
   - Parameter selection method
   - GPIO / analog input requirement
   - Sensorless /  analog Hall / digital Hall
   - Current sense type
   - PFC frontend
   - Scripting
3. **Device selection**
   - iMOTION™ Controller
   - iMOTION™ Driver
   - iMOTION™ IPM



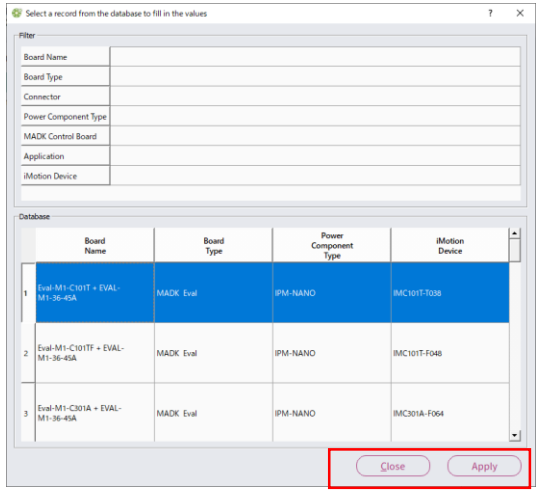


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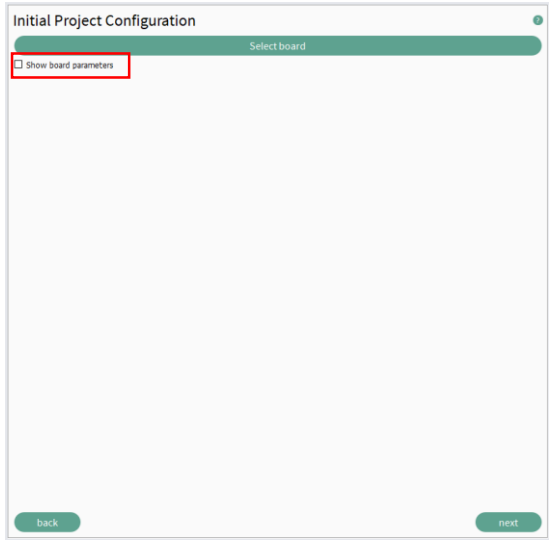
# Initial project configuration
# Board Catalog Files



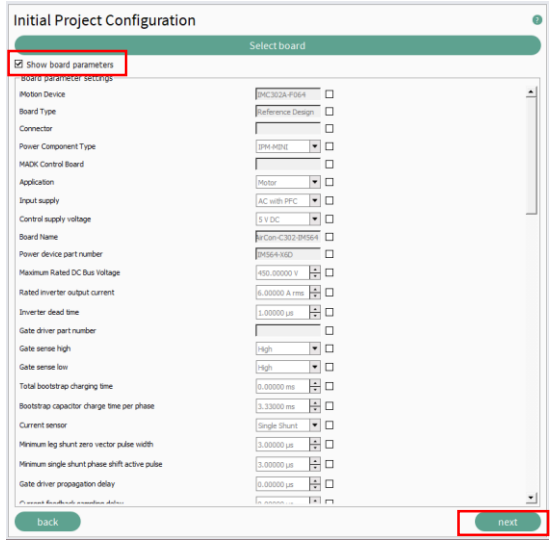

Select board icon to create the project based on board catalog files




Select board file and press **Apply**, then press **Close**




If you would like to see the detail of board parameters, check **Show board parameters**



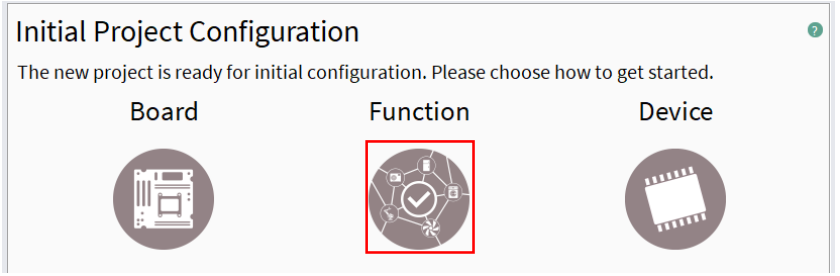

If OK, press **next** to create the new project.
If you would like to change board file, press **back**.

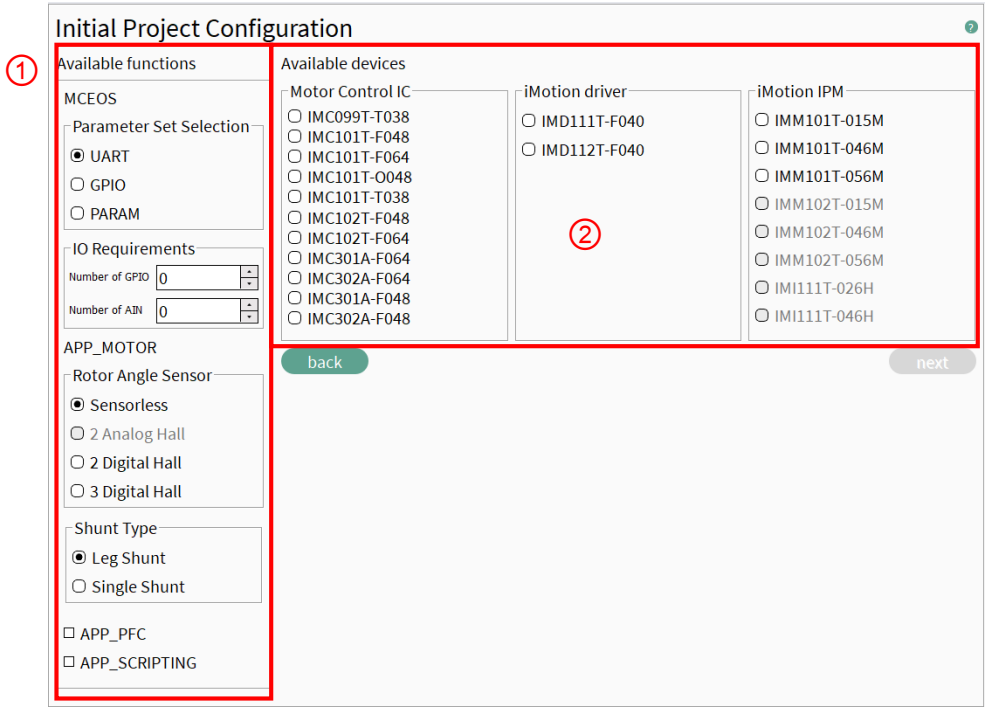

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# Initial project configuration
# Function selection

① Select the required functions from **Available functions**.

② Select proper device from the list in **Available devices**.
Devices that do not support required functions are grayed out and cannot be selected.



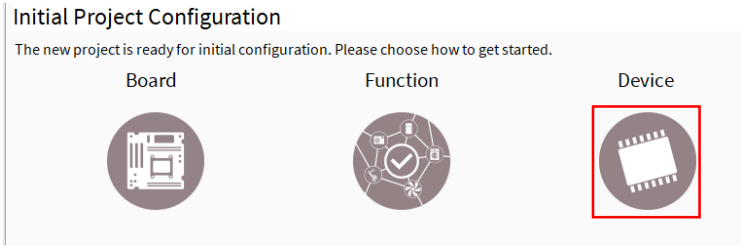



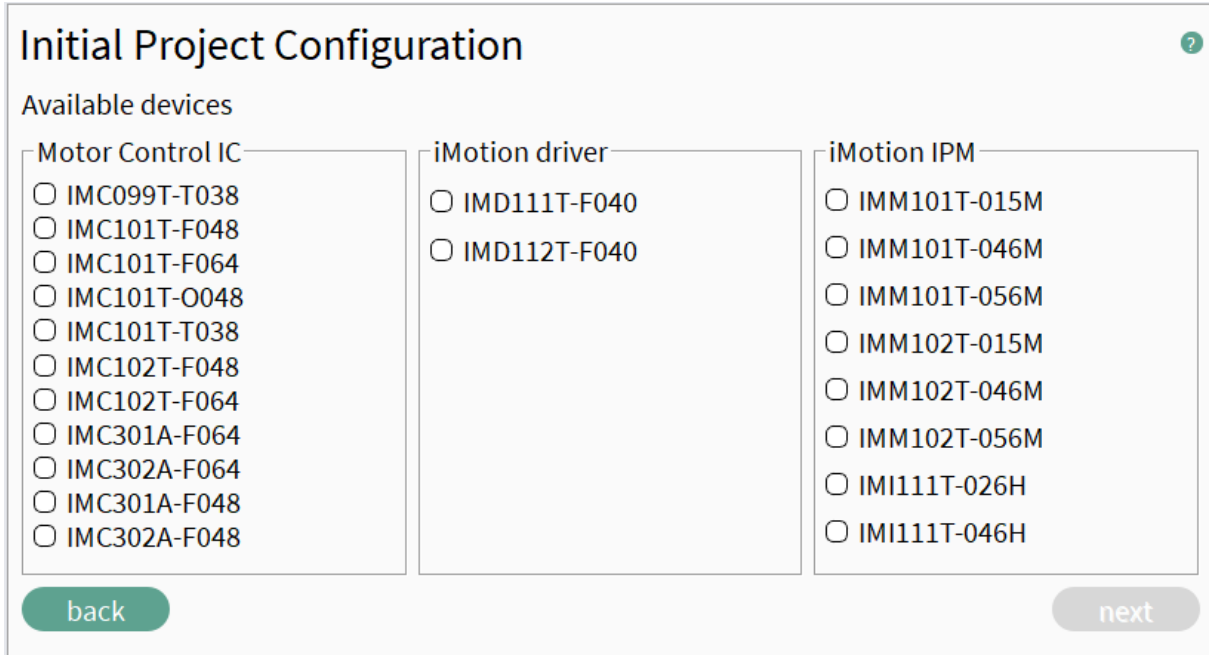


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# Initial project configuration
# Device selection

Select proper device from the list in **Available devices**.





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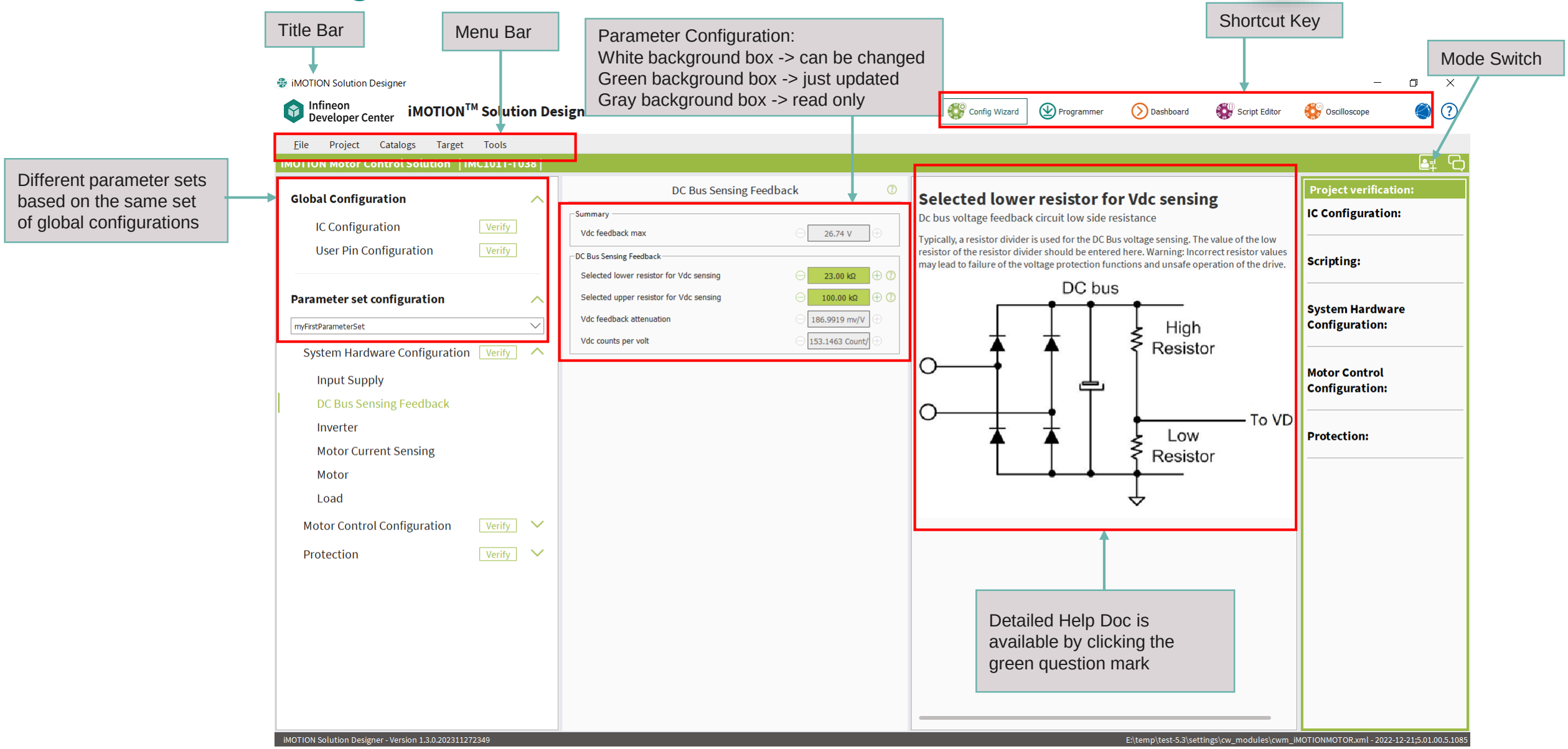
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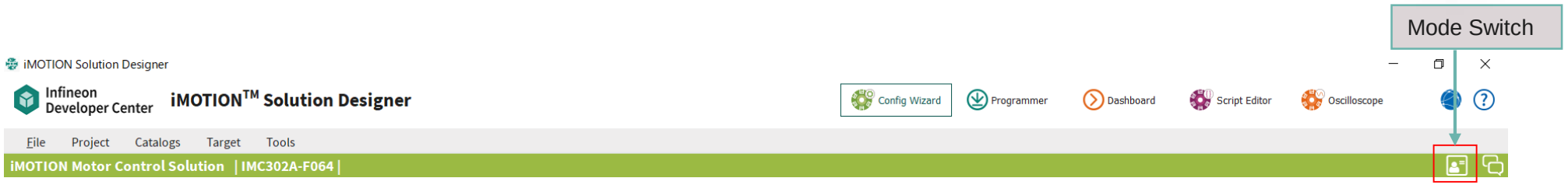
# iMOTION™ Solution Designer
# Parameter Configuration Wizard





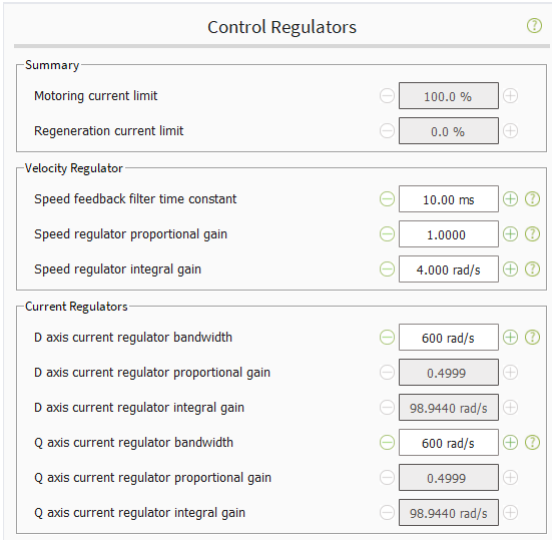
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# Parameter Configuration Wizard
# Normal vs. Expert Mode



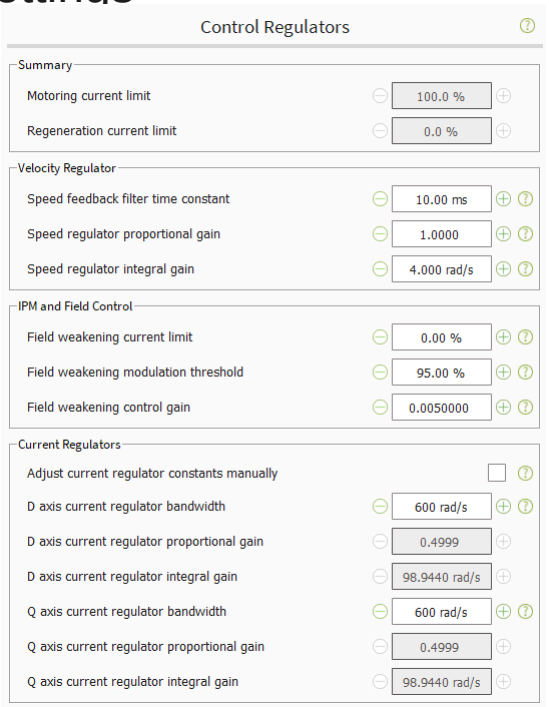

## Normal Mode

Shows the most commonly used and required parameters only




## Expert Mode

Opens up the full parameter tree for more detailed settings



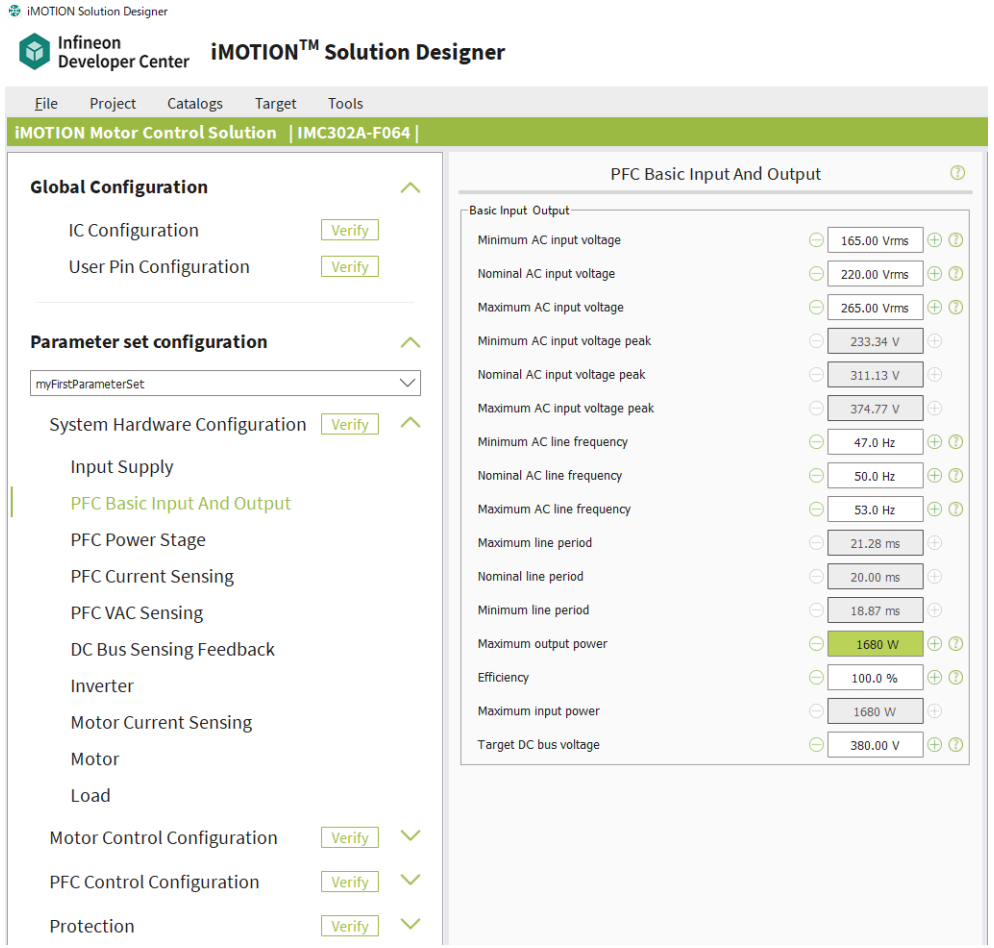


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# Parameter Configuration Wizard in Explorer View
# Motor Control

## 6 top level parameter groups

1. **IC Configuration**
   - General IC configuration
   - ADC, UART, Class B, Clock compensation, Control input method
2. **GPIO & analog input resource configuration for scripting**
   - Scripting related settings
3. **System hardware configuration**
   - System (inverter/board related settings)
   - Input supply, DC bus sensing, Inverter and feedback, Motor, Load
4. **Motor control configuration**
   - Motor specifics
   - Motor control configuration, Control regulators, FOC and inverter, Application (start-up method…), Angle feedback
5. **PFC Control Configuration (only shown for limited devices)**
   - PFC control parameters
   - PFC control configuration
6. **Protection**
   - Motor and system protection
   - UART Link Break, CPU Execution Fault, Parameter load fault

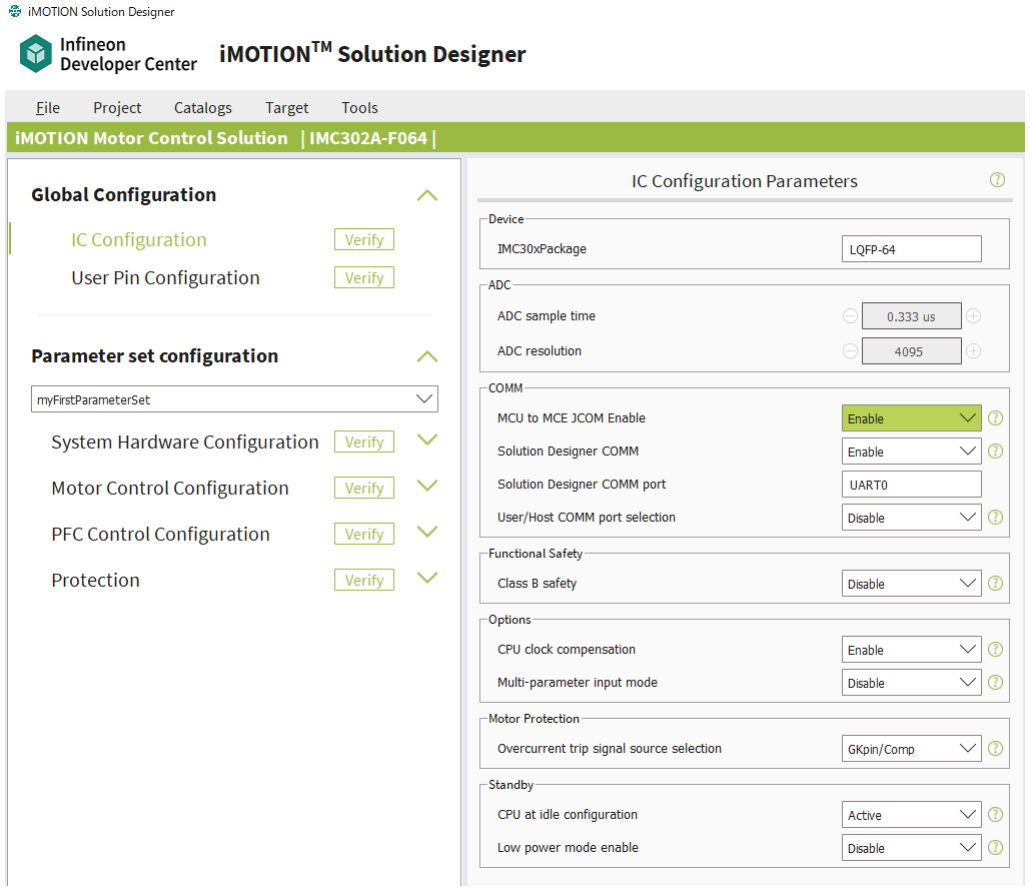



- **Hierarchical configuration tree with logical parameter grouping**
- **Integrated parameter help**


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# Parameter Set Configuration
# 1. IC Configuration

Specify IC configuration
- Communication
- Functional options
- Gatekill source
- Class-B safety
- Standby mode

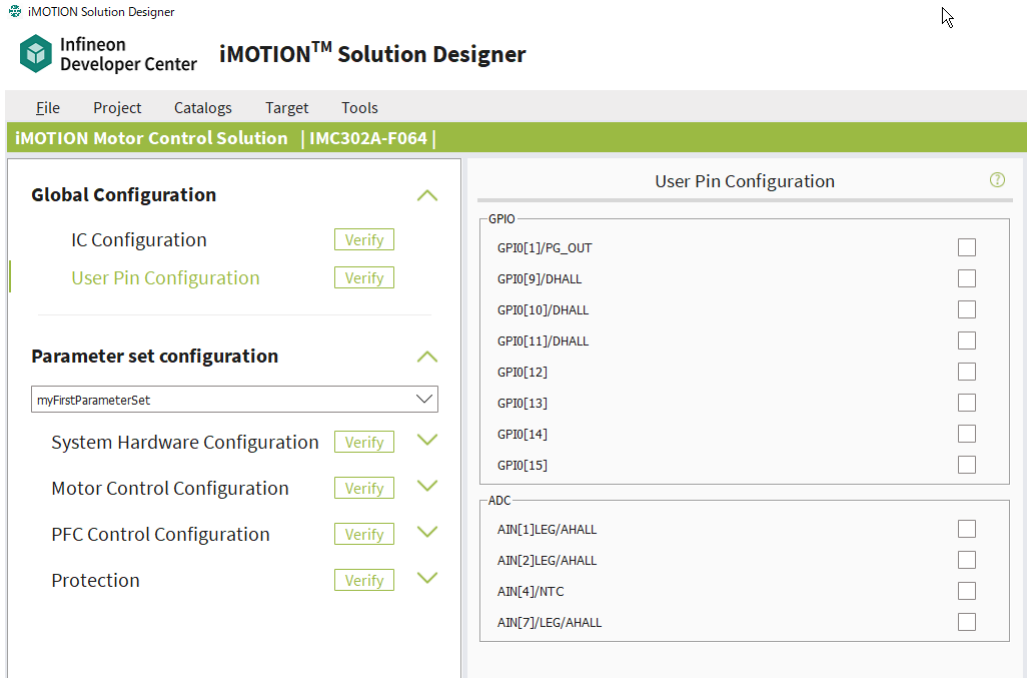




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# Parameter Set Configuration
# 2. User Pin Configuration

Specify user pin configuration used in scripting

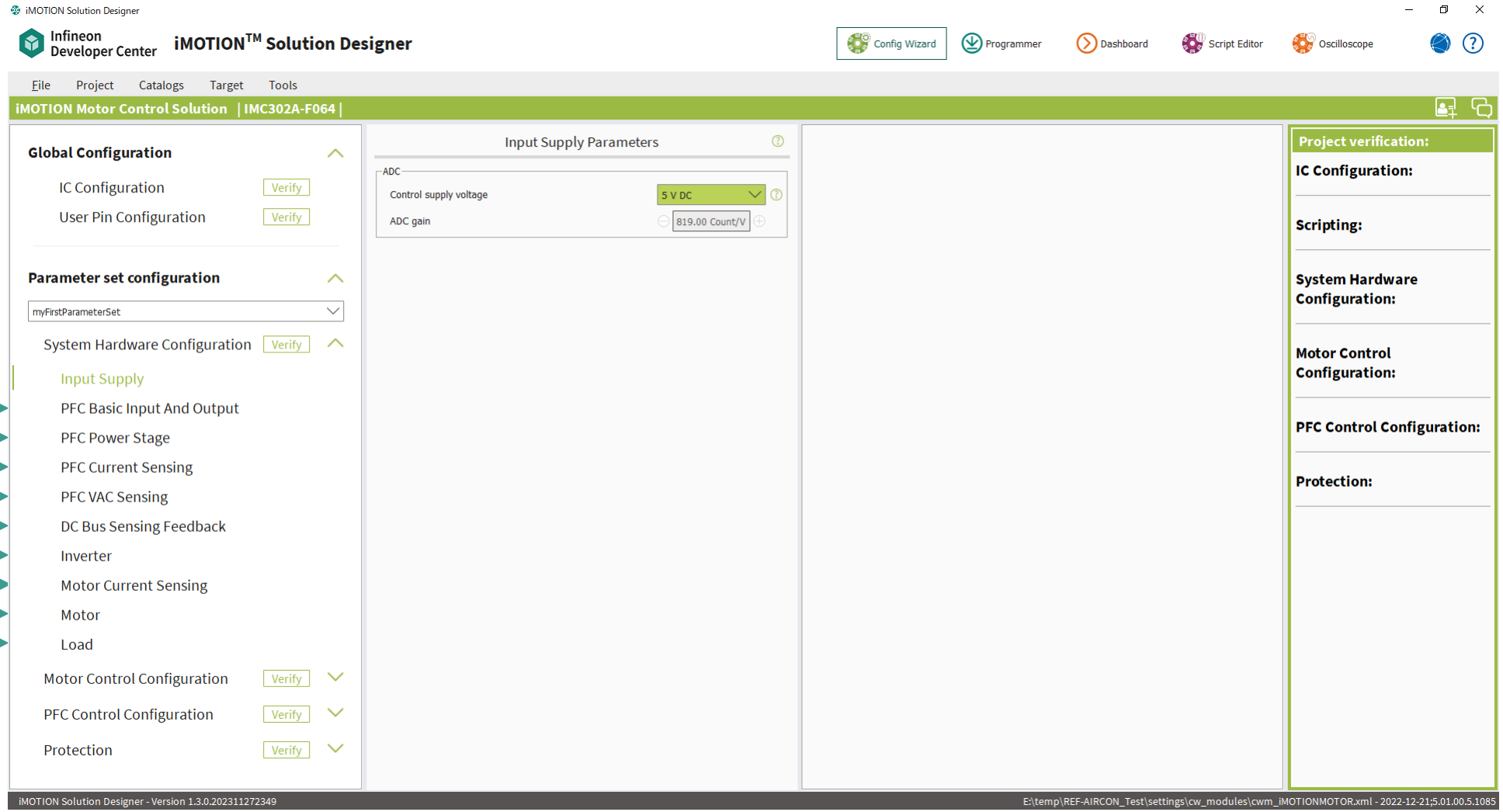




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# Parameter Set Configuration
# 3. System Hardware Configuration

Go through **all** categories of the System Hardware Configuration step by step

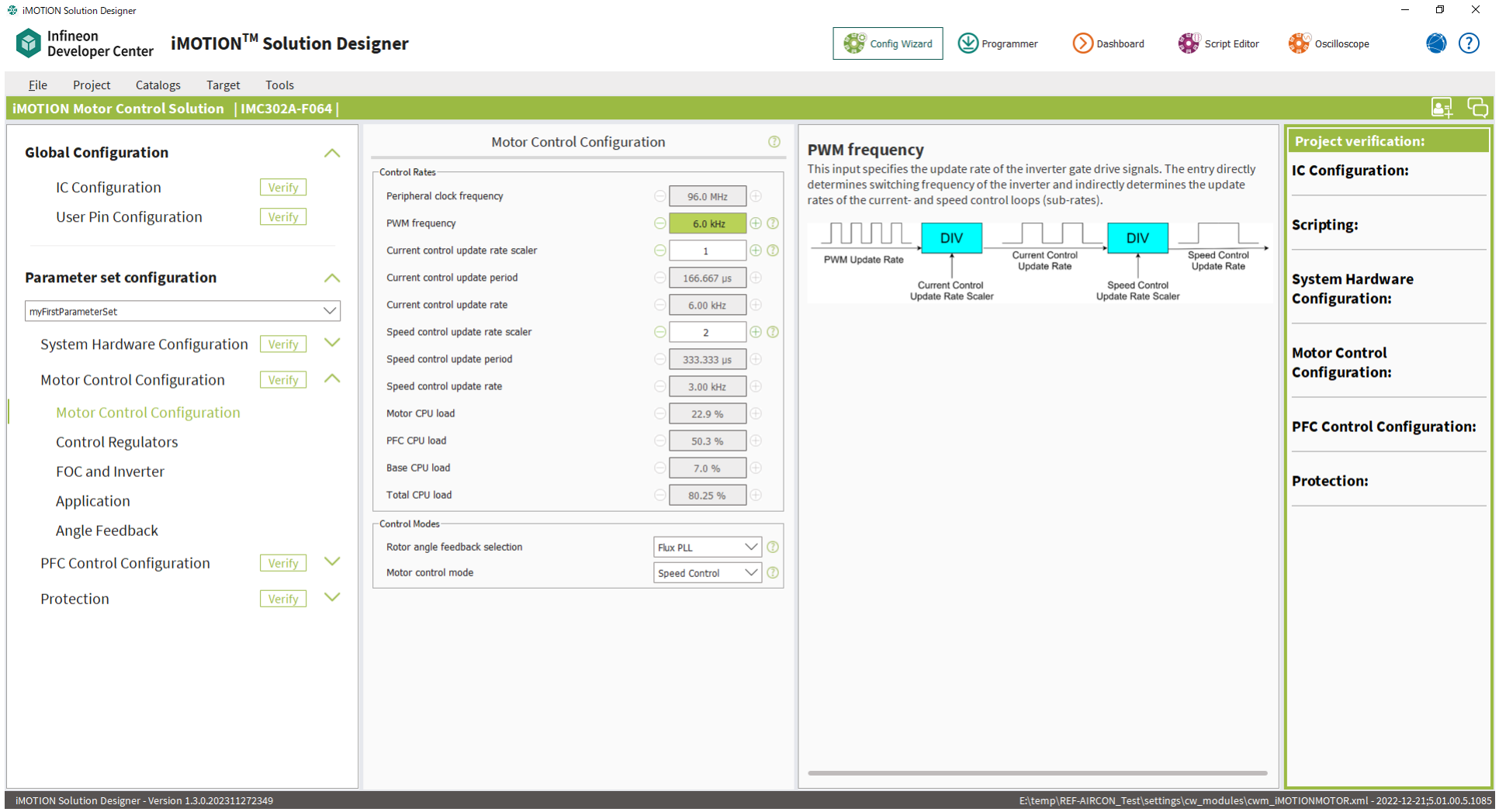




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# Parameter Set Configuration
# 4. Motor Control configuration

Go through **all** categories of the Motor Control Configuration step by step

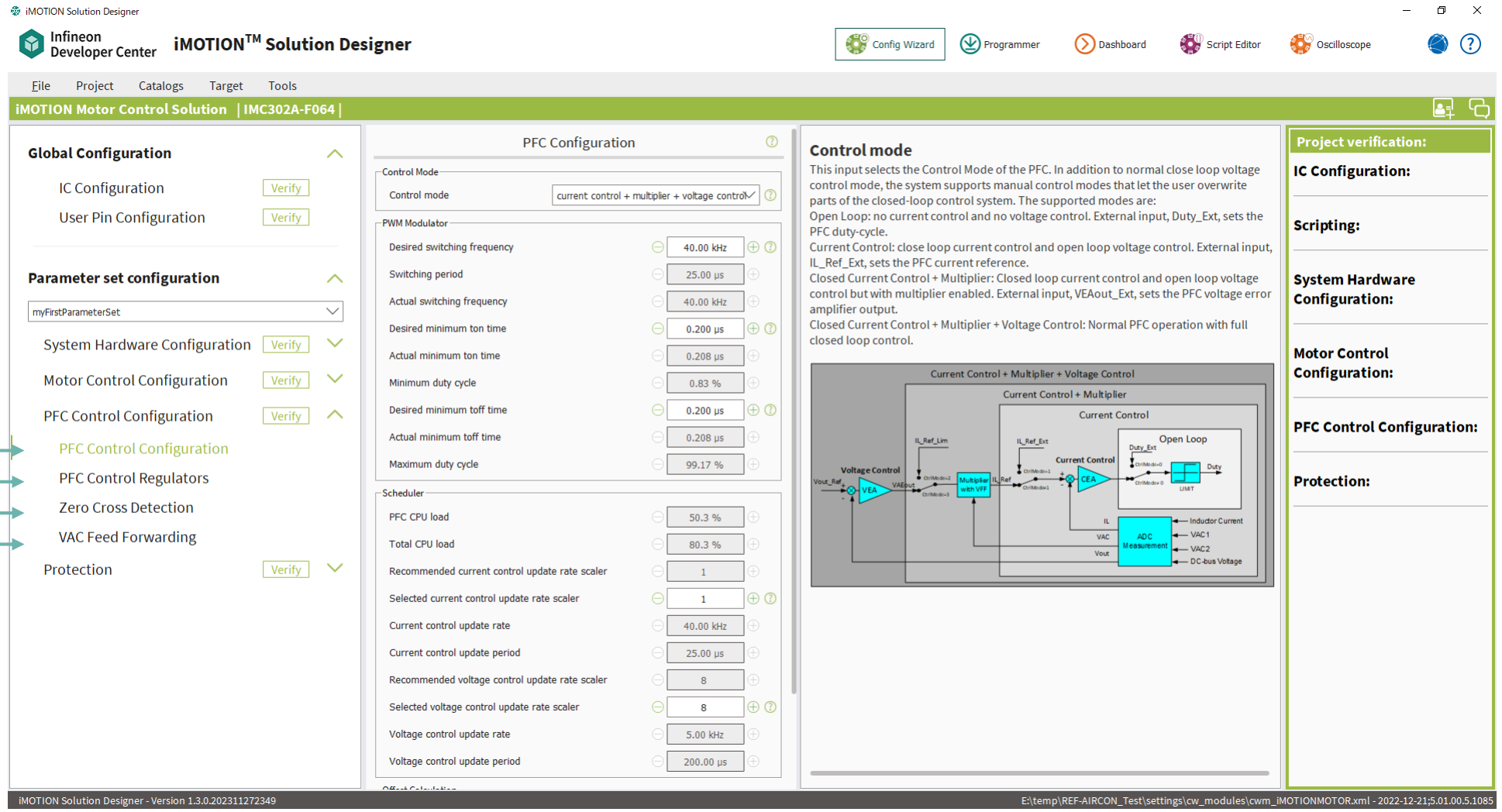




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# Parameter Set Configuration
# 5. PFC Control Configuration

Go through **all** categories of the PFC Control Configuration step by step

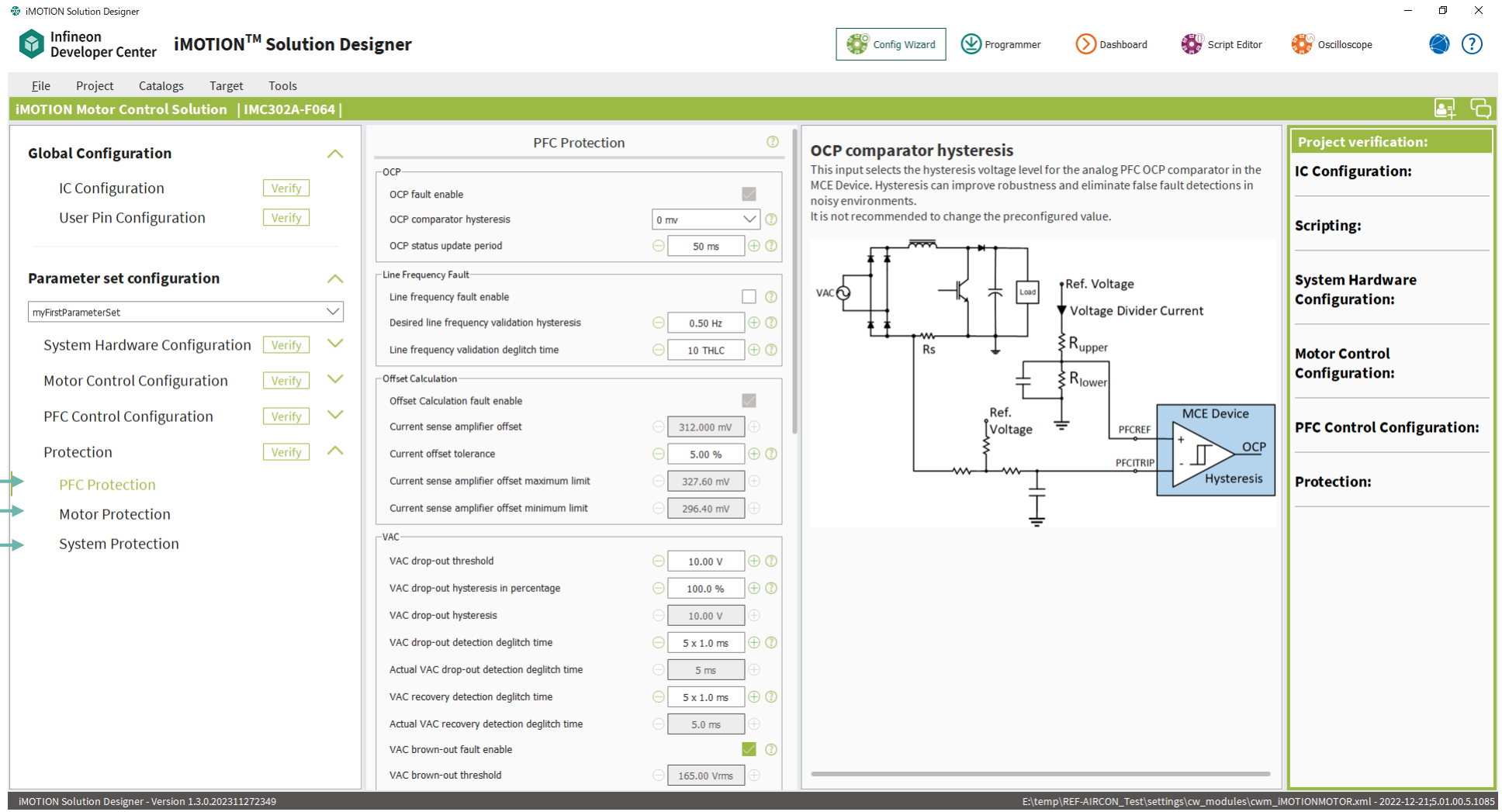



※This section is shown for specific devices only which have PFC function


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# Parameter Set Configuration
# 6. Protection

Go through **all** categories of the Protection Configuration step by step



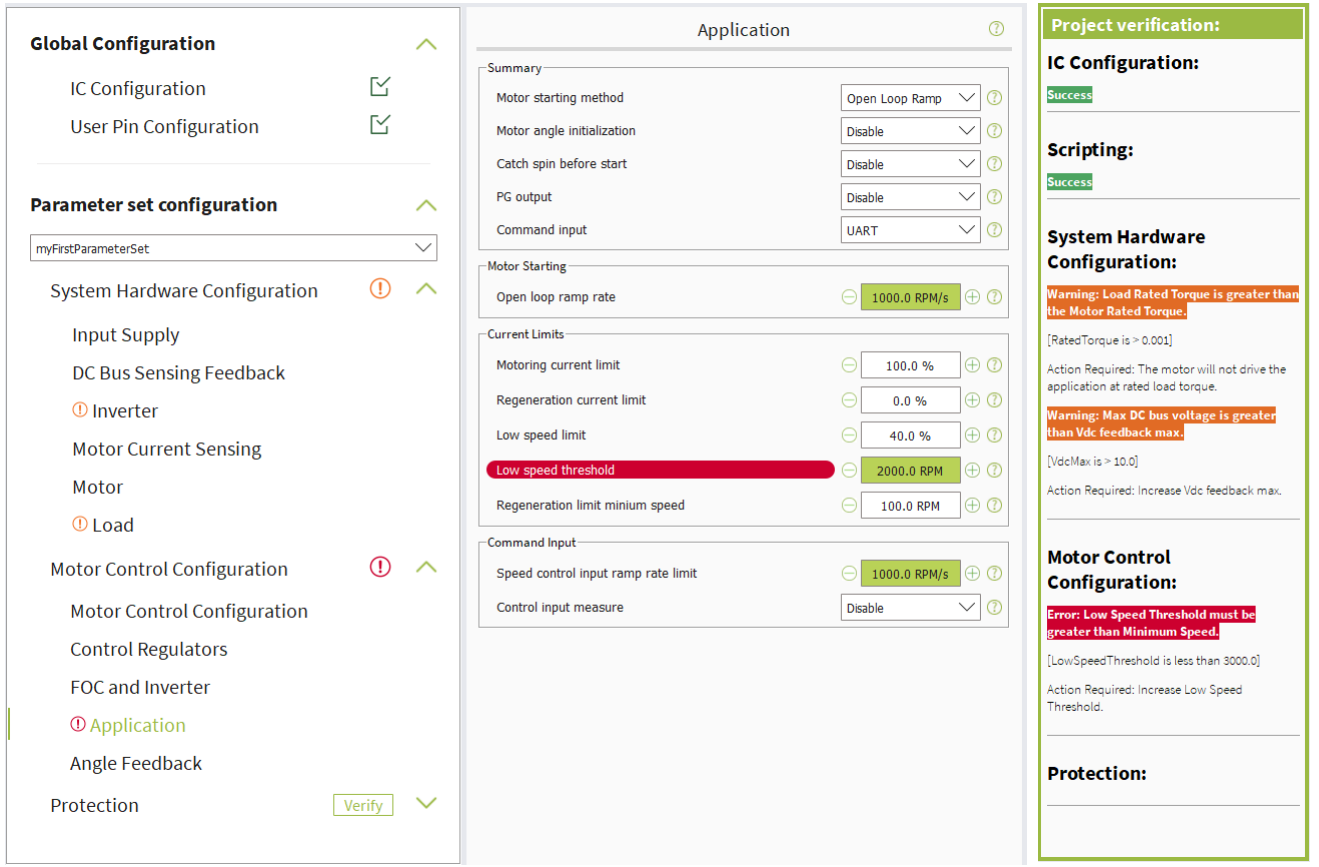

※PFC protection is shown for specific devices only which have PFC function


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# Parameter Verification

## Parameter Verification

- Verification results are shown in the following color code:
  - Success
  - Warning
  - Error (**must** be corrected before proceeding and turns dark orange when selected)
- Guidelines are shown for why the error or warning occurred
- Visually directs you to the parameter in question

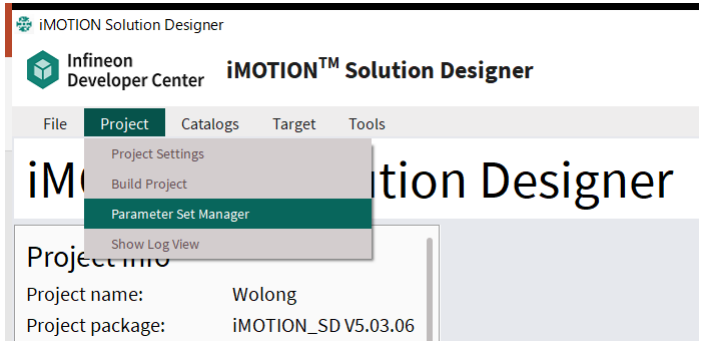


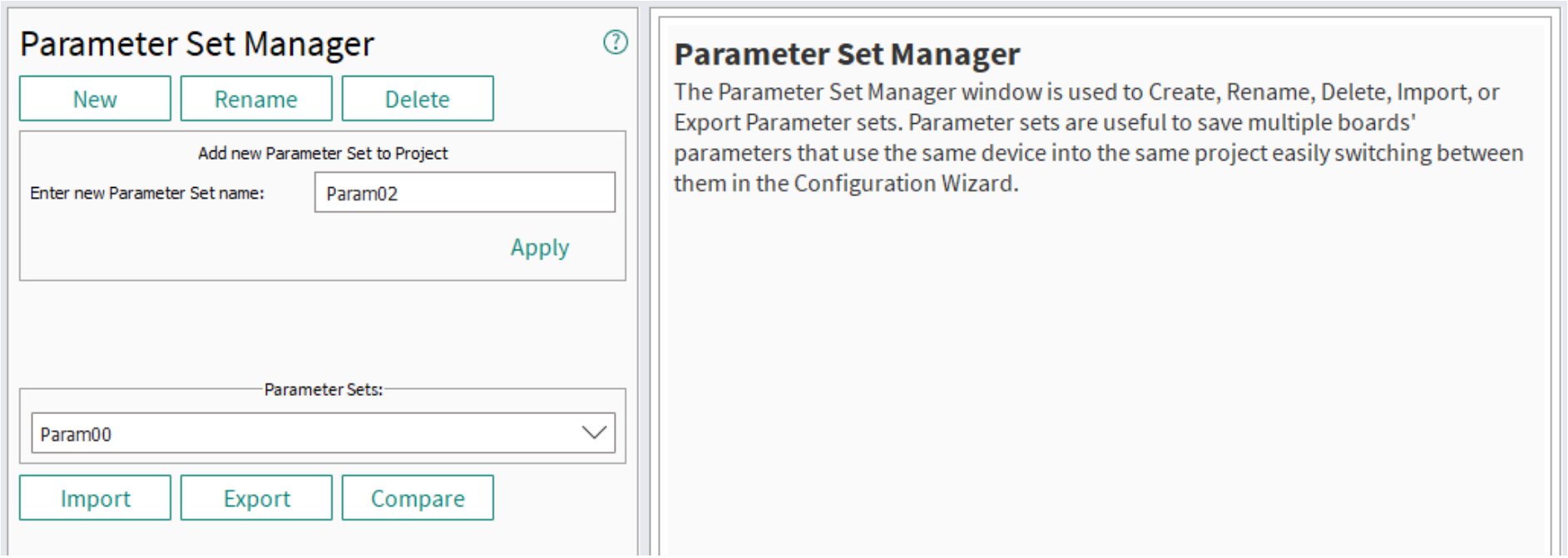


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# Parameter Set Manager

- Select **Project** in the menu bar and then select **Parameter Set Manager**, then **Parameter Set Manager** will open.
- User can configure parameter sets, and import or export parameter set data from/to external file.



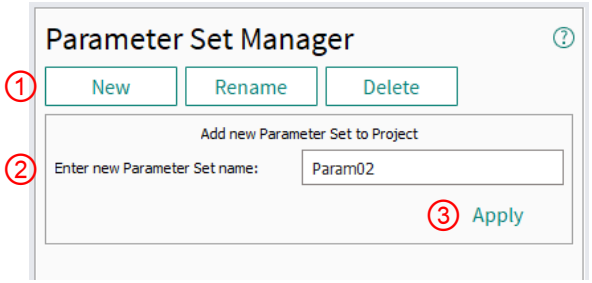





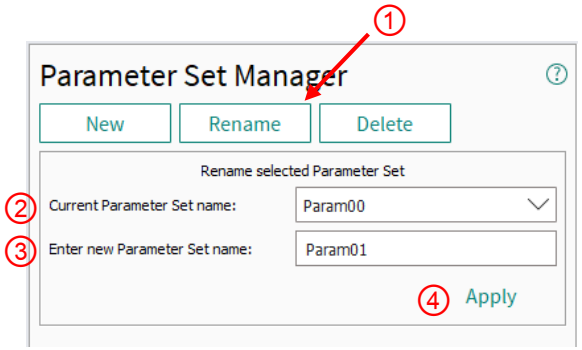
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# Configure Parameter Set

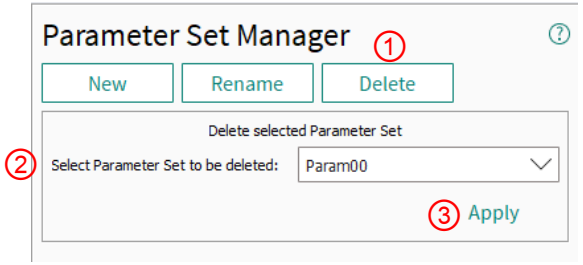
1. Add new parameter set
   - ① Press **New**
   - ② Enter parameter set name in **Enter new parameter set name**
   - ③ Press **Apply**




2. Rename parameter set
   - ① Press **Rename**
   - ② Select parameter set that you would like to rename in **Current Parameter Set name**
   - ③ Enter new parameter set name in **Enter new Parameter Set name**
   - ④ Press **Apply**




3. Delete parameter set
   - ① Press **Delete**
   - ② Select parameter set that you would like to delete in **Select Parameter Set to be deleted**
   - ③ Press **Apply**




***Note: It is highly recommended to build the project after parameter set is configured***


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# Import Parameter Data from External File

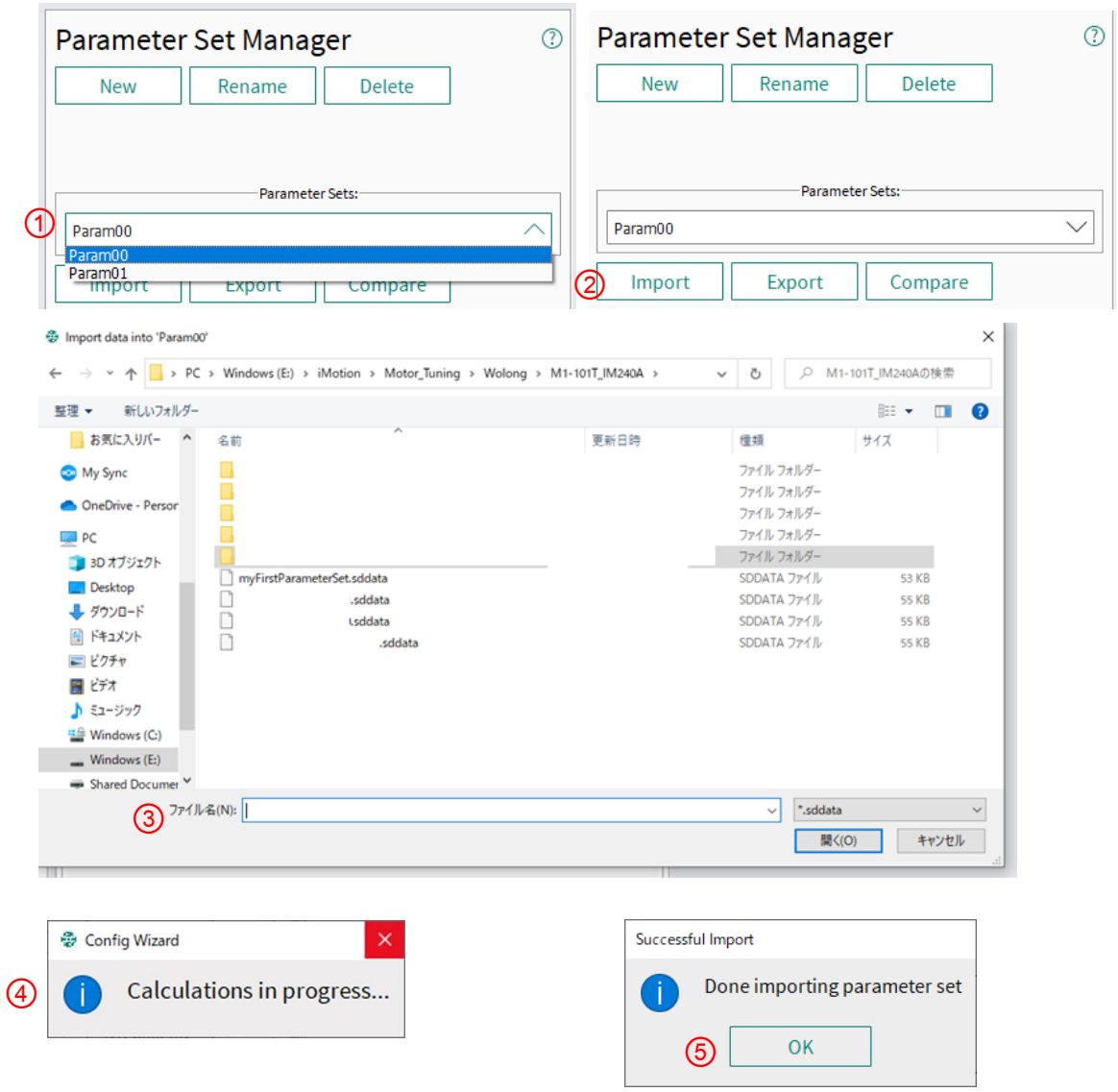
① Select parameter set in the list box

② Press **Import**

③ Select **.sddata* file from explorer window

④ Window with **Calculation in progress** appears.

⑤ When import process is finished, **Successful Import** windows appears. Press **OK** to close the window.





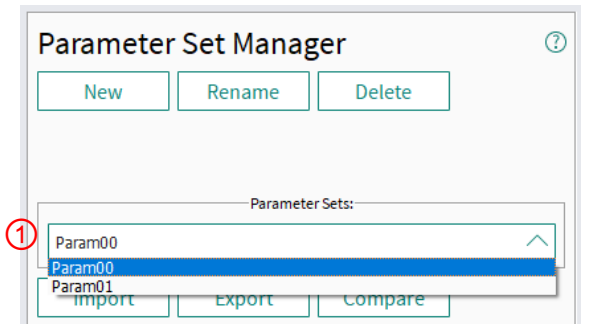
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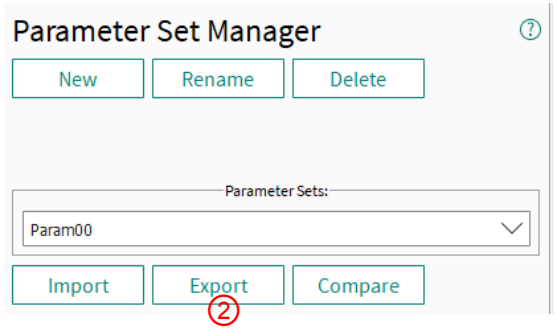
# Export Parameter Data to External File

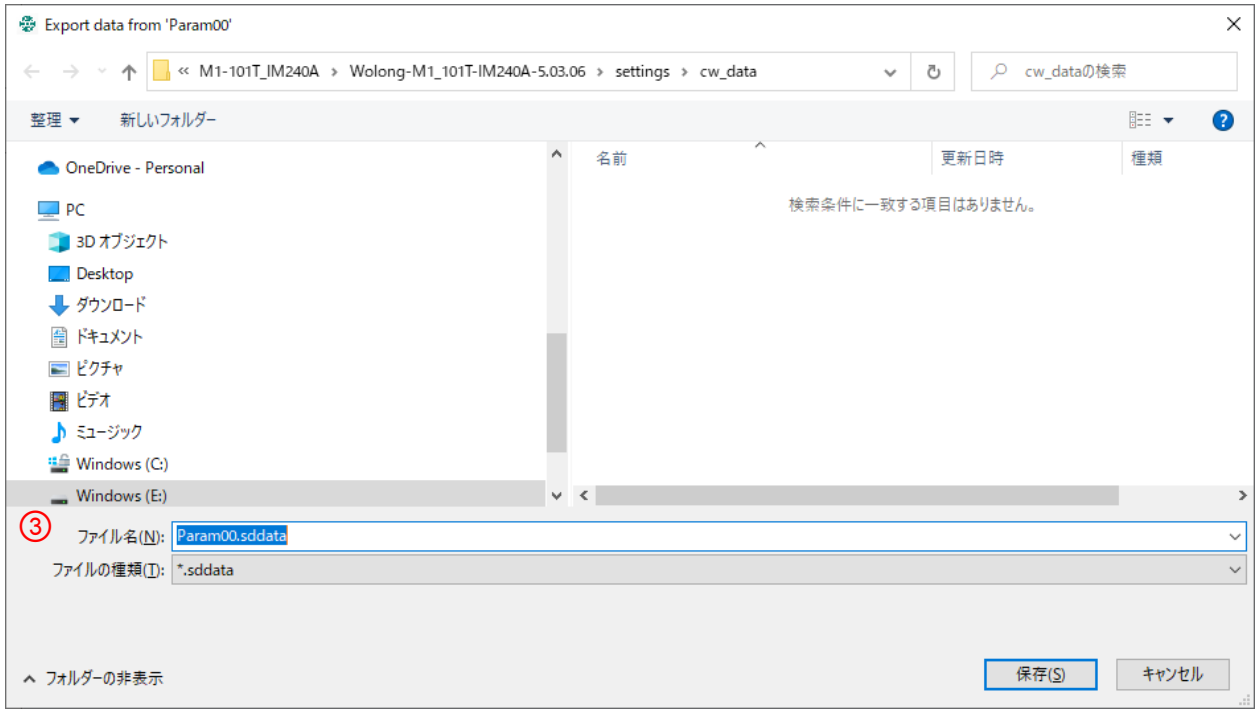
① Select parameter set in the list box

② Press **Export**

③ Select folder to save parameter data in explorer window



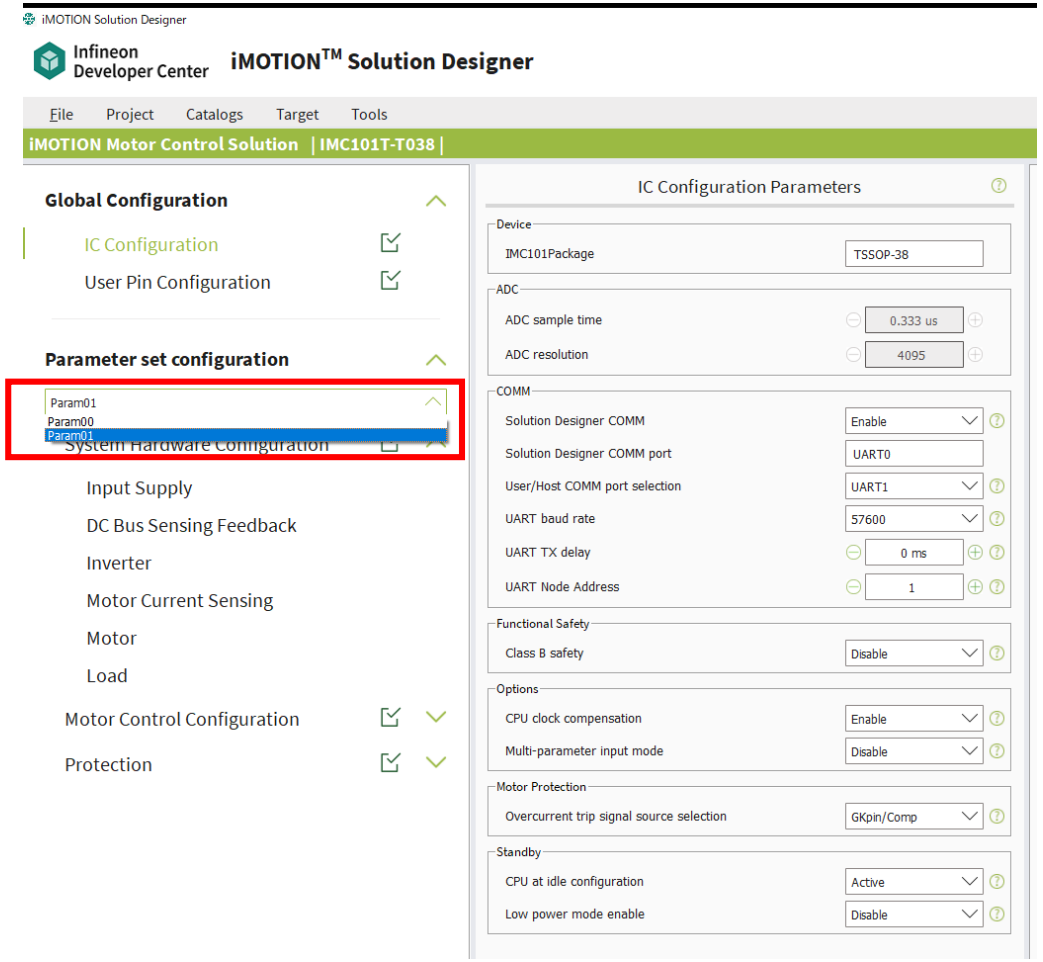





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# Parameter Set Selection in Configuration Wizard

User can select parameter set to be edited in Configuration Wizard by selecting parameter set in the list box.





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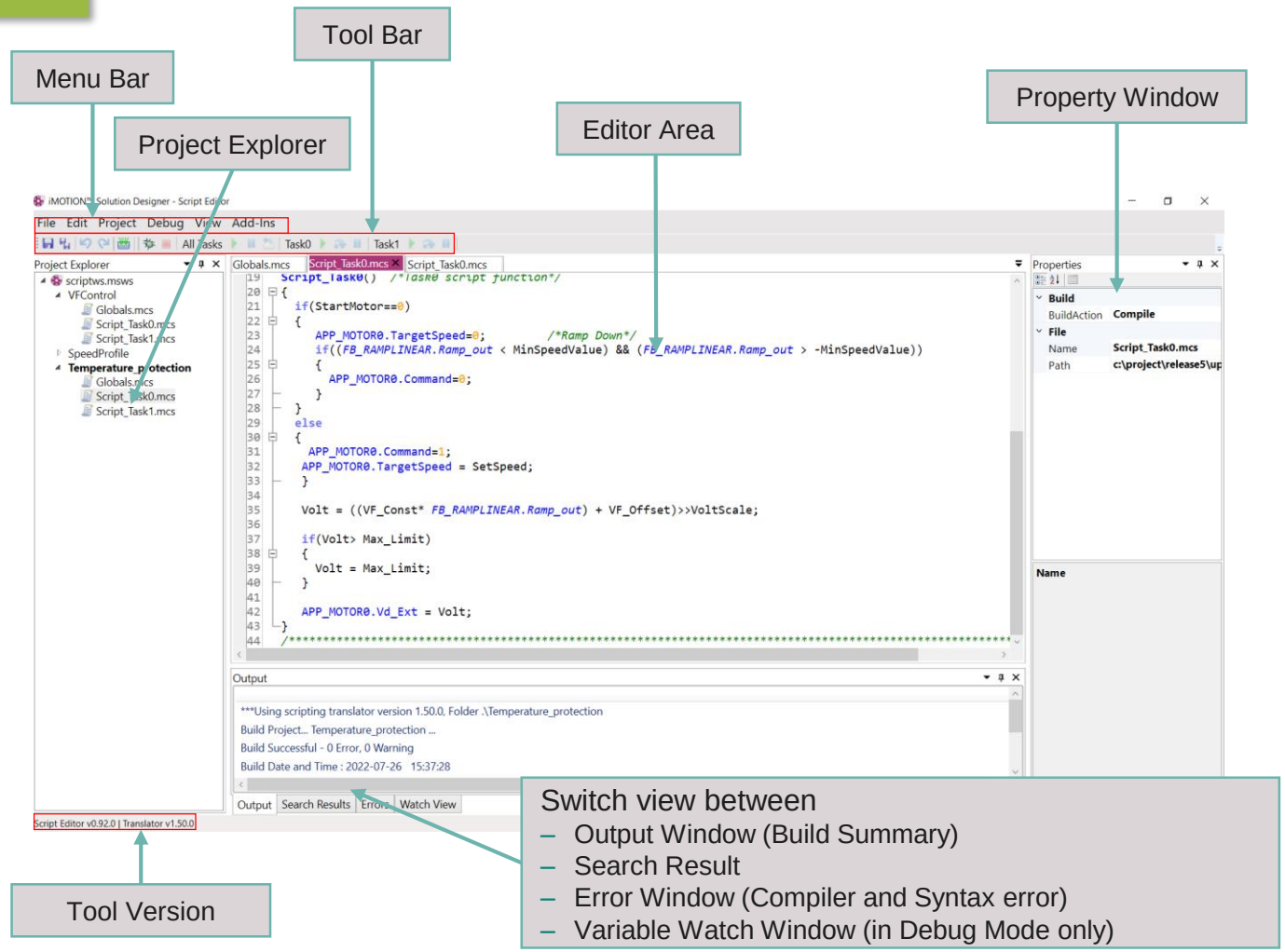
# Script Editor
# Graphical User Interface

## Script Editor and Debugger

- **Script editor**
  - Runtime syntax checking
  - Project management
  - Keyword highlighting and auto completion
  - Online help system

- **Script translator**
  - Integrated script code compilation
  - Optimized byte code generation to reduce code size and execution time
  - Enhanced  data memory usage, supports  8, 16 and 32 bit integer variable type
  - 256 Byte memory allocated for global variables and 128byte data memory for local variables

- **Script debugger**
  - Support for break points, variable watch window, and execution control

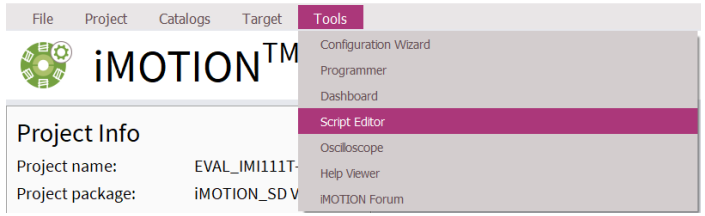


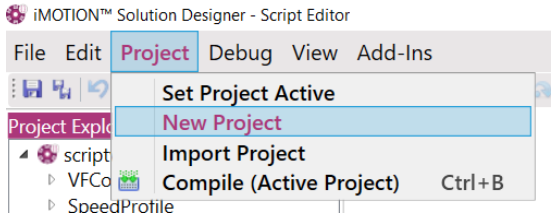


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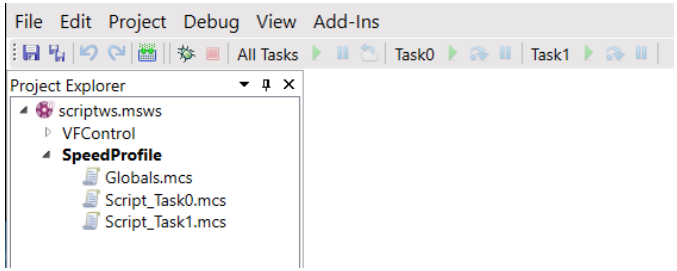
# Script Editor
# Step by step

– After opening the Script Editor, a new Script Project **must** be created.

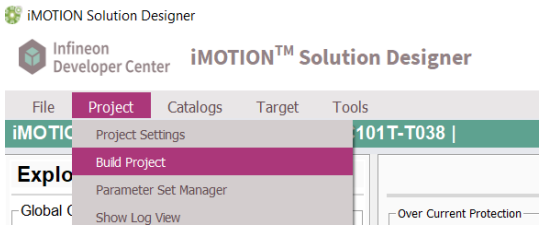


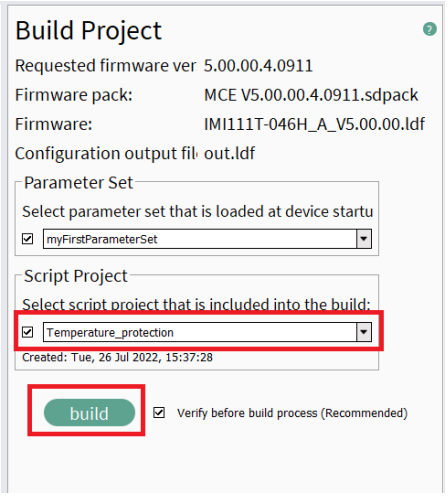




– The Script development process consists of defining the Global parameters, Task0, and Task1.




– User needs to assure that the script is **selected** in the Project Build settings.





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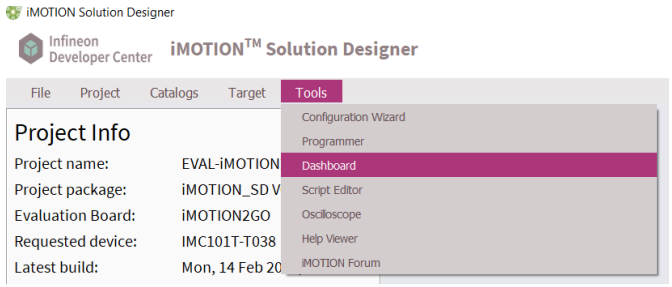
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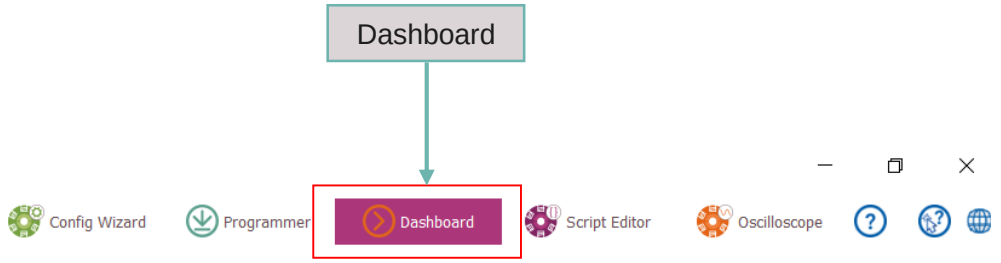
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# Build, Connect and Program

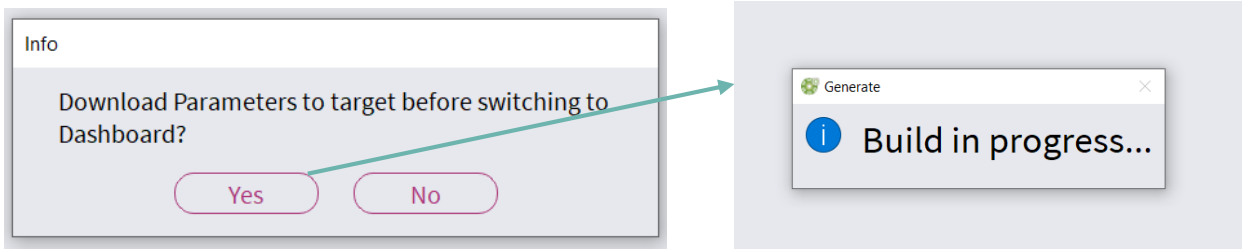
– After opening or creating a project, select **Dashboard** via menu or toolbar.




or



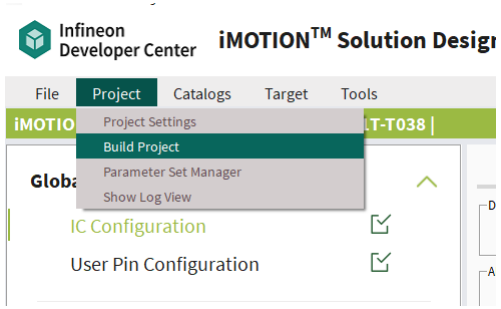

– The **Build**, **Connect**, and **Program** steps will be done as required (through popups).



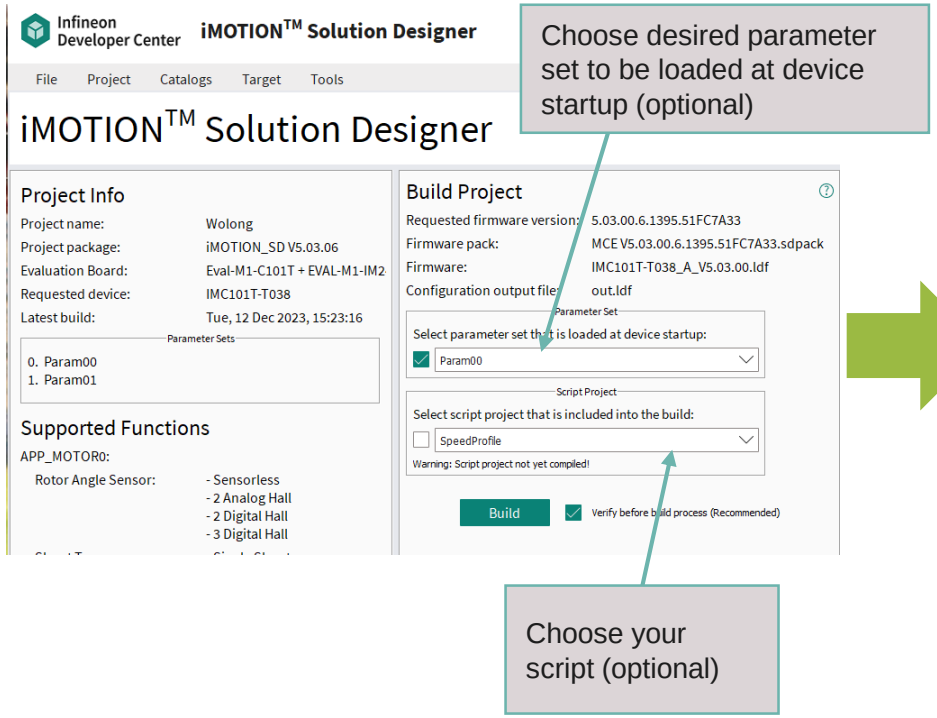

– Steps (Build, Connect, Programer) can be done individually and are explained on the next slides.


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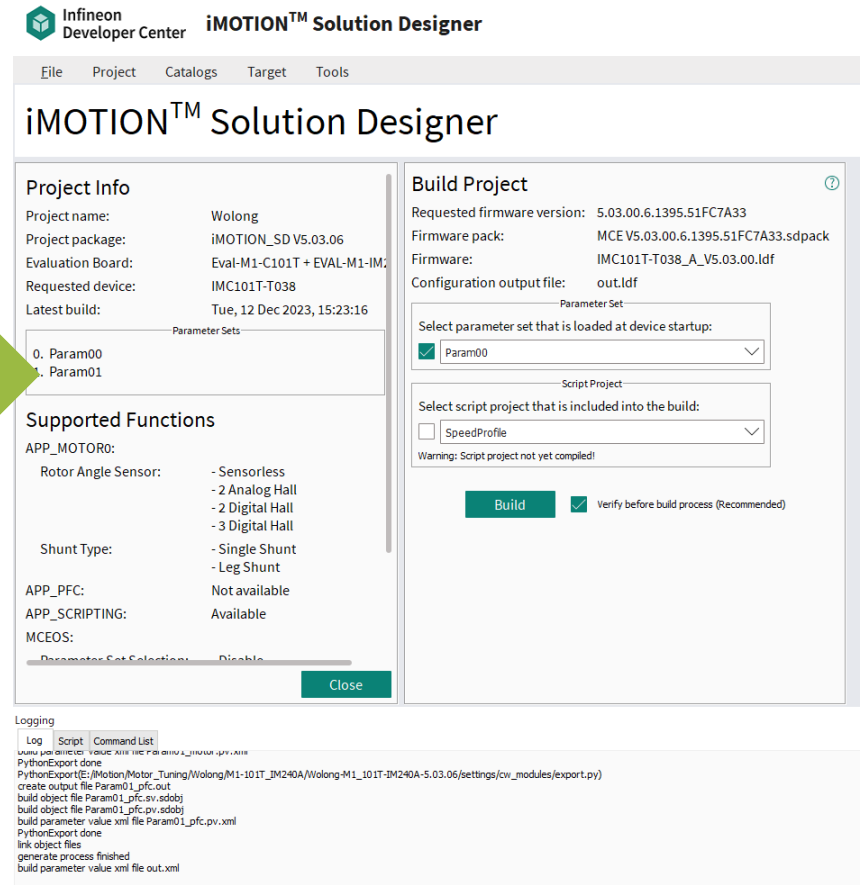
# Build the Program




Select **Project → Build Project**




If necessary, select the parameter set to be loaded at startup, and a script. (optional)
Then press **Build**

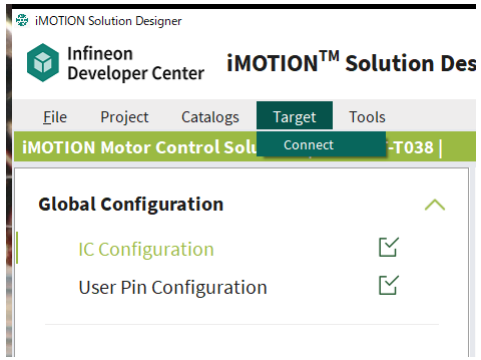



After build process done, log is shown in log window.
In order to open log window, select **Project → Show Log View**.

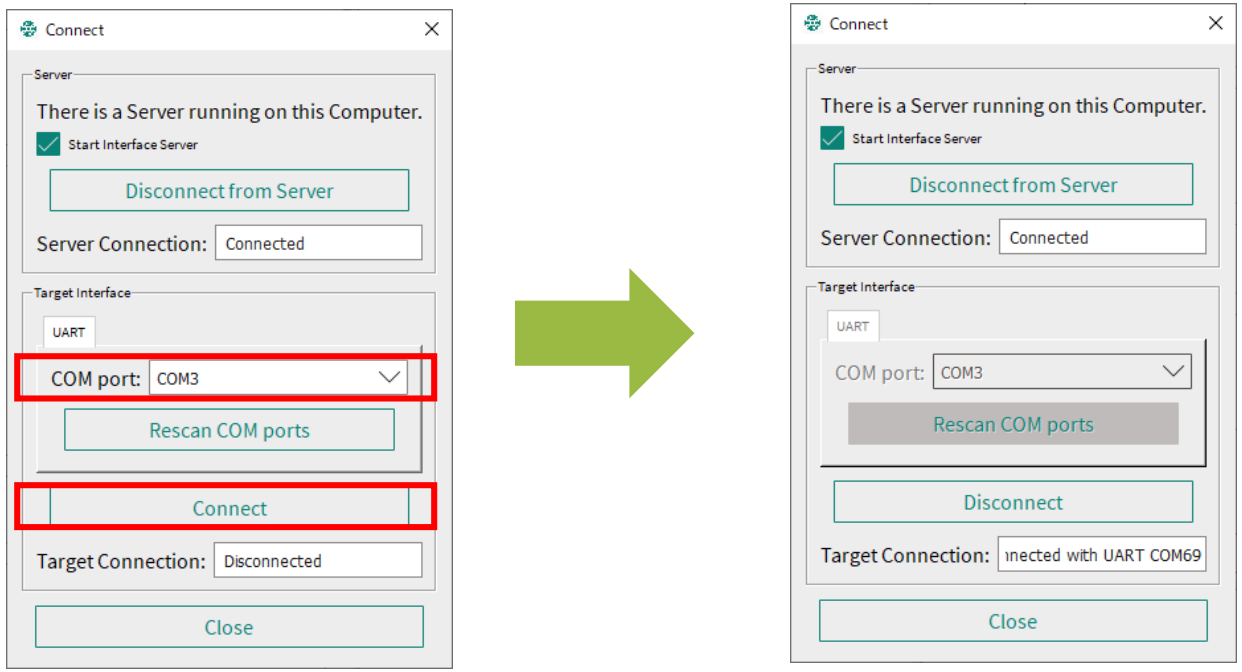

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# Connect with Target

– It is necessary to connect to the target device for program or debug.




Select **Target → Connect**



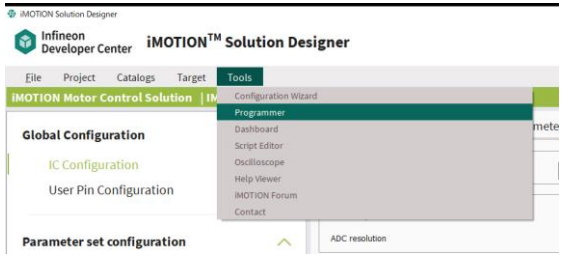

– Select COM port that target device is connected
  – If the desired COM port cannot be found in the list, press **Rescan COM ports** to refresh the port list, and then select the desired COM port.

– Press **Connect**


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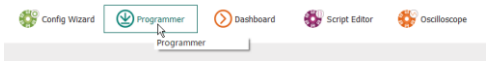
# Connect and Program

– By using **Programmer** tool, user can program built project to the target device.

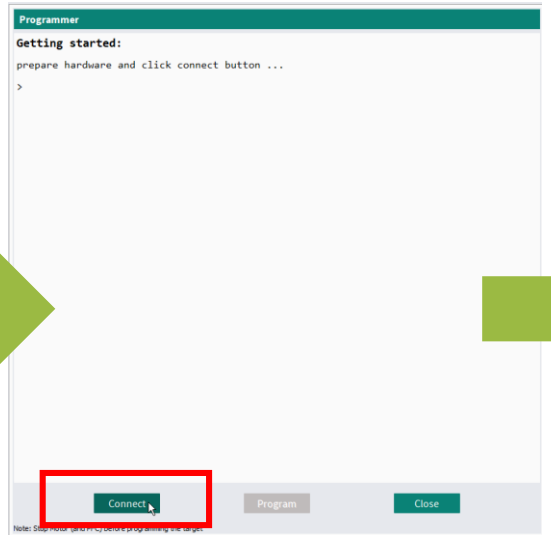



Select **Tools → Programmer**

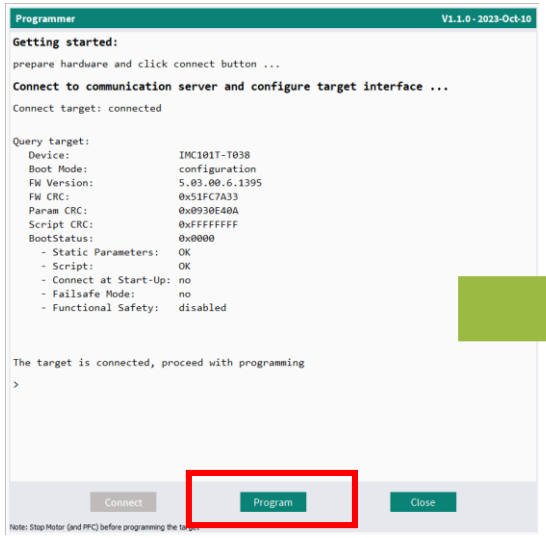
OR



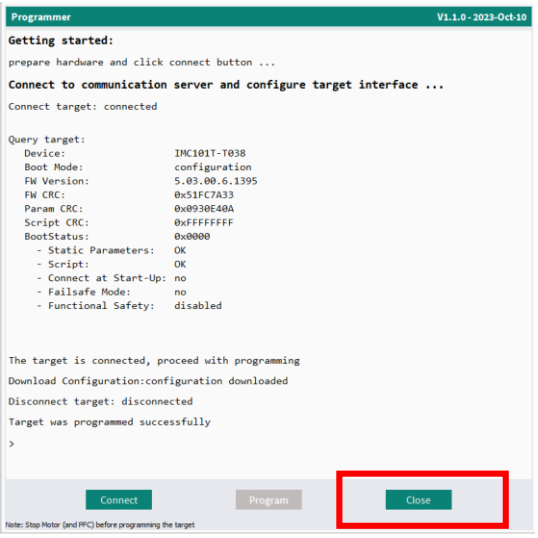

Press **Programmer** icon




Press **Connect** button to connect the target device, as shown in the previous page




If connection is successful, device information is shown in the window. Then press **Program**.



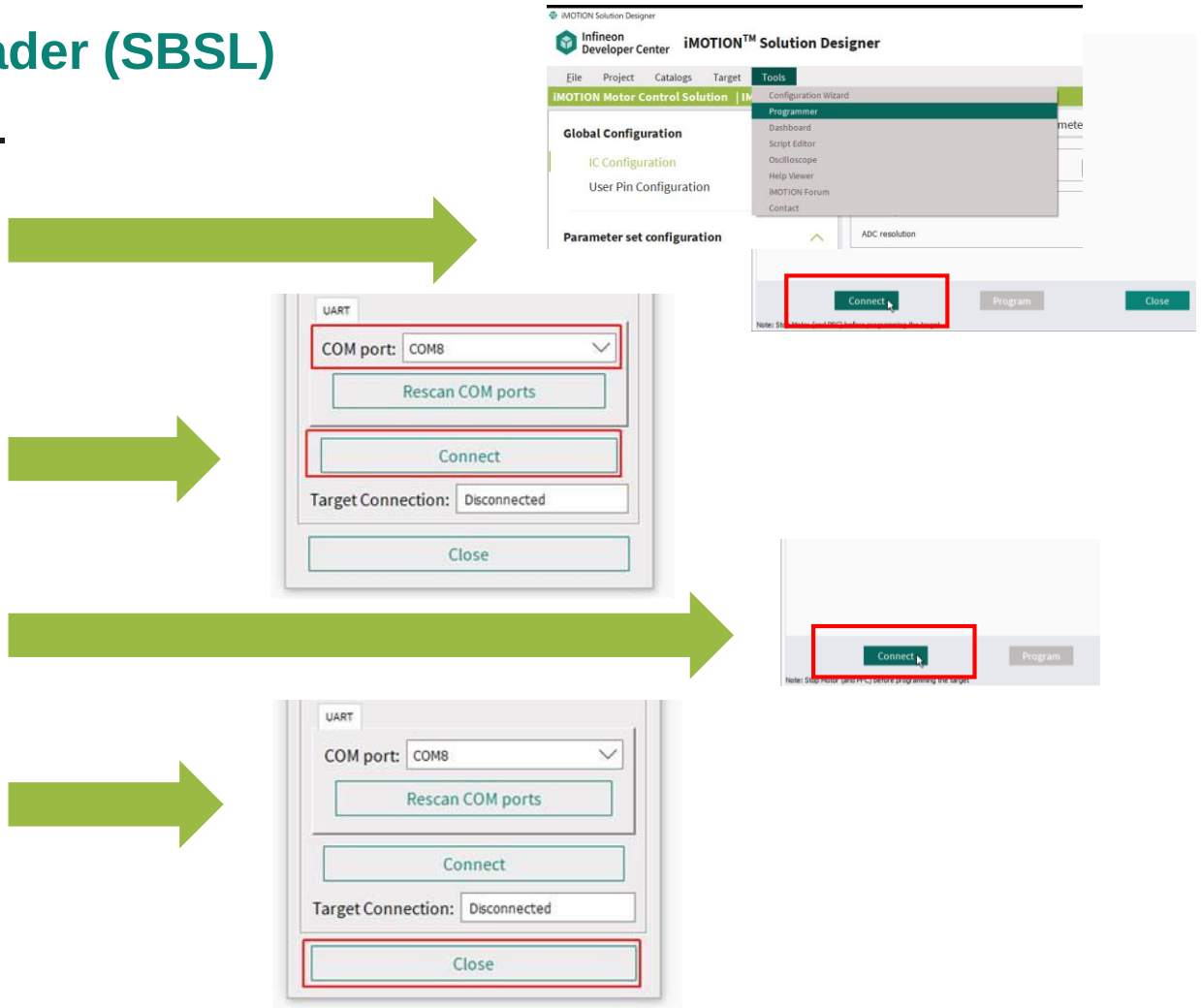

If programming is successfully done, press **Close** to close Programmer window.


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# Connecting to Secure loader

In case of problems connecting to the **secure loader (SBSL)** the following connection sequence can be used.

- Plug-in device, open 'Programmer' window,
- Press **'Connect**' to open the connection window
- Select the COM port and press **'Connect**' (this will fail, but it will set the correct COM port)
- Close 'Programmer', unplug and re-plug the device
- Open 'Programmer', press **'Connect**'
- In the connection window press **'Close**' (there is no need to select the COM port here)
- Success




```
Query target:
   Device:    IMC101T-T038
   Boot Mode:bootloader
```


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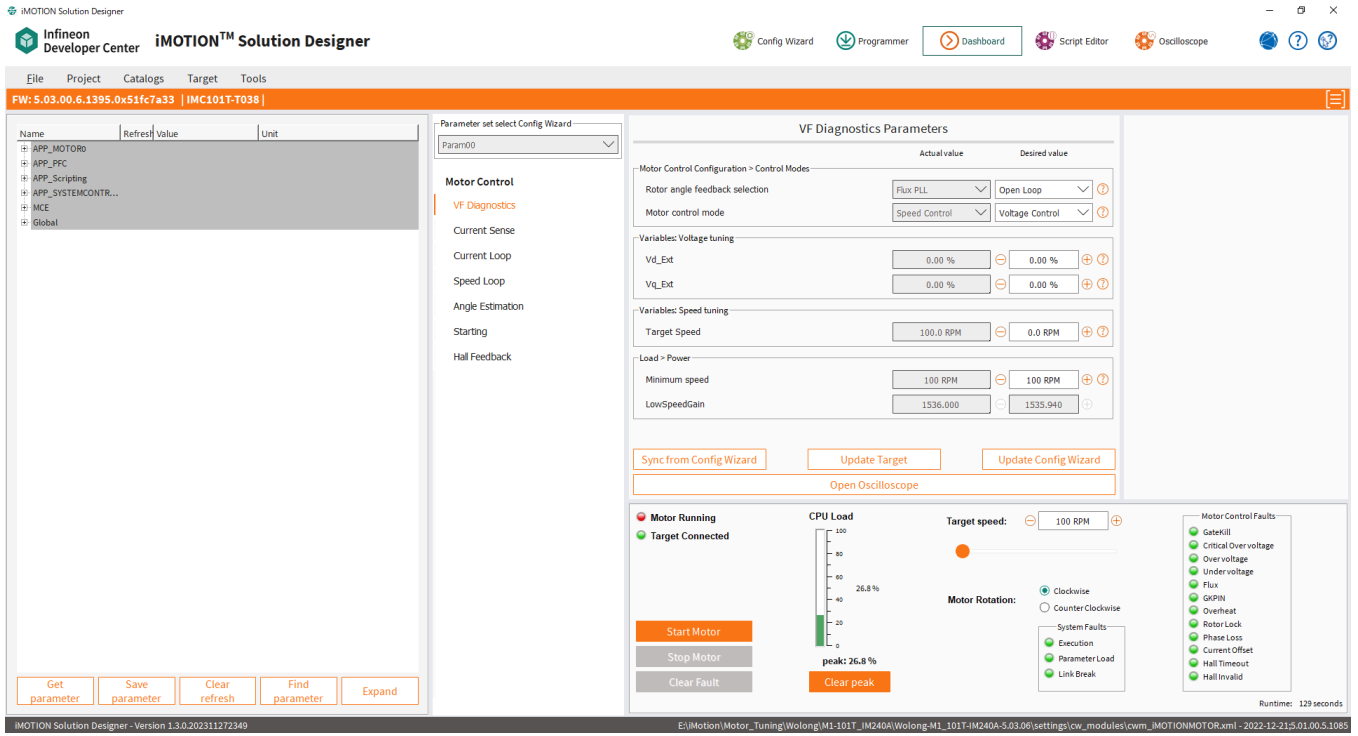
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# Run Motors with Dashboard

## Dashboard

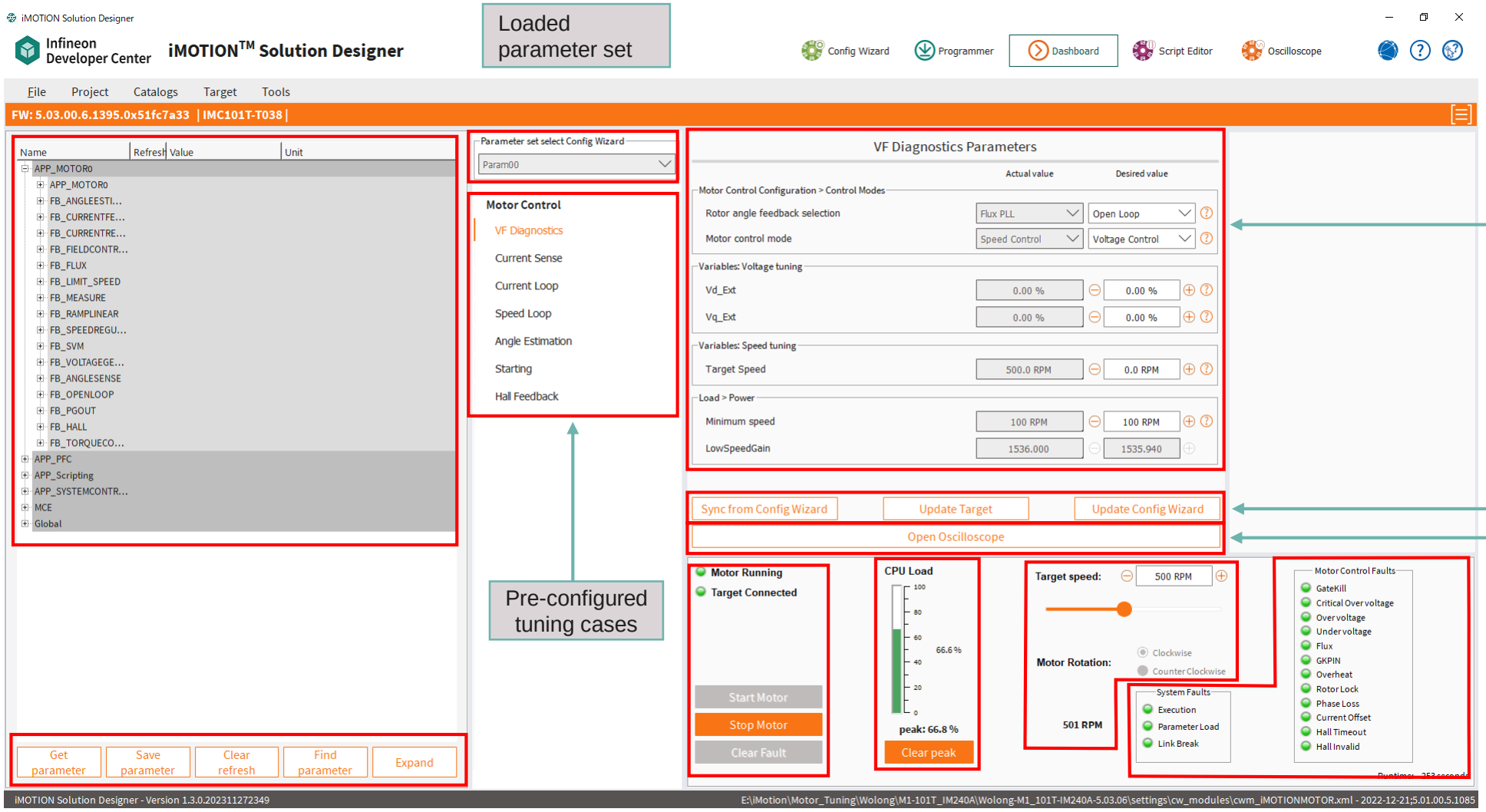
- This tool gives users an **interactive** environment for motor **tuning** work
- **Parameter tree** is updated in real time
- Pre-configured motor **tuning use cases**
  - Current sensing
  - Current loop tuning
  - Speed loop tuning
  - And more
- Motor / PFC **operation control and indicators**
  - Start / stop motor control
  - Target speed configuration
  - Rotation direction configuration
  - Motor speed estimation
  - CPU load
  - Fault status





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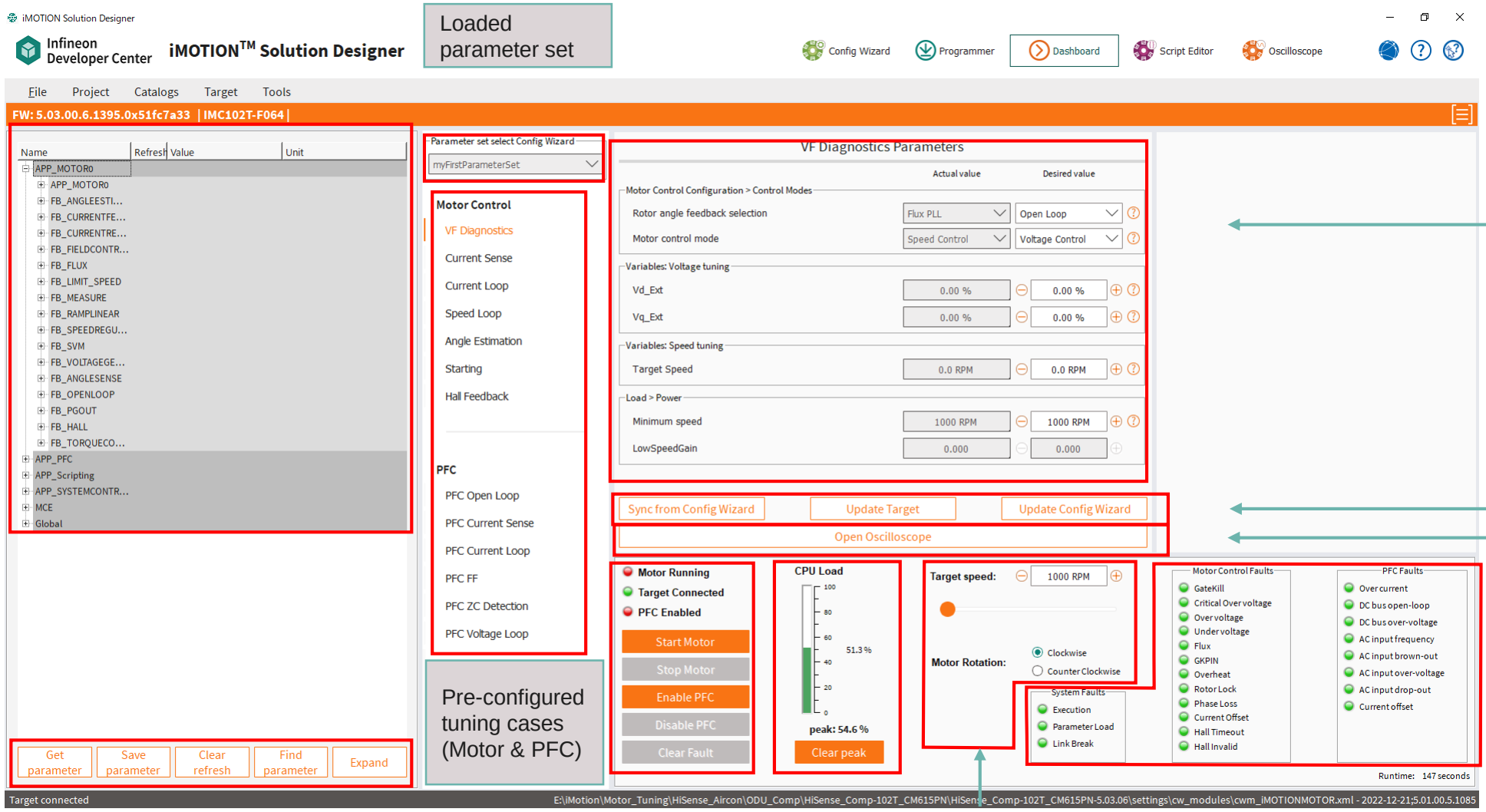
# Dashboard Overview (w/o PFC)





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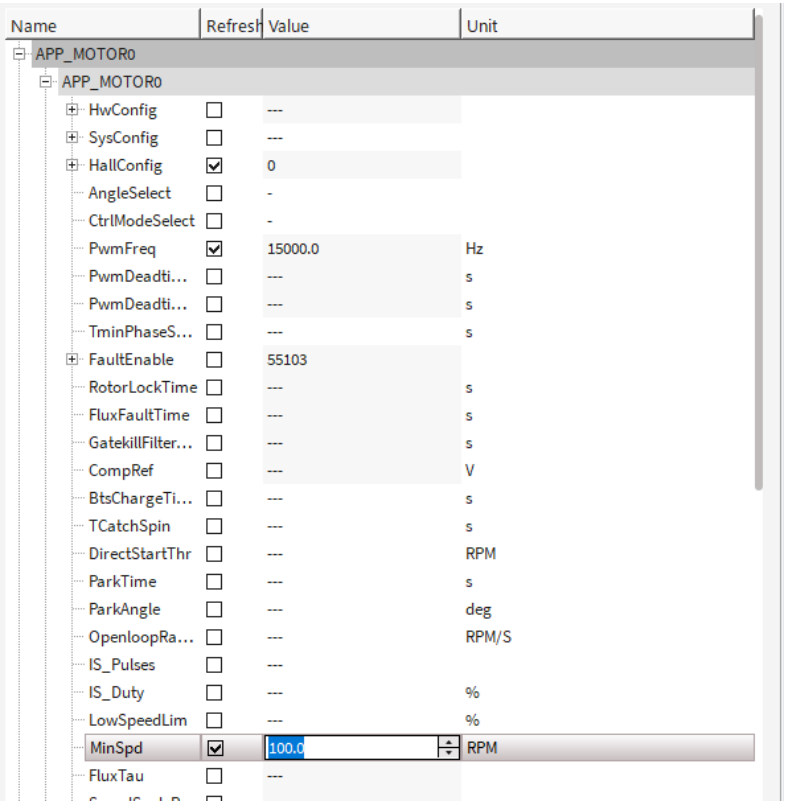
# Dashboard Overview (w/ PFC)





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# Register Read/Write



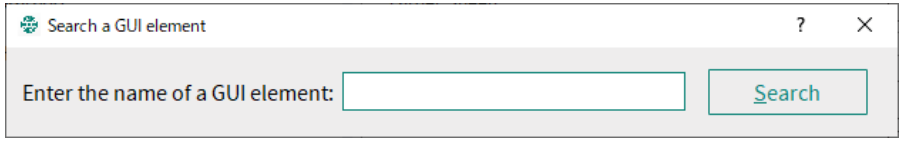

- If **Refresh** check box is checked, the register value is updated automatically.
  - It is recommended to execute **Get parameter** (see next page) the 1st time when the Dashboard is opened after programming.

- User can configure register values.
  - By double clicking **Value**, user can edit register value in the text box.
  - Read only or STATIC registers cannot be edited. The text box does not open after double clicking.


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# Parameters Control




| Button | Function |
|---|---|
| Get parameter | Download all parameters from the target device<br>It is recommended to execute this the 1st time the Dashboard is opened after programming. |
| Save parameter | Save parameter data to local PC in csv format |
| Clear refresh | Uncheck all check box in Refresh |
| Find parameter | Search register  |
| Expand | Expand all register list in Dashboard |

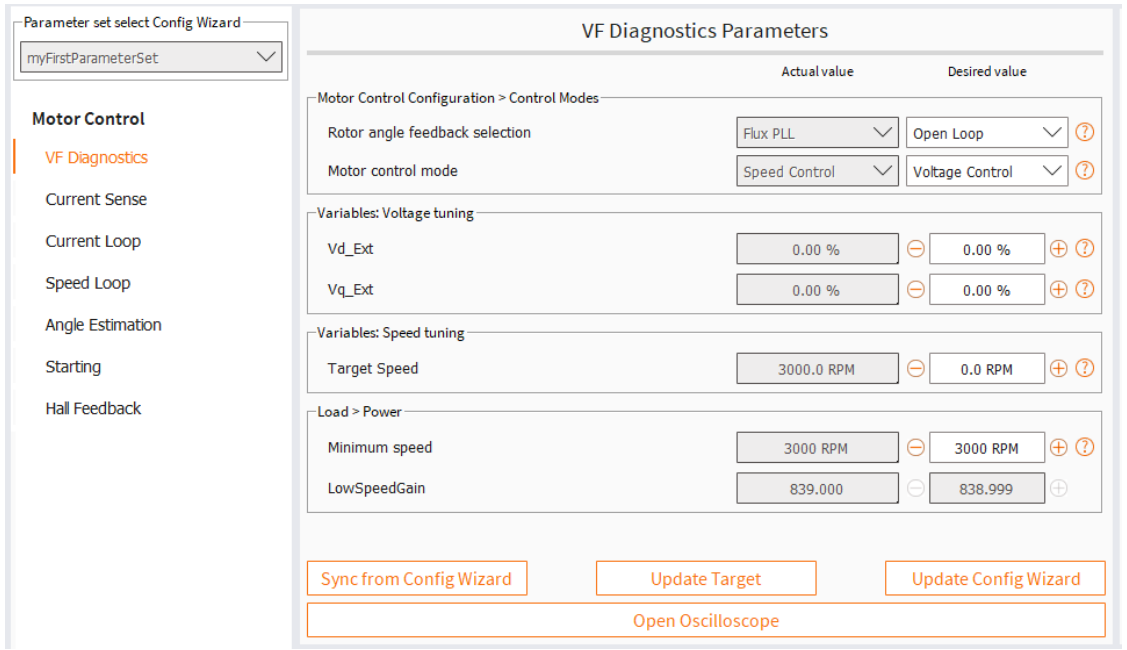



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# Parameter Tuning for Use Cases

- iSD provides some parameter tuning use cases for easy parameter tuning.
- User can change or undo parameters.

| Button | Function |
|---|---|
| Sync from Config Wizard | Import parameter values from Config Wizard. |
| Update Target | Upload input parameters to target device in the RAM. |
| Update Config Wizard | Update parameter values in Config Wizard to the input values |
| Open Oscilloscope | Open oscilloscope<br>Oscilloscope configuration meets tuning use cases. |



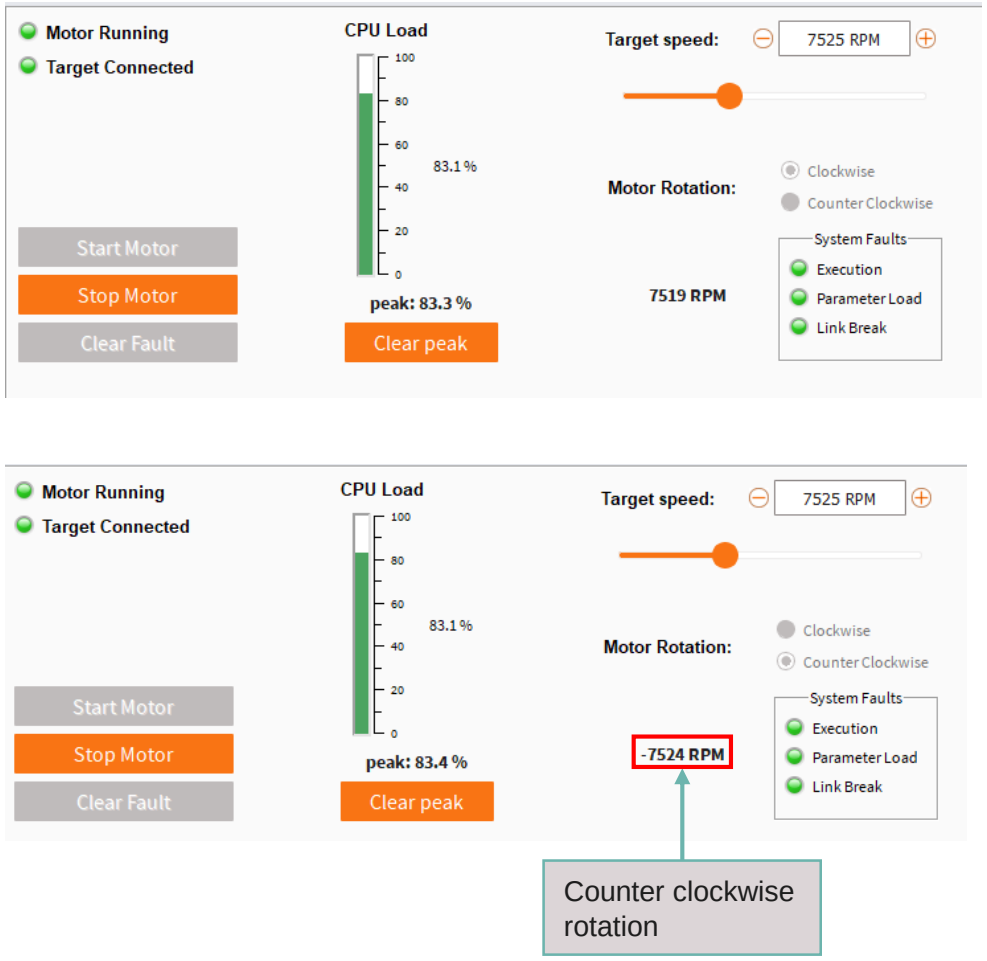


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# Change Speed and Direction of the Motor Rotation

- The target speed can be configured by either entering desired speed value in RPM or by sliding the bar to the left or right.

- The rotation of the motor can be changed and will be shown with a positive (clockwise) or negative (counter clockwise) speed value.



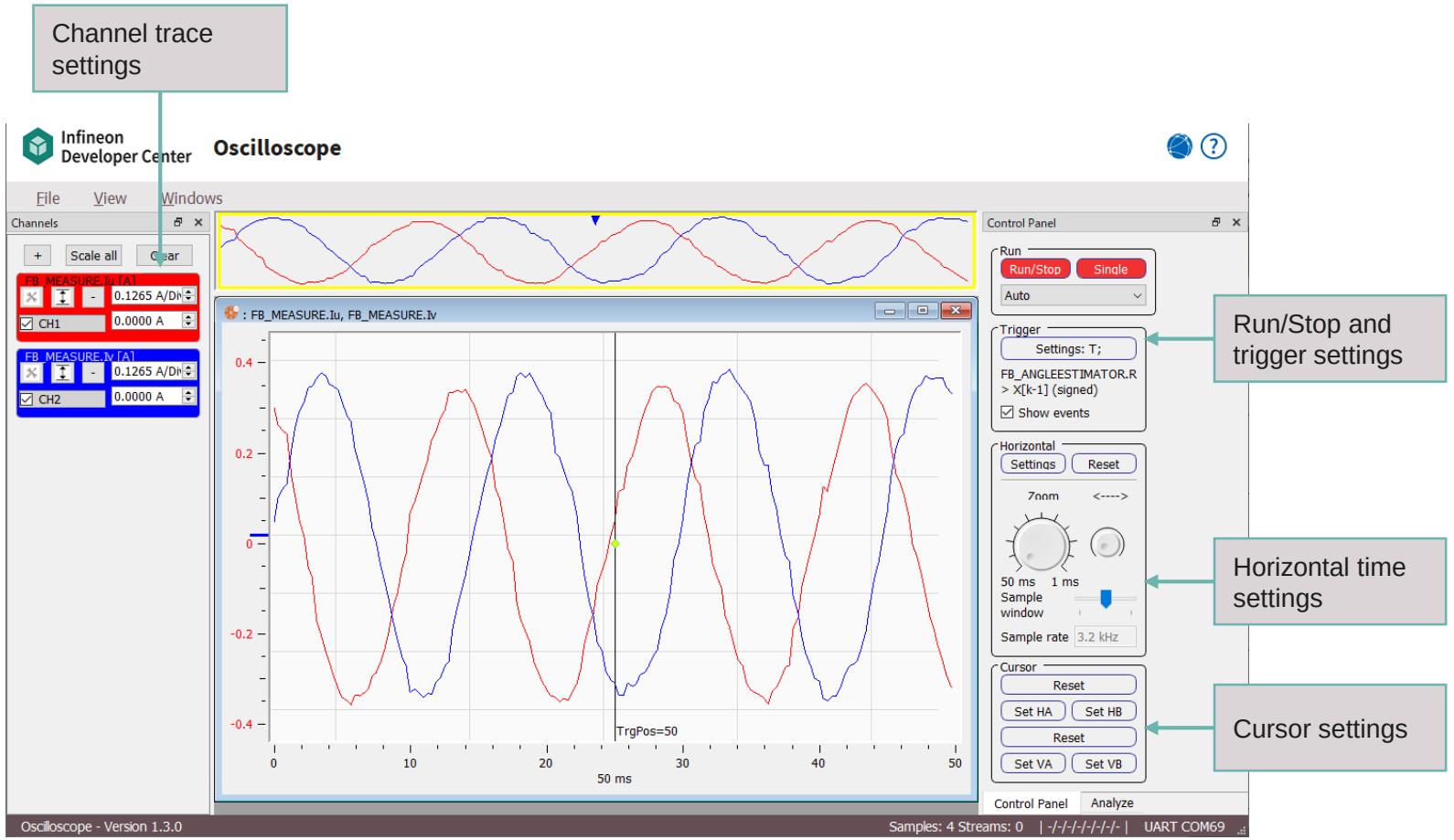


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# Debugging and Tuning Motors with Oscilloscope

## Oscilloscope

- Up to 8 Channels of Real-Time Tracing
- Sampling has three options
  - Synchronized with motor PWM
  - Synchronized with PFC PWM
- Advanced trigger methods available (Edge, Slope, Comparison)
- Autoscaling
- Cursor function

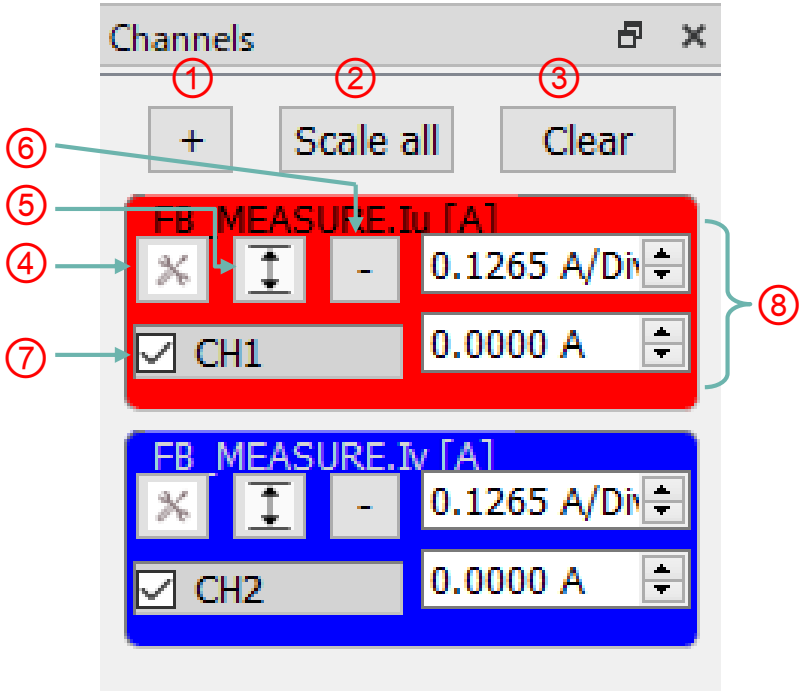




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# Channel Configuration

| # | Function | Description |
|---|---|---|
| ① | Add signal | Add channel to Oscilloscope. Maximum 8 channels can be displayed. |
| ② | Autoscale all signals | Auto scale for all channels |
| ③ | Clear and reset chart | Clear oscilloscope display |
| ④ | Settings | Open channel configuration window |
| ⑤ | Autoscale | Auto scale for selected channel |
| ⑥ | Remove channel | Remove the channel from Oscilloscope |
| ⑦ | Show/hide channel | Show or hide selected channel on Oscilloscope display |
| ⑧ | Gain and Offset | Change gain and offset of the selected channel on Oscilloscope display |

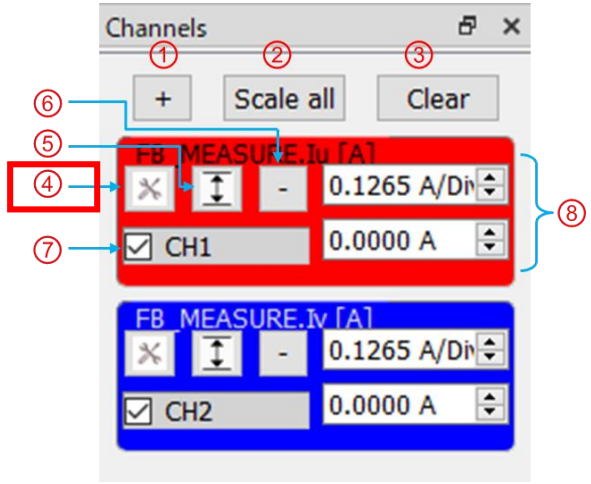




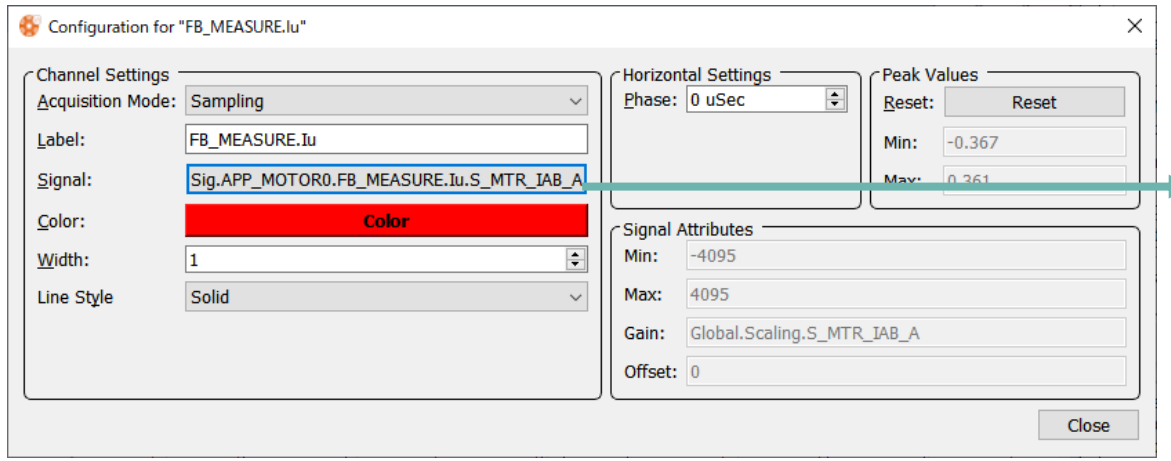
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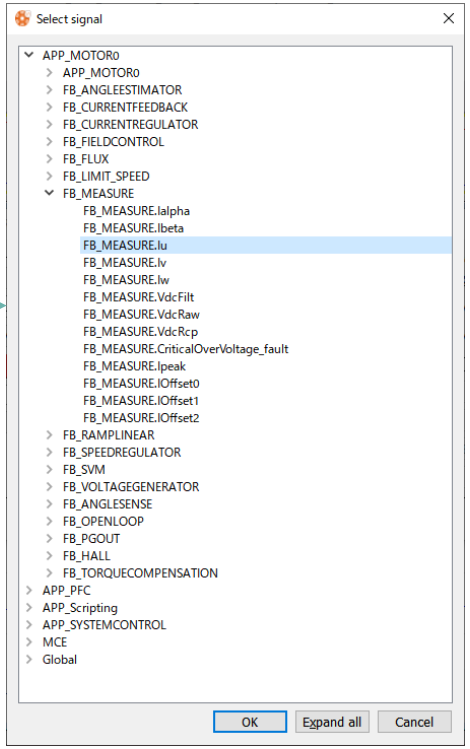
# Channel Setting

1. Press **Settings** icon




2. Select signal by pressing **Signal**
   Select signal from parameter tree
   Color of the channel is also configured here.



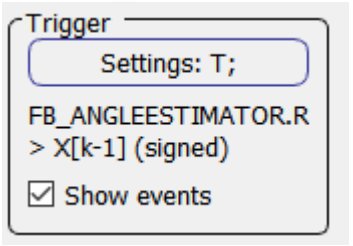





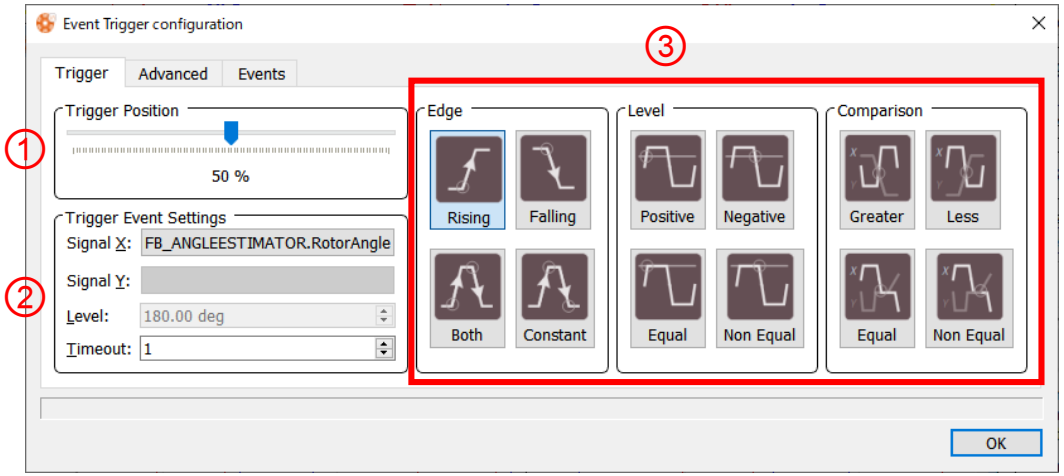
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# Event Trigger

**Event Trigger Configuration** window opens when pressing **Settings: T;** button.




| # | Function | Description |
|---|---|---|
| ① | Trigger Position | Set trigger position by slider bar |
| ② | Trigger Event Settings | Select signals used for triggering function, trigger level and timeout |
| ③ | Trigger Type | Select trigger type |



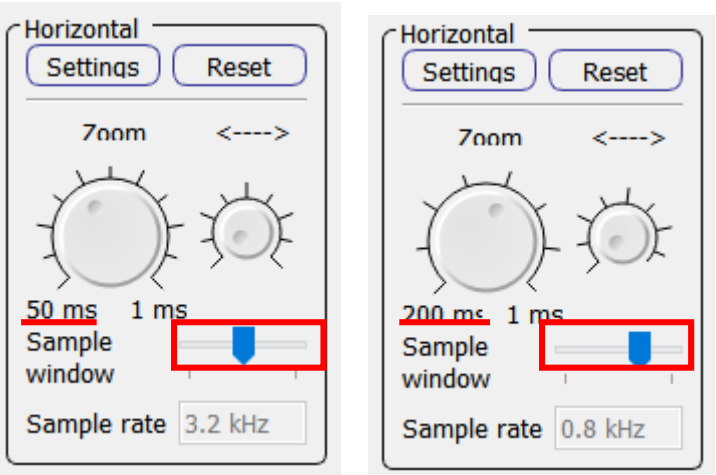


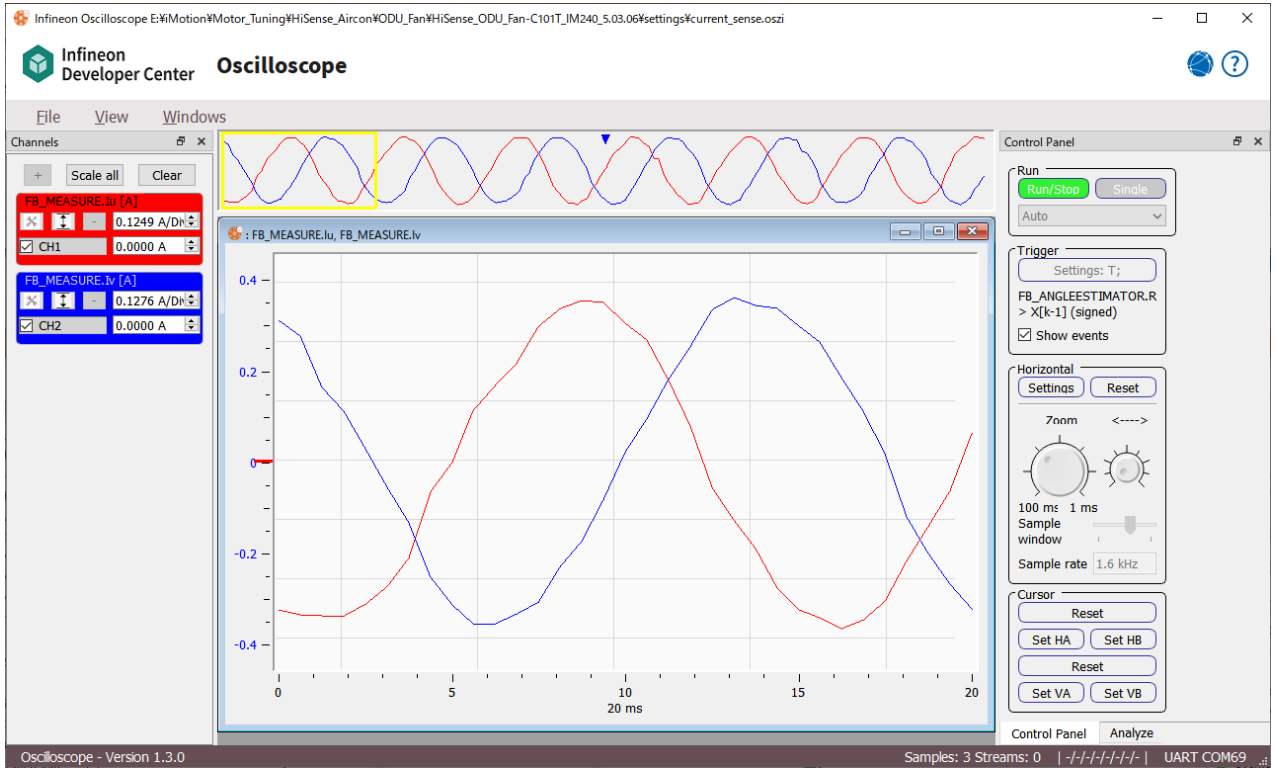
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# Configuration of Horizontal Axis

Horizontal range can be configured via slider.

- Whole horizontal range is shown in the upper display.
- It is possible to use zoom and change zoom range by two dials.



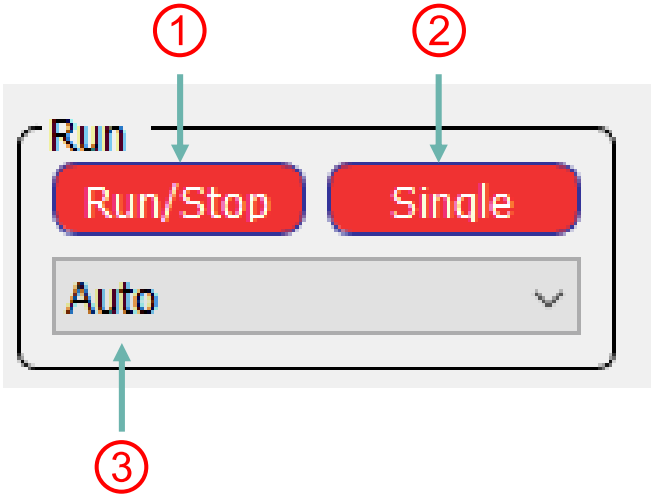





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# Oscilloscope Control

| # | Function | Description |
|---|---|---|
| ① | Run/Stop | Run/Stop Oscilloscope function |
| ② | Single | Acquire single capture |
| ③ | Set the trigger mode | Select Auto if trigger function is not necessary<br>Select Normal to use trigger function |





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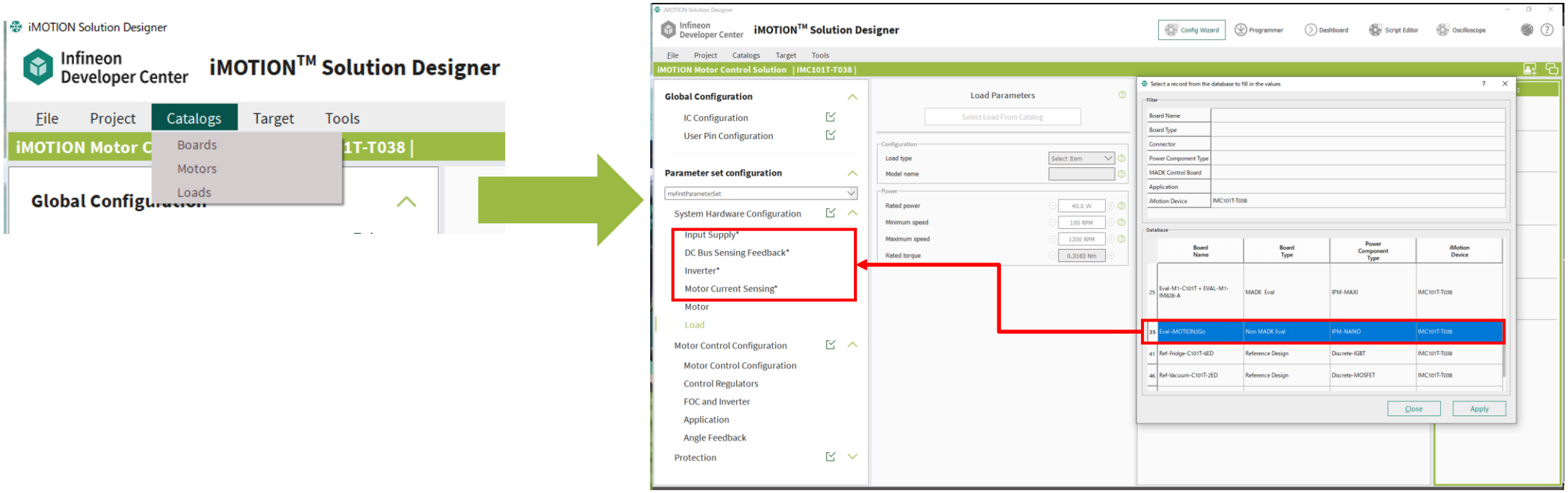
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# Using catalog files (1/3)

- Catalog files contain the default parameters for the evaluation/reference design boards. Users can use the default parameters to run the motor after selecting **Boards**, **Motors**, and **Loads.**
- Click **Boards** to load the default parameters from the boards catalog (iMOTION2Go).

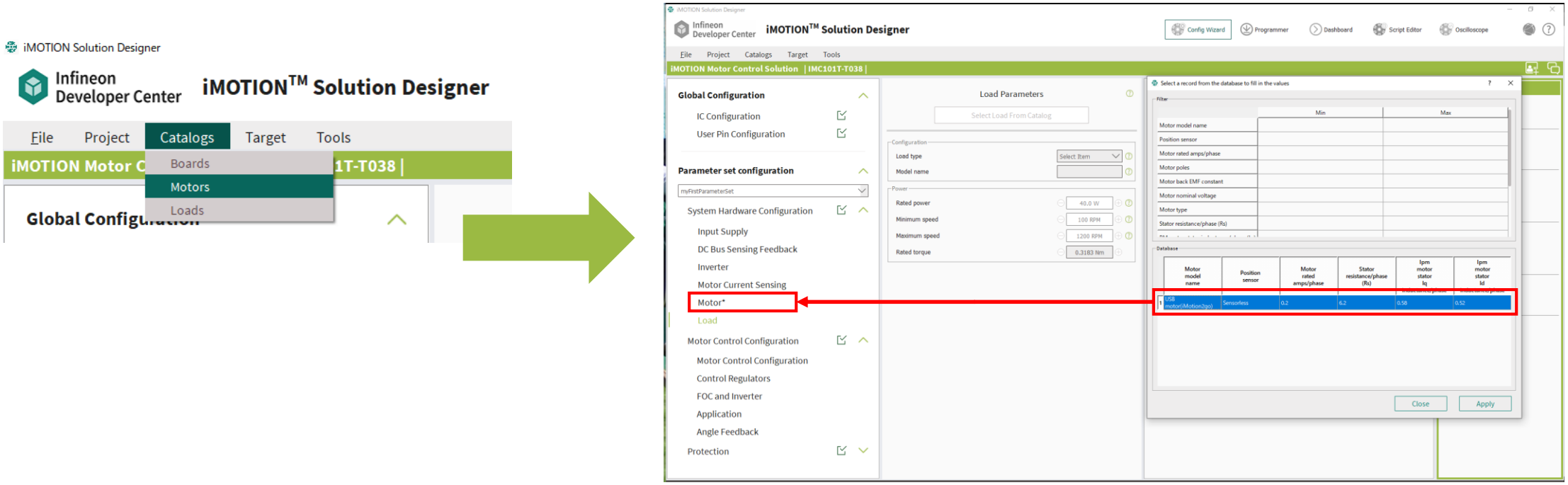




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# Using catalog files (2/3)

– Click **Motors** to load the default parameters from the motors catalog (USB motor).

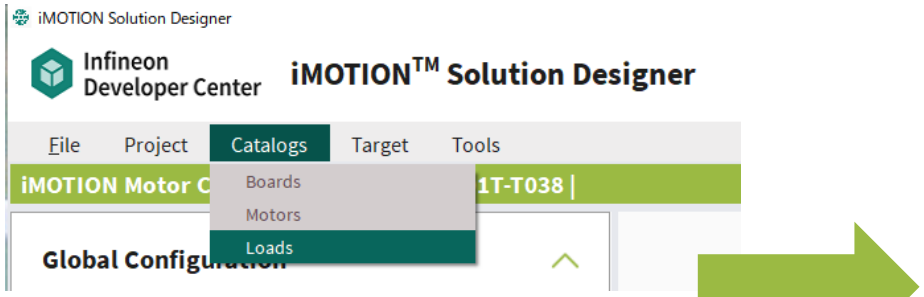


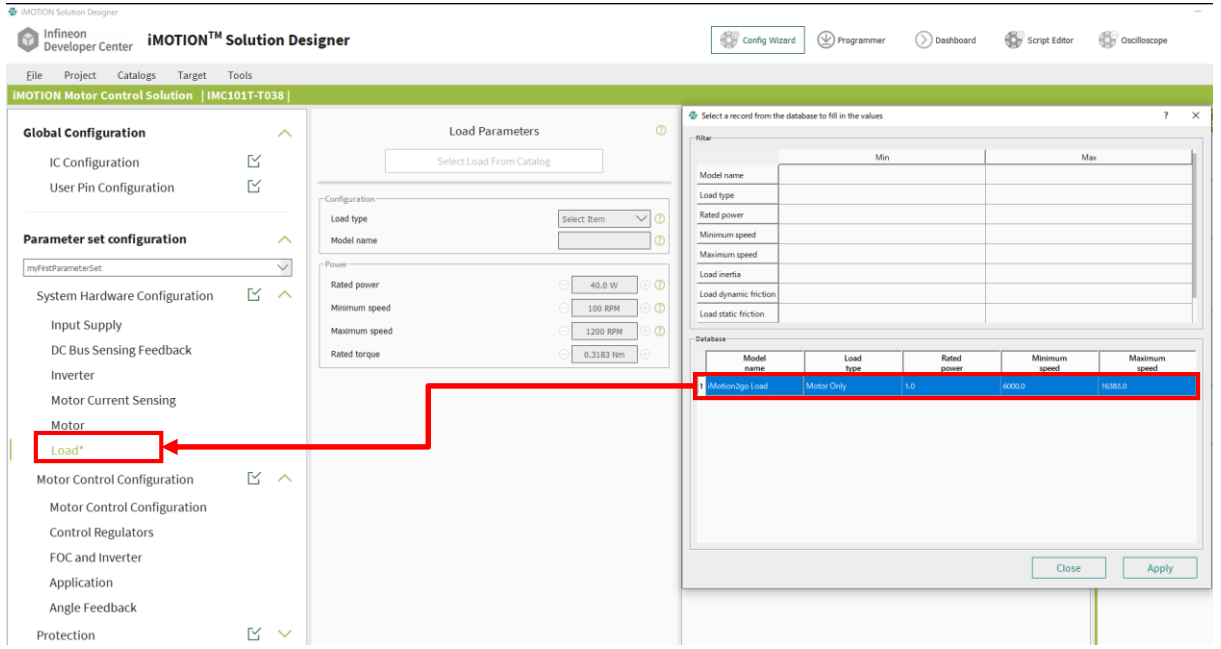


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# Using catalog files (3/3)

– Click **Loads** to load the default parameters from the loads catalog (iMOTION2Go Load).





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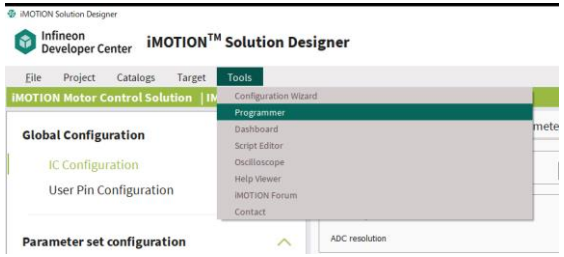
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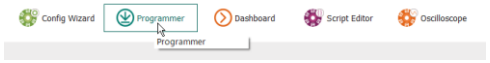
# Upgrade FW to Release #5.x

– By using the **Programmer** tool, user can upgrade firmware from FW version 1.3.7.

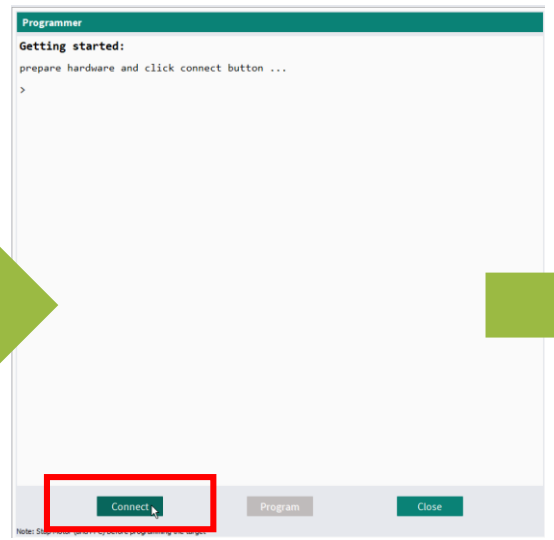



Select **Tools → Programmer**

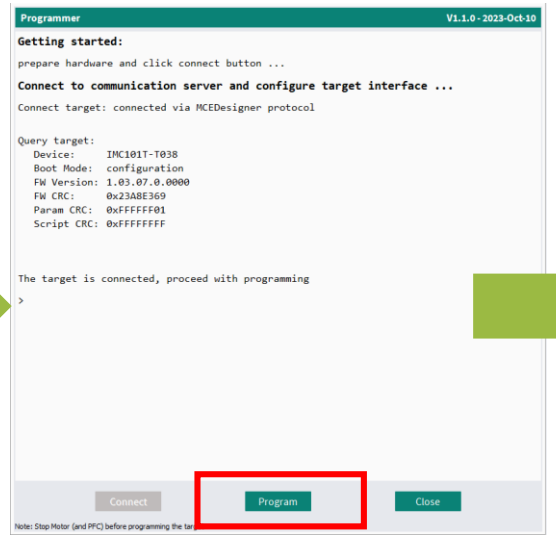
OR



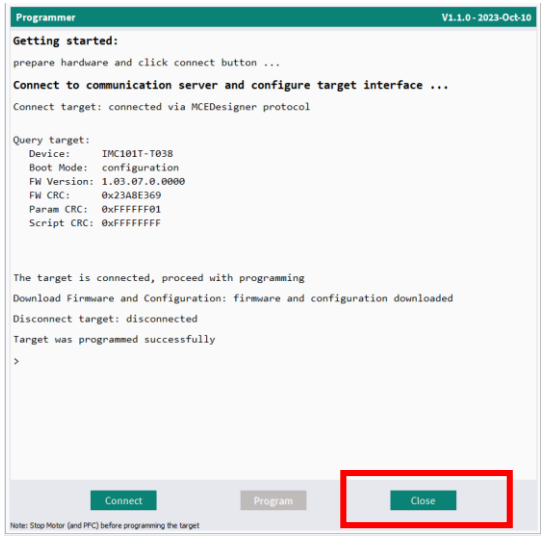

Press **Programmer** icon




Press **Connect** button to connect the target device, as shown in the previous page




If connection is successful, device information is shown in the window. Then press **Program**.




If programming is successfully done, press **Close** to close Programmer window.

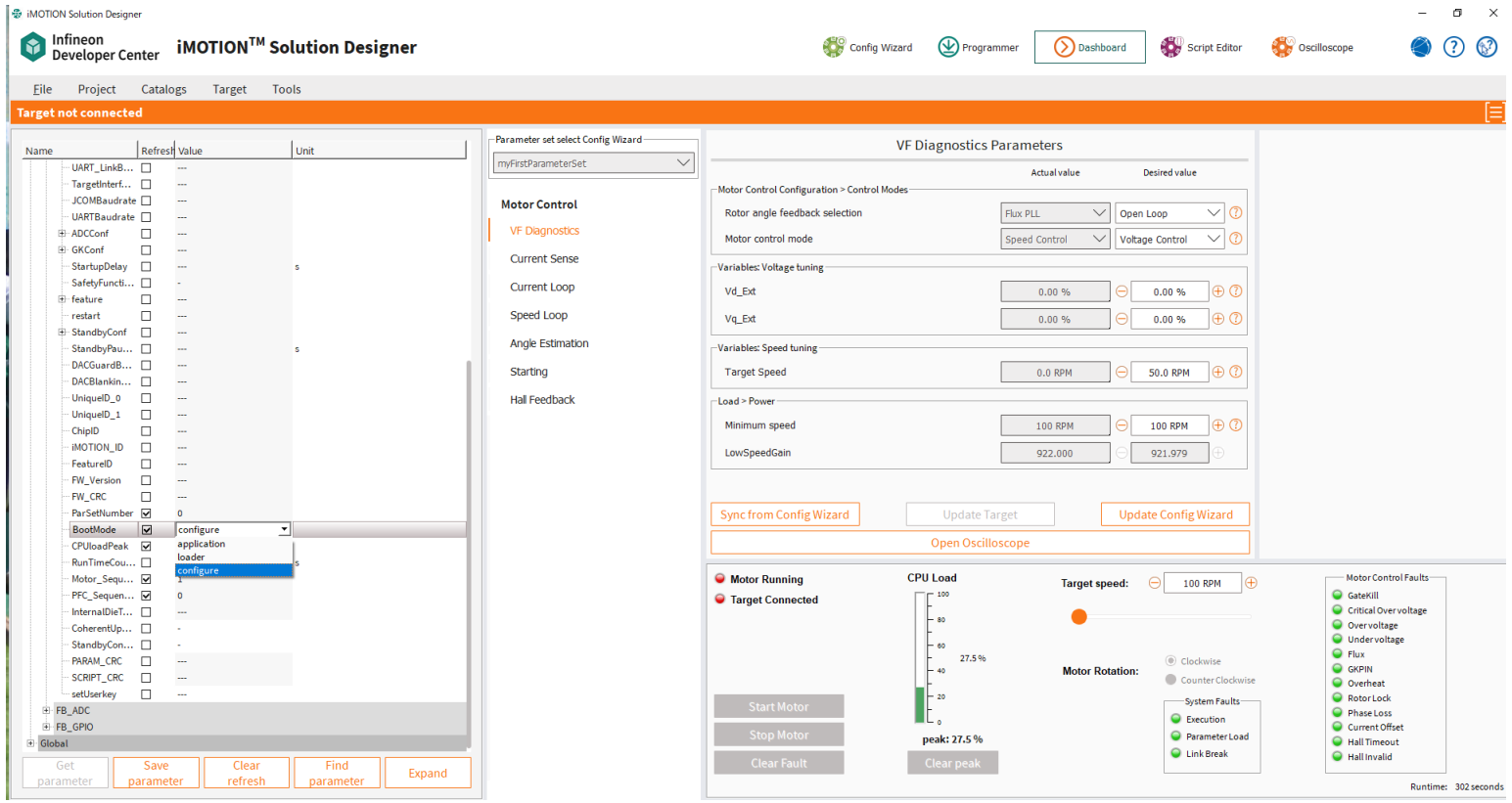

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# Downgrade to FW1.3.7

## Step 1:

Change the **BootMode** from “Application” to “Configure” in the Solution Designer when connected with board.

Users will then find **Target Connected** indicator changes from green to red.





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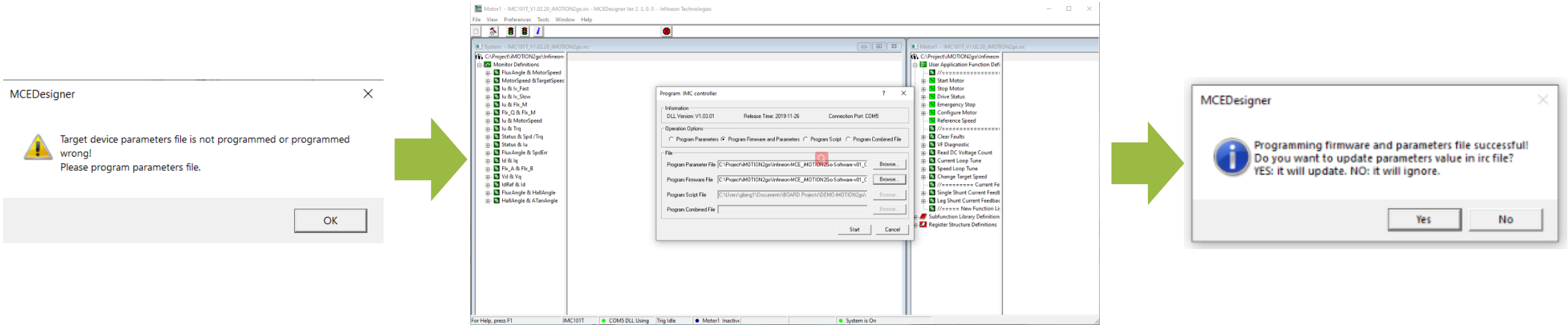
# Downgrade to FW1.3.7

## Step 2:

Ignore the warning information after opening the MCEDesigner.

Use the MCE Designer to download the firmware (FW1.3.7) and the respective parameter file.

The firmware will be successfully downgraded to FW1.3.7.





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