



# 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

# Table of contents

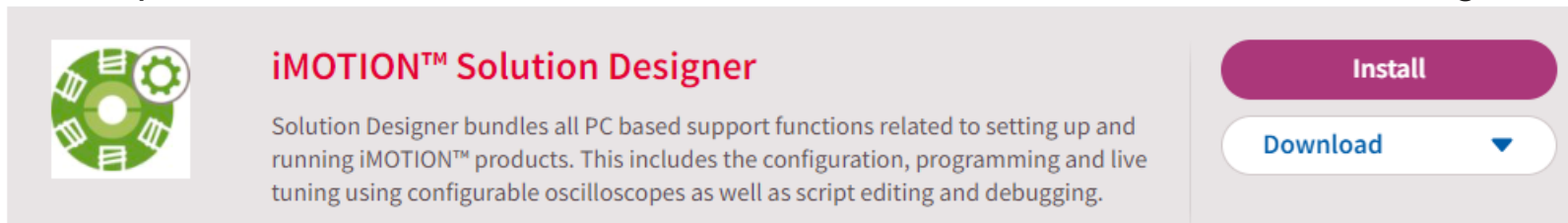
1	Software installation	4
2	iMOTION™ Solution Designer workflow	7
	Project initialization	9
	Parameter configuration	15
	Script	31
	Downloading firmware	34
	Debugging and tuning	40
3	Using catalog files	54
4	Firmware upgrade and downgrade between release 5.x.x and 1.3.7	58

# Table of contents

<b>1</b>	<b>Software installation</b>	<b>4</b>
<b>2</b>	<b>iMOTION™ Solution Designer workflow</b>	<b>7</b>
	Project initialization	9
	Parameter configuration	15
	Script	31
	Downloading firmware	34
	Debugging and tuning	40
<b>3</b>	<b>Using catalog files</b>	<b>54</b>
<b>4</b>	<b>Firmware upgrade and downgrade between release 5.x.x and 1.3.7</b>	<b>58</b>

# 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>

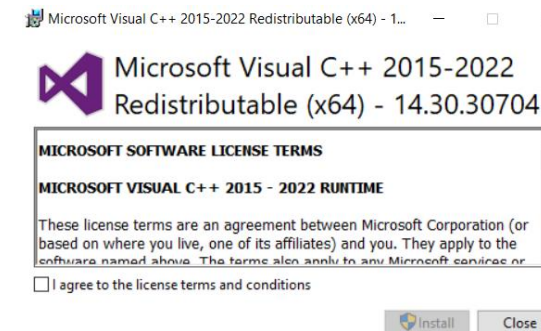
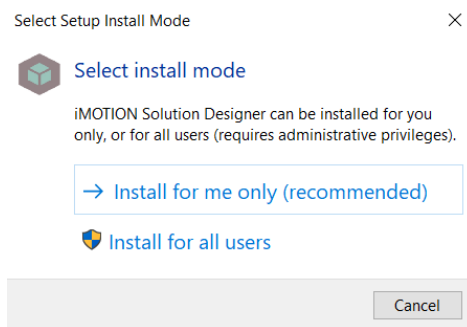
**iMOTION™ Solution Designer**

Solution Designer bundles all PC based support functions related to setting up and running iMOTION™ products. This includes the configuration, programming and live tuning using configurable oscilloscopes as well as script editing and debugging.

[Install](#)

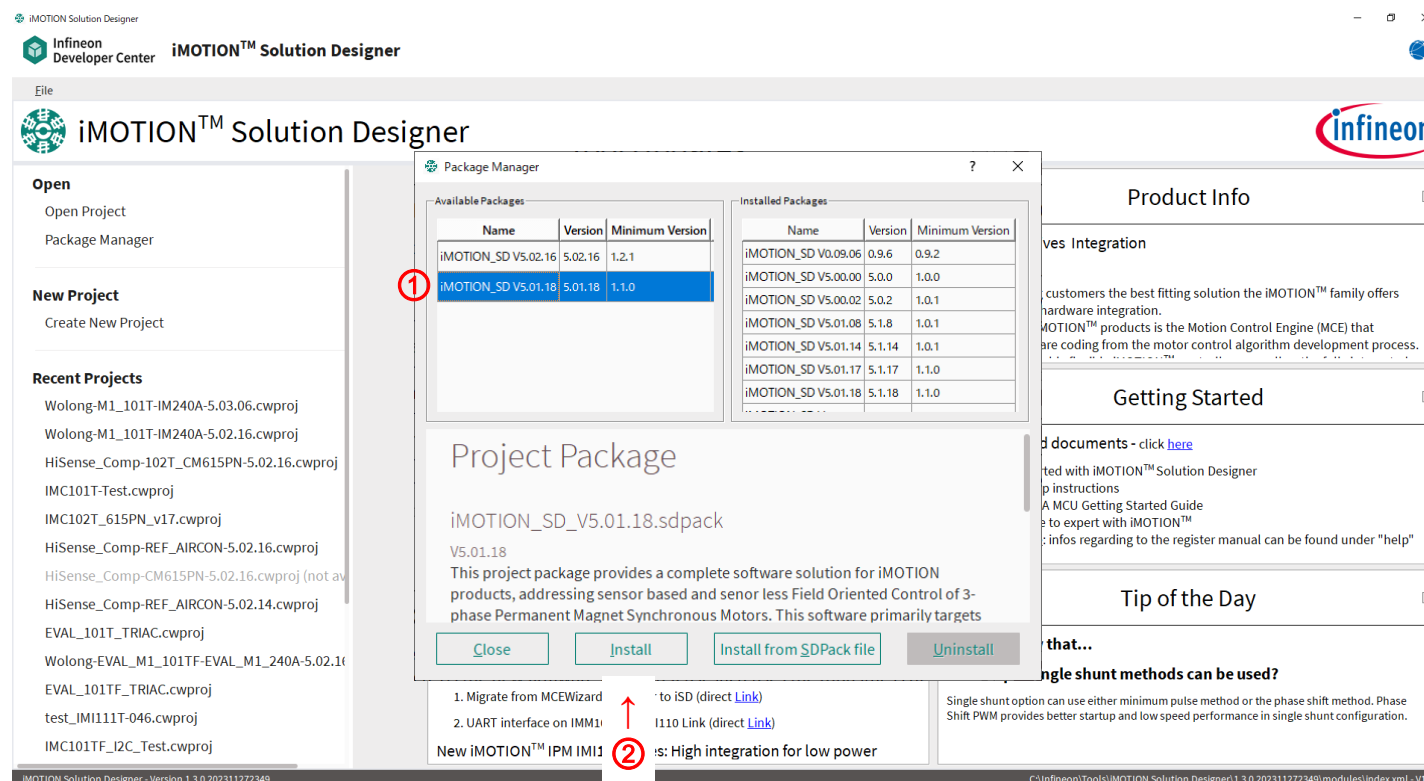
[Download](#)

- 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.



# Installing SD pack

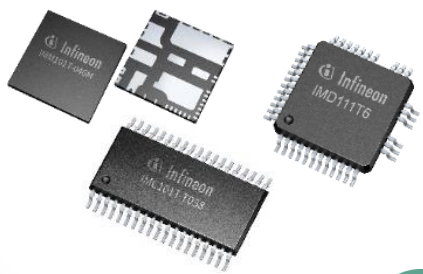
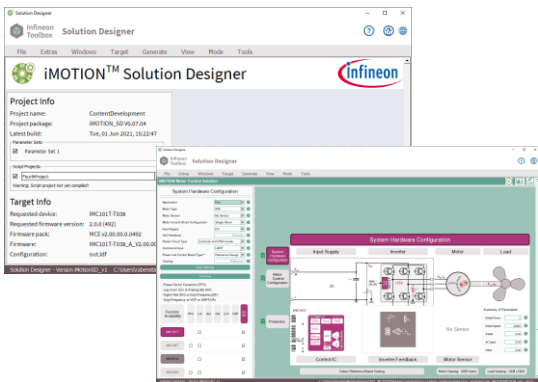
- Open the **iMOTION™ Solution Designer**, then press the **Package Manager**.
- Check and update the necessary SD pack(s).
  - ① Select the latest package from **Available Package**
  - ② Press **Install** button to install the package



# Table of contents

1	Software installation	4
2	<b>iMOTION™ Solution Designer workflow</b>	<b>7</b>
	Project initialization	9
	Parameter configuration	15
	Script	31
	Downloading firmware	34
	Debugging and tuning	40
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4	Firmware upgrade and downgrade between release 5.x.x and 1.3.7	58

# iMOTION™ Solution Designer Workflow



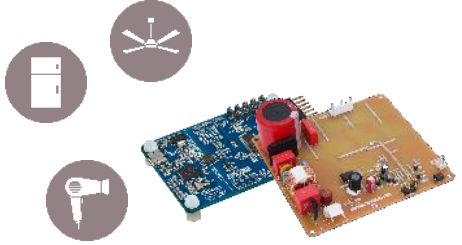
1. Define your setup by Application/Board/...

2. Configure the System

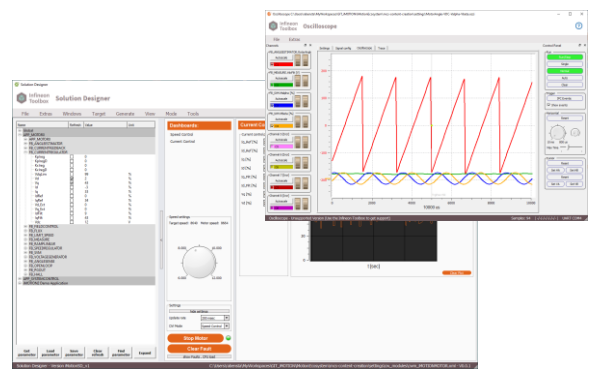
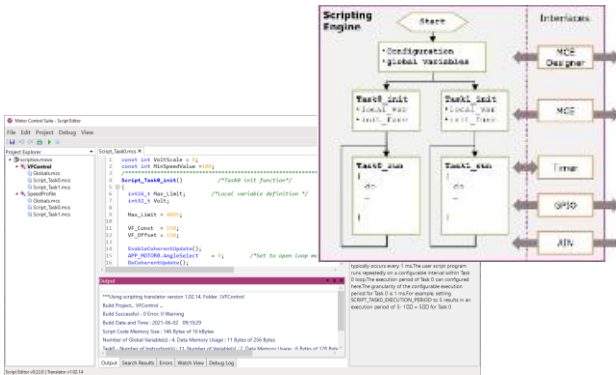
3. Develop a Script (optional)

4. Load the Firmware to the Target

5. Tune the Control Loop



Poles, R, L, ...



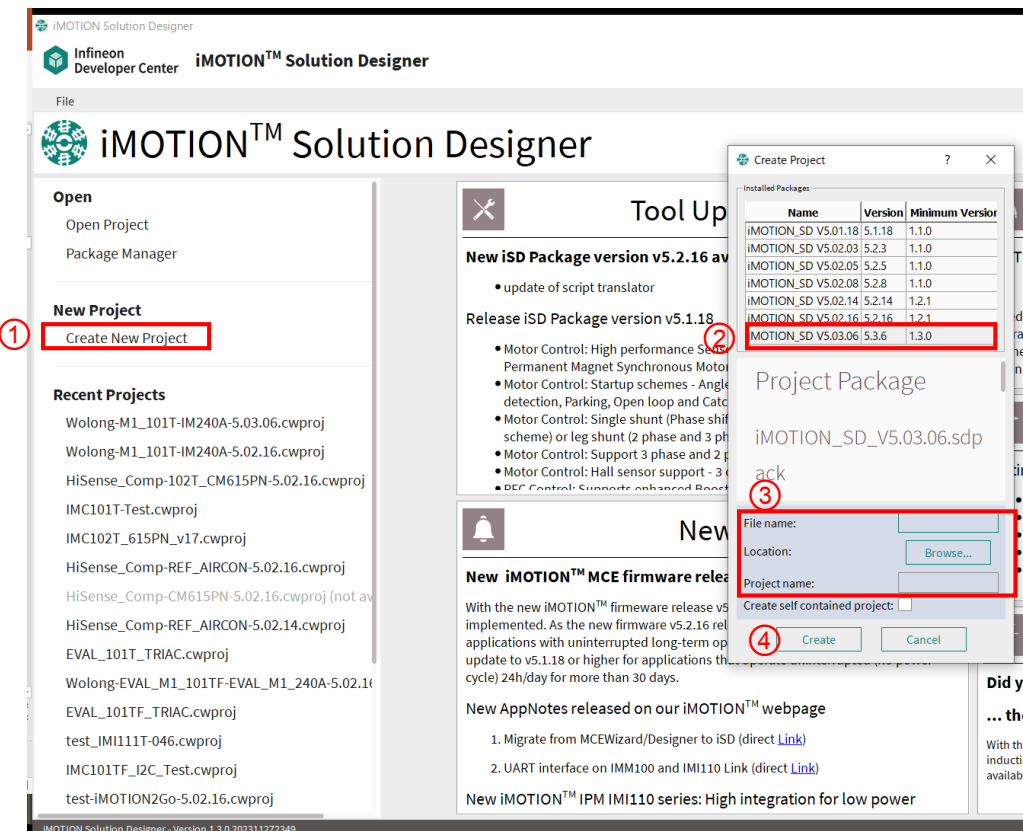


# Table of contents

1	Software installation	4
2	<b>iMOTION™ Solution Designer workflow</b>	<b>7</b>
	Project initialization	9
	Parameter configuration	15
	Script	31
	Downloading firmware	34
	Debugging and tuning	40
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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.



# Initial project configuration Overview

## 3 ways to start a new project

### 1. Board catalog files

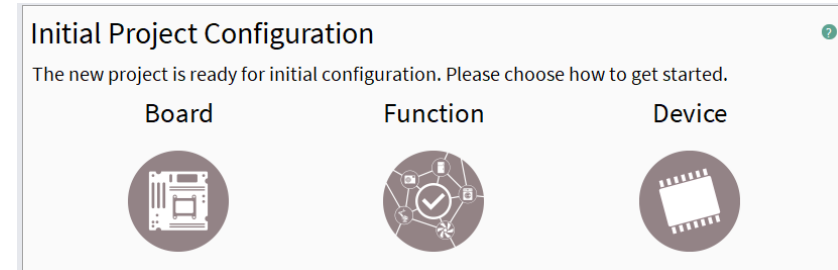
- MADK boards
- Reference design boards
- Customer's boards

### 2. Function selection

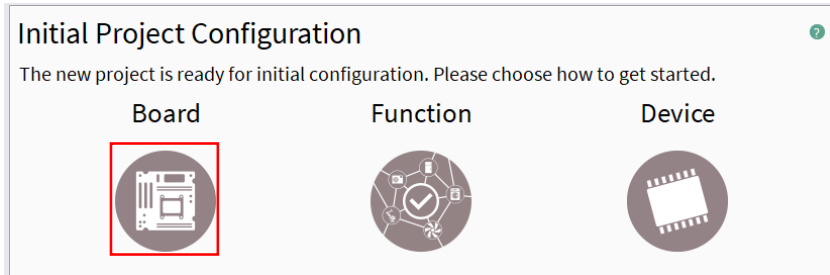
- Communication interface
- Parameter selection method
- GPIO / analog input requirement
- Sensorless / analog Hall / digital Hall
- Current sense type
- PFC frontend
- Scripting

### 3. Device selection

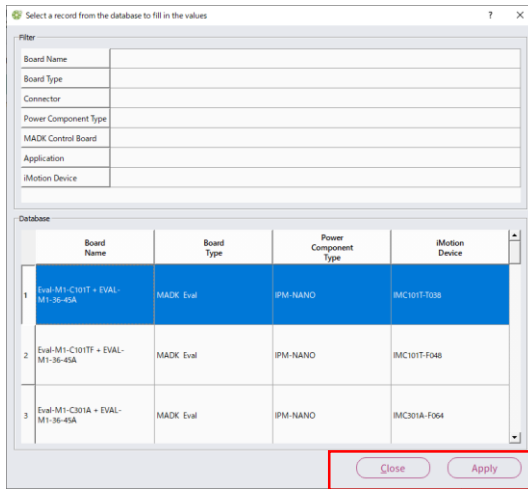
- iMOTION™ Controller
- iMOTION™ Driver
- iMOTION™ IPM



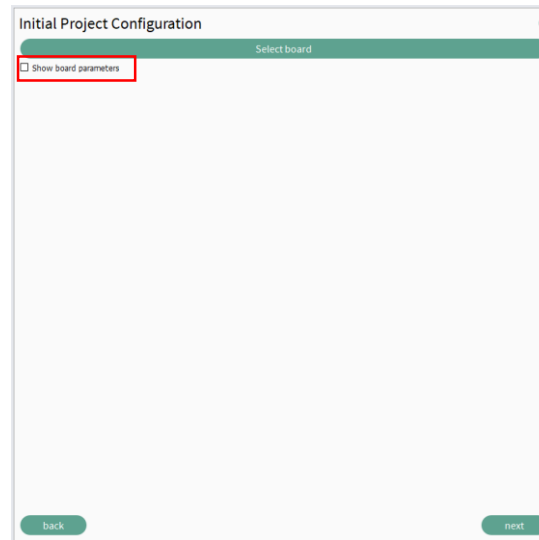
# Initial project configuration Board Catalog Files



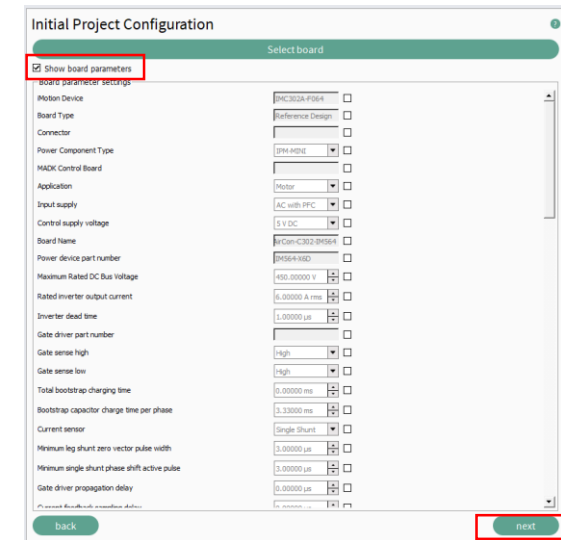
Select board icon to create the project based on board catalog files



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



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

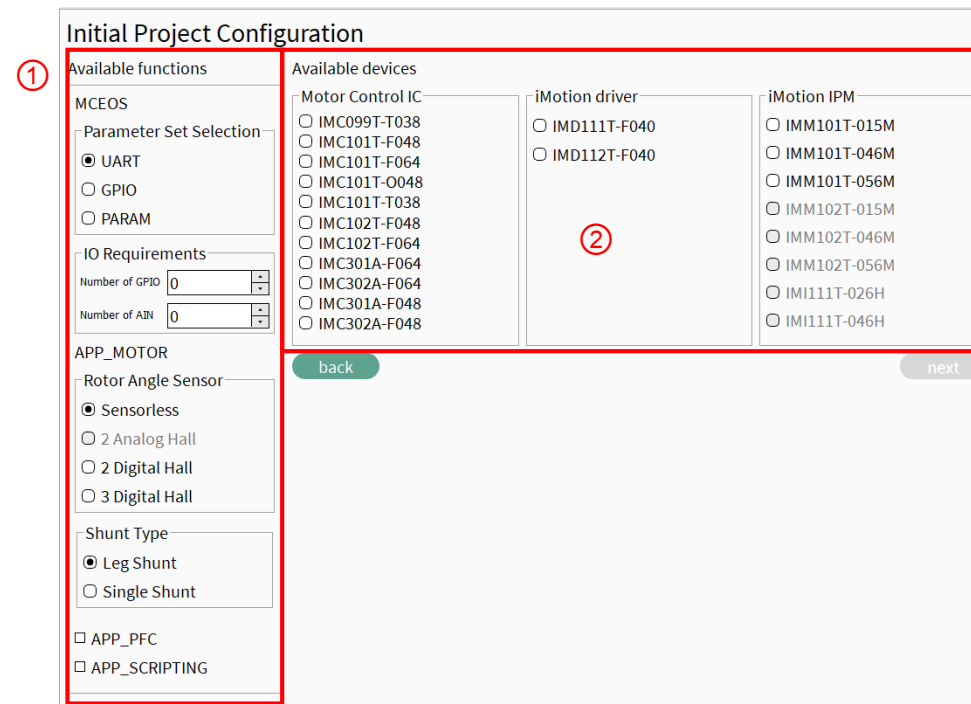
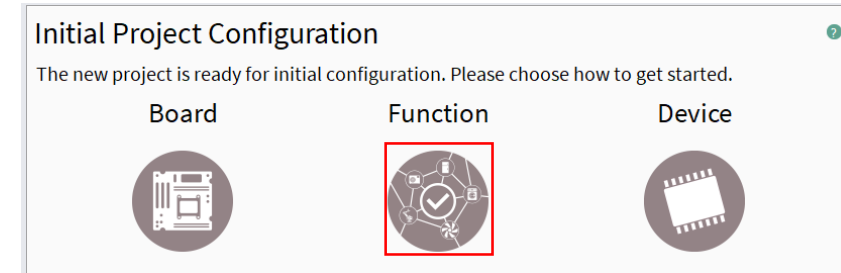


If OK, press **next** to create the new project. If you would like to change board file, press **back**.

# Initial project configuration

## Function selection

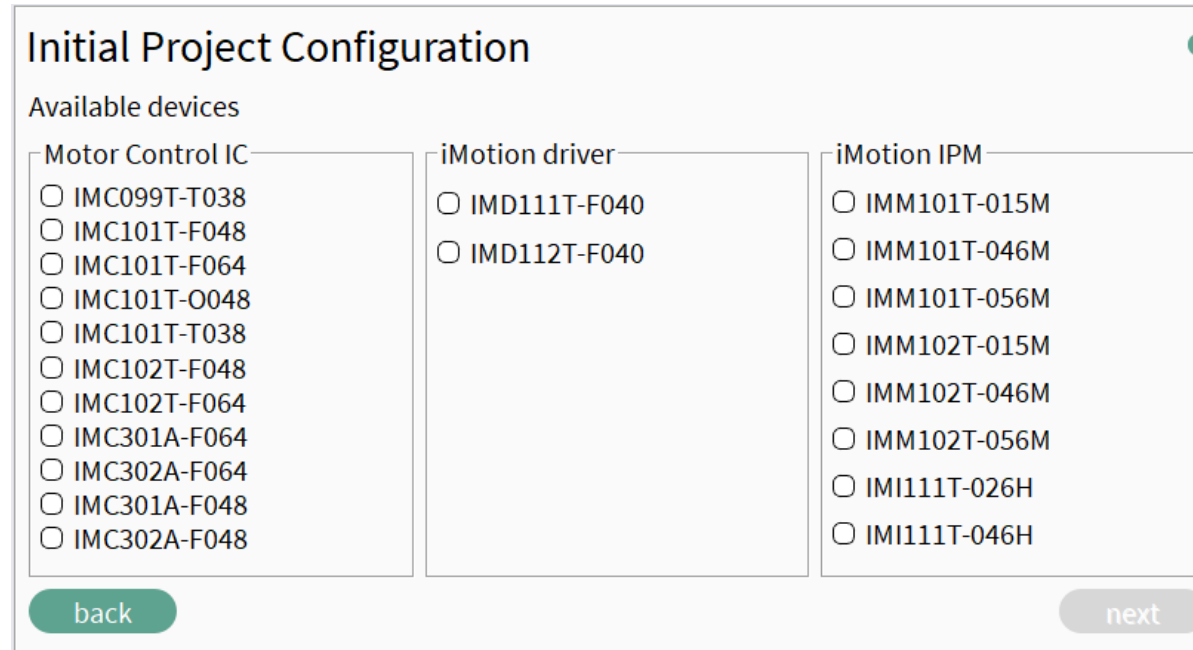
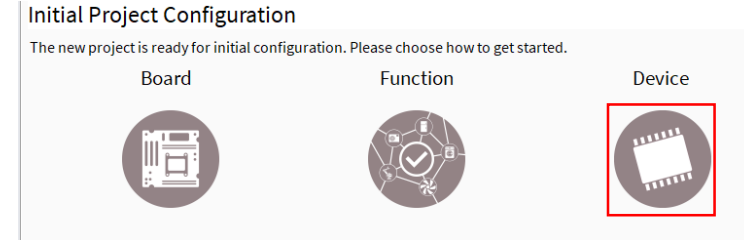
- ① Select the required functions from **Available functions**.
- ② Select proper device from the list in **Available devices**.  
Devices that do not support required functions are grayed out and cannot be selected.



# Initial project configuration

## Device selection

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



# Table of contents

1	Software installation	4
2	<b>iMOTION™ Solution Designer workflow</b>	<b>7</b>
	Project initialization	9
	Parameter configuration	15
	Script	31
	Downloading firmware	34
	Debugging and tuning	40
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# iMOTION™ Solution Designer Parameter Configuration Wizard



Title Bar

Menu Bar

Parameter Configuration:  
White background box -> can be changed  
Green background box -> just updated  
Gray background box -> read only

Shortcut Key

Mode Switch

iMOTION Solution Designer

Infineon Developer Center **iMOTION™ Solution Design**

File Project Catalogs Target Tools

IMOTION Motor Control Solution | IMC1011-1036

**Global Configuration**

IC Configuration Verify

User Pin Configuration Verify

---

**Parameter set configuration**

myFirstParameterSet

---

System Hardware Configuration Verify

Input Supply

DC Bus Sensing Feedback

Inverter

Motor Current Sensing

Motor

Load

Motor Control Configuration Verify ✓

Protection Verify ✓

DC Bus Sensing Feedback

Summary

Vdc feedback max 26.74 V

---

DC Bus Sensing Feedback

Selected lower resistor for Vdc sensing 23.00 kΩ

Selected upper resistor for Vdc sensing 100.00 kΩ

Vdc feedback attenuation 186.9919 mV/V

Vdc counts per volt 153.1463 Count

**Selected lower resistor for Vdc sensing**

Dc bus voltage feedback circuit low side resistance

Typically, a resistor divider is used for the DC Bus voltage sensing. The value of the low resistor of the resistor divider should be entered here. Warning: Incorrect resistor values may lead to failure of the voltage protection functions and unsafe operation of the drive.

**Project verification:**

**IC Configuration:**

---

**Scripting:**

---

**System Hardware Configuration:**

---

**Motor Control Configuration:**

---

**Protection:**

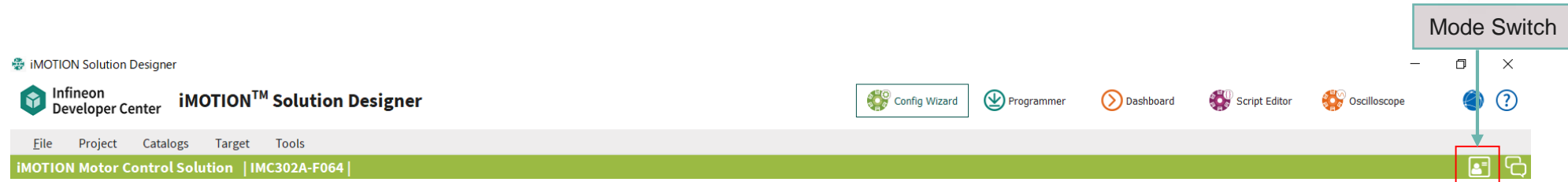
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Different parameter sets based on the same set of global configurations

Detailed Help Doc is available by clicking the green question mark



# Parameter Configuration Wizard Normal vs. Expert Mode



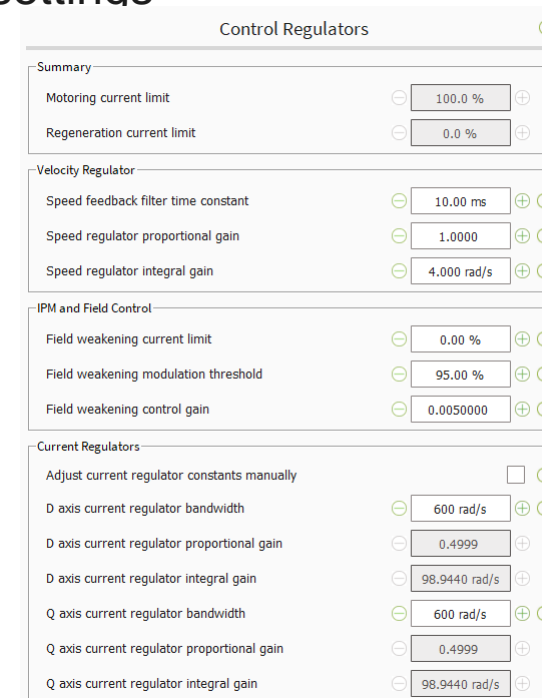
## Normal Mode

Shows the most commonly used and required parameters only



## Expert Mode

Opens up the full parameter tree for more detailed settings



# 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

The screenshot displays the iMOTION Solution Designer interface. On the left, a hierarchical configuration tree is visible under the heading 'Global Configuration'. The tree includes sections for 'IC Configuration', 'User Pin Configuration', 'Parameter set configuration' (with a dropdown menu), and 'System Hardware Configuration'. The 'System Hardware Configuration' section is expanded to show 'Input Supply', 'PFC Basic Input And Output' (highlighted in green), 'PFC Power Stage', 'PFC Current Sensing', 'PFC VAC Sensing', 'DC Bus Sensing Feedback', 'Inverter', 'Motor Current Sensing', 'Motor', 'Load', 'Motor Control Configuration', 'PFC Control Configuration', and 'Protection'. Each section has a 'Verify' button and a dropdown arrow. On the right, the 'PFC Basic Input And Output' configuration panel is shown, featuring a table of parameters with input fields and adjustment buttons (minus, plus, and help icons). The parameters include:

Parameter	Value
Minimum AC input voltage	165.00 Vrms
Nominal AC input voltage	220.00 Vrms
Maximum AC input voltage	265.00 Vrms
Minimum AC input voltage peak	233.34 V
Nominal AC input voltage peak	311.13 V
Maximum AC input voltage peak	374.77 V
Minimum AC line frequency	47.0 Hz
Nominal AC line frequency	50.0 Hz
Maximum AC line frequency	53.0 Hz
Maximum line period	21.28 ms
Nominal line period	20.00 ms
Minimum line period	18.87 ms
Maximum output power	1680 W
Efficiency	100.0 %
Maximum input power	1680 W
Target DC bus voltage	380.00 V

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

# Parameter Set Configuration

## 1. IC Configuration



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

iMOTION Solution Designer

Infineon Developer Center iMOTION™ Solution Designer

File Project Catalogs Target Tools

IMOTION Motor Control Solution | IMC302A-F064 |

### Global Configuration

- IC Configuration [Verify](#)
- User Pin Configuration [Verify](#)

### Parameter set configuration

myFirstParameterSet

- System Hardware Configuration [Verify](#) ✓
- Motor Control Configuration [Verify](#) ✓
- PFC Control Configuration [Verify](#) ✓
- Protection [Verify](#) ✓

### IC Configuration Parameters

Device

IMC30xPackage: LQFP-64

ADC

ADC sample time: 0.333 us

ADC resolution: 4095

COMM

MCU to MCE JCOM Enable: Enable

Solution Designer COMM: Enable

Solution Designer COMM port: UART0

User/Host COMM port selection: Disable

Functional Safety

Class B safety: Disable

Options

CPU clock compensation: Enable

Multi-parameter input mode: Disable

Motor Protection

Overcurrent trip signal source selection: GKpin/Comp

Standby

CPU at idle configuration: Active

Low power mode enable: Disable

# Parameter Set Configuration

## 2. User Pin Configuration



Specify user pin configuration used in scripting

iMOTION Solution Designer

Infineon Developer Center iMOTION™ Solution Designer

File Project Catalogs Target Tools

IMOTION Motor Control Solution | IMC302A-F064 |

### Global Configuration

- IC Configuration [Verify](#)
- User Pin Configuration [Verify](#)

### Parameter set configuration

myFirstParameterSet

- System Hardware Configuration [Verify](#) ✓
- Motor Control Configuration [Verify](#) ✓
- PFC Control Configuration [Verify](#) ✓
- Protection [Verify](#) ✓

### User Pin Configuration

GPIO

- GPIO[1]/PG\_OUT
- GPIO[9]/DHALL
- GPIO[10]/DHALL
- GPIO[11]/DHALL
- GPIO[12]
- GPIO[13]
- GPIO[14]
- GPIO[15]

ADC

- AIN[1]/LEG/AHALL
- AIN[2]/LEG/AHALL
- AIN[4]/NTC
- AIN[7]/LEG/AHALL

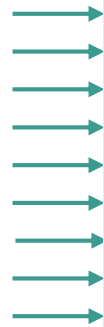
# Parameter Set Configuration

## 3. System Hardware Configuration



The screenshot displays the iMOTION Solution Designer interface. The main window is titled "iMOTION Motor Control Solution | IMC302A-F064". The left sidebar shows a tree view of configuration categories: Global Configuration, Parameter set configuration, System Hardware Configuration, Motor Control Configuration, PFC Control Configuration, and Protection. The "System Hardware Configuration" category is expanded, showing sub-categories: Input Supply, PFC Basic Input And Output, PFC Power Stage, PFC Current Sensing, PFC VAC Sensing, DC Bus Sensing Feedback, Inverter, Motor Current Sensing, Motor, and Load. The "Input Supply" sub-category is selected, and its parameters are shown in the main area: Control supply voltage (5 V DC) and ADC gain (819.00 Count/V). The right sidebar contains a "Project verification" section with sub-sections: IC Configuration, Scripting, System Hardware Configuration, Motor Control Configuration, PFC Control Configuration, and Protection. The status bar at the bottom indicates the version of the software and the current project settings.

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



# Parameter Set Configuration

## 4. Motor Control configuration



iMOTION Solution Designer

Infineon Developer Center iMOTION™ Solution Designer

File Project Catalogs Target Tools

iMOTION Motor Control Solution | IMC302A-F064

**Global Configuration**

- IC Configuration Verify
- User Pin Configuration Verify

**Parameter set configuration**

myFirstParameterSet

- System Hardware Configuration Verify ✓
- Motor Control Configuration** Verify ^
- Motor Control Configuration
  - Control Regulators
  - FOC and Inverter
  - Application
  - Angle Feedback
- PFC Control Configuration Verify ✓
- Protection Verify ✓

**Motor Control Configuration**

Control Rates

Peripheral clock frequency	96.0 MHz
PWM frequency	6.0 kHz
Current control update rate scaler	1
Current control update period	166.667 µs
Current control update rate	6.00 kHz
Speed control update rate scaler	2
Speed control update period	333.333 µs
Speed control update rate	3.00 kHz
Motor CPU load	22.9 %
PFC CPU load	50.3 %
Base CPU load	7.0 %
Total CPU load	80.25 %

Control Modes

Rotor angle feedback selection	Flux PLL
Motor control mode	Speed Control

**PWM frequency**

This input specifies the update rate of the inverter gate drive signals. The entry directly determines switching frequency of the inverter and indirectly determines the update rates of the current- and speed control loops (sub-rates).

Project verification:

- IC Configuration:
- Scripting:
- System Hardware Configuration:
- Motor Control Configuration:
- PFC Control Configuration:
- Protection:

iMOTION Solution Designer - Version 1.3.0.202311272349

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



# Parameter Set Configuration

## 5. PFC Control Configuration



iMOTION Solution Designer

Infineon Developer Center iMOTION™ Solution Designer

File Project Catalogs Target Tools

iMOTION Motor Control Solution | IMC302A-F064 |

**Global Configuration**

IC Configuration Verify

User Pin Configuration Verify

**Parameter set configuration**

myFirstParameterSet

System Hardware Configuration Verify ✓

Motor Control Configuration Verify ✓

PFC Control Configuration Verify ✓

PFC Control Configuration

PFC Control Regulators

Zero Cross Detection

VAC Feed Forwarding

Protection Verify ✓

**PFC Configuration**

Control Mode

Control mode  current control + multiplier + voltage control

PWM Modulator

Desired switching frequency

Switching period

Actual switching frequency

Desired minimum ton time

Actual minimum ton time

Minimum duty cycle

Desired minimum toff time

Actual minimum toff time

Maximum duty cycle

Scheduler

PFC CPU load

Total CPU load

Recommended current control update rate scaler

Selected current control update rate scaler

Current control update rate

Current control update period

Recommended voltage control update rate scaler

Selected voltage control update rate scaler

Voltage control update rate

Voltage control update period

**Control mode**

This input selects the Control Mode of the PFC. In addition to normal close loop voltage control mode, the system supports manual control modes that let the user overwrite parts of the closed-loop control system. The supported modes are:

Open Loop: no current control and no voltage control. External input, Duty\_Ext, sets the PFC duty-cycle.

Current Control: close loop current control and open loop voltage control. External input, IL\_Ref\_Ext, sets the PFC current reference.

Closed Current Control + Multiplier: Closed loop current control and open loop voltage control but with multiplier enabled. External input, VEAout\_Ext, sets the PFC voltage error amplifier output.

Closed Current Control + Multiplier + Voltage Control: Normal PFC operation with full closed loop control.

**Project verification:**

**IC Configuration:**

**Scripting:**

**System Hardware Configuration:**

**Motor Control Configuration:**

**PFC Control Configuration:**

**Protection:**

iMOTION Solution Designer - Version 1.3.0.202311272349

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

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

# Parameter Set Configuration

## 6. Protection



iMOTION Solution Designer

Infineon Developer Center iMOTION™ Solution Designer

Config Wizard Programmer Dashboard Script Editor Oscilloscope

File Project Catalogs Target Tools

iMOTION Motor Control Solution | IMC302A-F064 |

### Global Configuration

- IC Configuration Verify
- User Pin Configuration Verify

### Parameter set configuration

myFirstParameterSet

- System Hardware Configuration Verify ✓
- Motor Control Configuration Verify ✓
- PFC Control Configuration Verify ✓
- Protection Verify ✓
  - PFC Protection**
  - Motor Protection
  - System Protection

### PFC Protection

OCF

- OCF fault enable
- OCF comparator hysteresis 0 mv
- OCF status update period 50 ms

Line Frequency Fault

- Line frequency fault enable
- Desired line frequency validation hysteresis 0.50 Hz
- Line frequency validation deglitch time 10 THLC

Offset Calculation

- Offset Calculation fault enable
- Current sense amplifier offset 312.000 mV
- Current offset tolerance 5.00 %
- Current sense amplifier offset maximum limit 327.60 mV
- Current sense amplifier offset minimum limit 296.40 mV

VAC

- VAC drop-out threshold 10.00 V
- VAC drop-out hysteresis in percentage 100.0 %
- VAC drop-out hysteresis 10.00 V
- VAC drop-out detection deglitch time 5 x 1.0 ms
- Actual VAC drop-out detection deglitch time 5 ms
- VAC recovery detection deglitch time 5 x 1.0 ms
- Actual VAC recovery detection deglitch time 5.0 ms
- VAC brown-out fault enable
- VAC brown-out threshold 165.00 Vrms

### OCF comparator hysteresis

This input selects the hysteresis voltage level for the analog PFC OCF comparator in the MCE Device. Hysteresis can improve robustness and eliminate false fault detections in noisy environments. It is not recommended to change the preconfigured value.

VAC

Rs

Ref. Voltage

Voltage Divider Current

R\_upper

R\_lower

Ref. Voltage

PFCREF

PFCITRIP

MCE Device

OCF

Hysteresis

### Project verification:

- IC Configuration:
- Scripting:
- System Hardware Configuration:
- Motor Control Configuration:
- PFC Control Configuration:
- Protection:

iMOTION Solution Designer - Version 1.3.0.202311272349

E:\temp\REF-AIRCON\_Test(settings)\cw\_modules\cwm\_iMOTIONMOTOR.xml - 2022-12-21:5:01:00.5:1085

Go through all categories of the Protection Configuration step by step

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





# Parameter Verification

## Parameter Verification

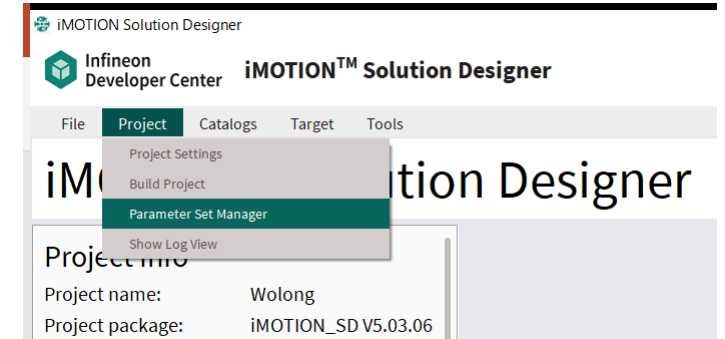
- Verification results are shown in the following color code:
  - ✔ Success
  - ⚠ Warning
  - ❌ Error (**must** be corrected before proceeding and turns dark orange when selected)
- Guidelines are shown for why the error or warning occurred
- Visually directs you to the parameter in question

The screenshot displays the Infineon parameter verification tool interface, divided into three main sections:

- Global Configuration:** Lists 'IC Configuration' and 'User Pin Configuration', both marked as successful with checkmarks.
- Parameter set configuration:** Shows a dropdown menu for 'myFirstParameterSet' and a tree view of configuration categories:
  - System Hardware Configuration (Warning icon)
  - Input Supply
  - DC Bus Sensing Feedback
  - Inverter (Warning icon)
  - Motor Current Sensing
  - Motor
  - Load (Warning icon)
  - Motor Control Configuration (Error icon)
  - Motor Control Configuration
  - Control Regulators
  - FOC and Inverter
  - Application (Warning icon)
  - Angle Feedback
  - Protection (Verify button)
- Application:** Shows detailed configuration for 'Application' with various parameters:
  - Summary: Motor starting method (Open Loop Ramp), Motor angle initialization (Disable), Catch spin before start (Disable), PG output (Disable), Command input (UART).
  - Motor Starting: Open loop ramp rate (1000.0 RPM/s).
  - Current Limits: Motoring current limit (100.0 %), Regeneration current limit (0.0 %), Low speed limit (40.0 %), Low speed threshold (2000.0 RPM), Regeneration limit minimum speed (100.0 RPM).
  - Command Input: Speed control input ramp rate limit (1000.0 RPM/s), Control input measure (Disable).
- Project verification:** A summary of verification results:
  - IC Configuration: Success
  - Scripting: Success
  - System Hardware Configuration: Warning: Load Rated Torque is greater than the Motor Rated Torque. [RatedTorque is > 0.001]. Action Required: The motor will not drive the application at rated load torque.
  - Warning: Max DC bus voltage is greater than Vdc feedback max. [VdcMax is > 10.0]. Action Required: Increase Vdc feedback max.
  - Motor Control Configuration: Error: Low Speed Threshold must be greater than Minimum Speed. [LowSpeedThreshold is less than 3000.0]. Action Required: Increase Low Speed Threshold.
  - Protection:

# 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.



## Parameter Set Manager

?

New
Rename
Delete

Add new Parameter Set to Project

Enter new Parameter Set name:

Apply

Parameter Sets:

Param00
▾

Import
Export
Compare

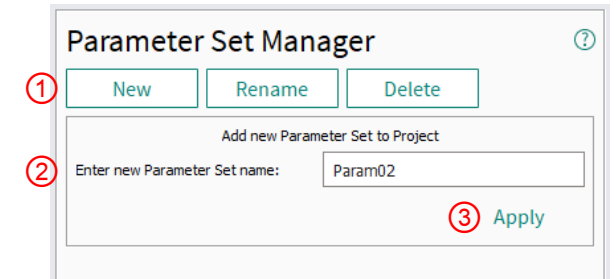
## Parameter Set Manager

The Parameter Set Manager window is used to Create, Rename, Delete, Import, or Export Parameter sets. Parameter sets are useful to save multiple boards' parameters that use the same device into the same project easily switching between them in the Configuration Wizard.

# Configure Parameter Set

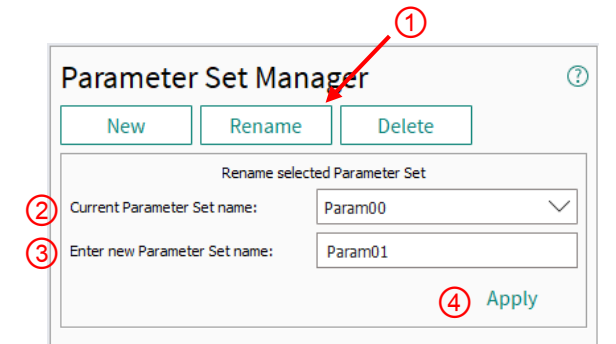
## 1. Add new parameter set

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



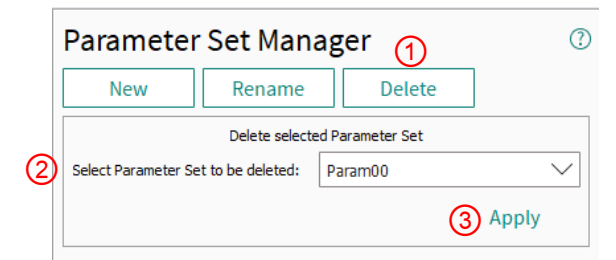
## 2. Rename parameter set

- 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

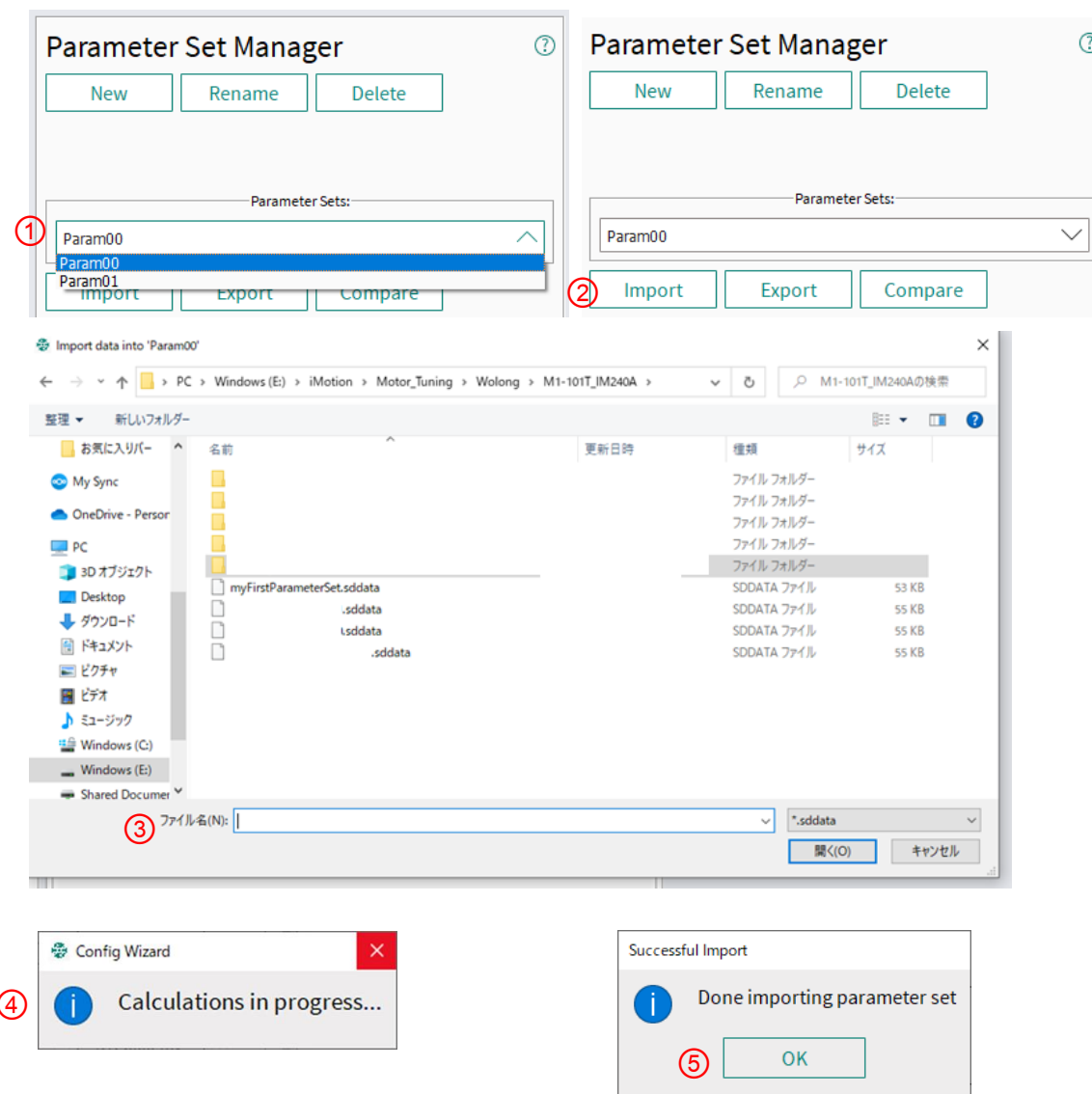
- ① Press **Delete**
- ② Select parameter set that you would like to delete in **Select Parameter Set to be deleted**
- ③ Press **Apply**



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

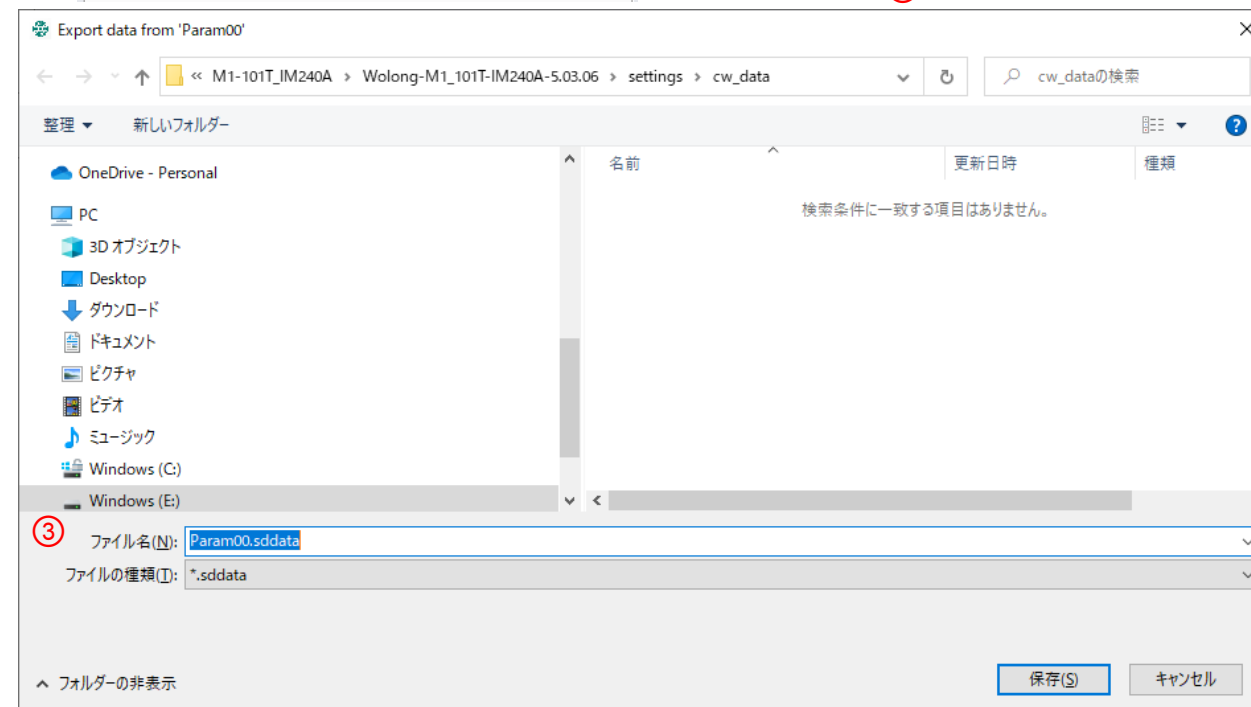
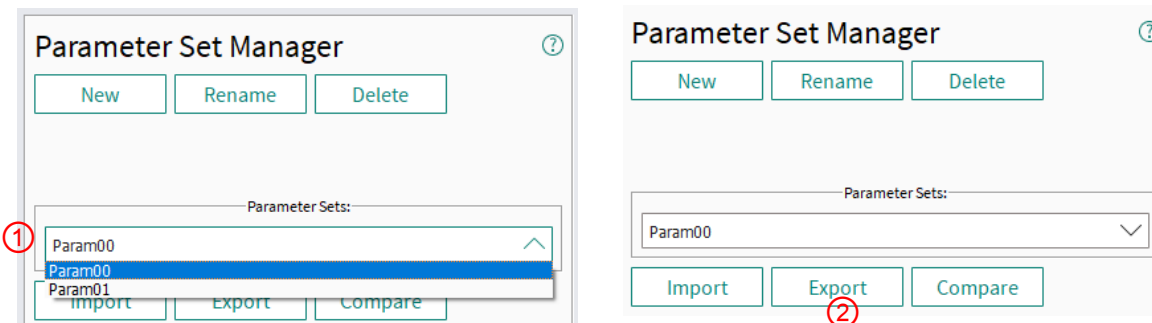
# Import Parameter Data from External File

- 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.



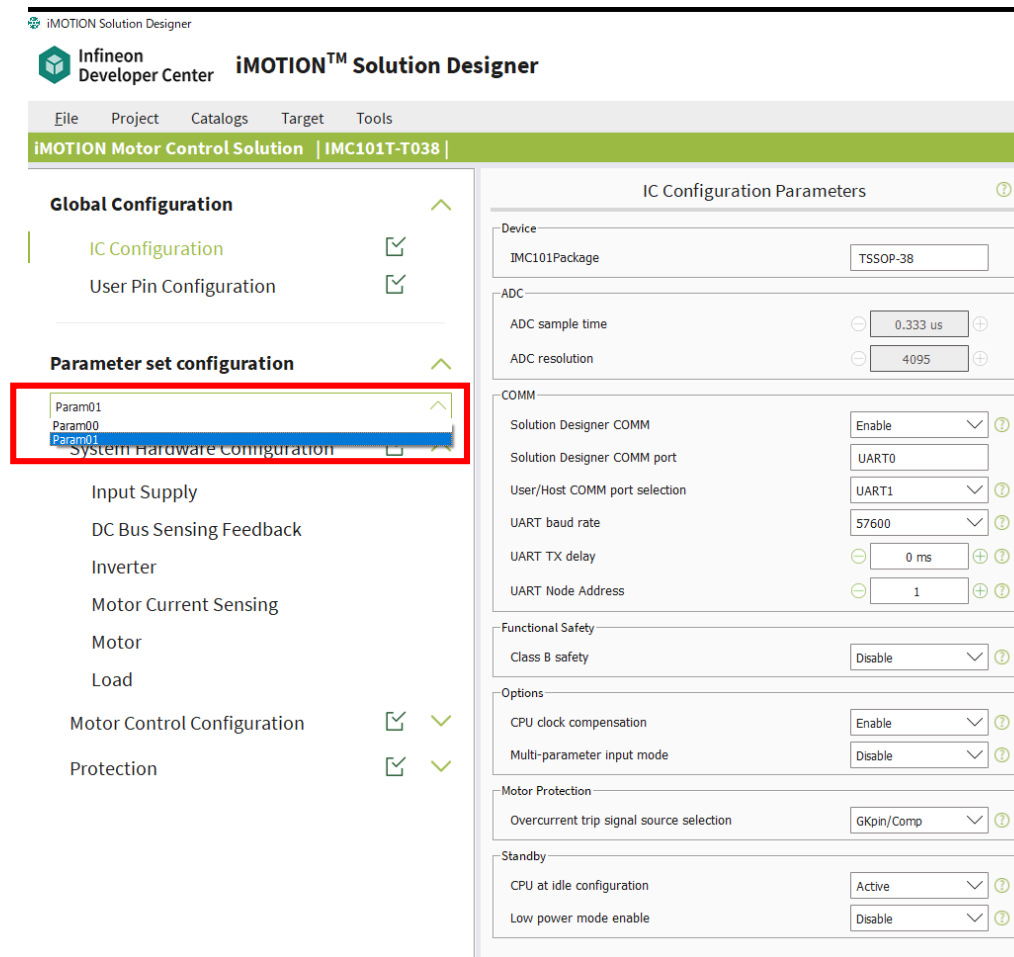
# Export Parameter Data to External File

- ① Select parameter set in the list box
- ② Press **Export**
- ③ Select folder to save parameter data in explorer window



# 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.



The screenshot displays the iMOTION Solution Designer interface. On the left, the 'Parameter set configuration' section is expanded, showing a list box with three entries: 'Param01', 'Param00', and 'Param01'. The 'Param01' entry is highlighted with a blue selection bar. The right pane shows the 'IC Configuration Parameters' configuration page, which includes sections for Device, ADC, COMM, Functional Safety, Options, Motor Protection, and Standby, each with various configuration options and values.

# Table of contents

1	Software installation	4
2	<b>iMOTION™ Solution Designer workflow</b>	<b>7</b>
	Project initialization	9
	Parameter configuration	15
	Script	31
	Downloading firmware	34
	Debugging and tuning	40
3	Using catalog files	54
4	Firmware upgrade and downgrade between release 5.x.x and 1.3.7	58

# Script Editor Graphical User Interface



## Script Editor and Debugger

### – Script editor

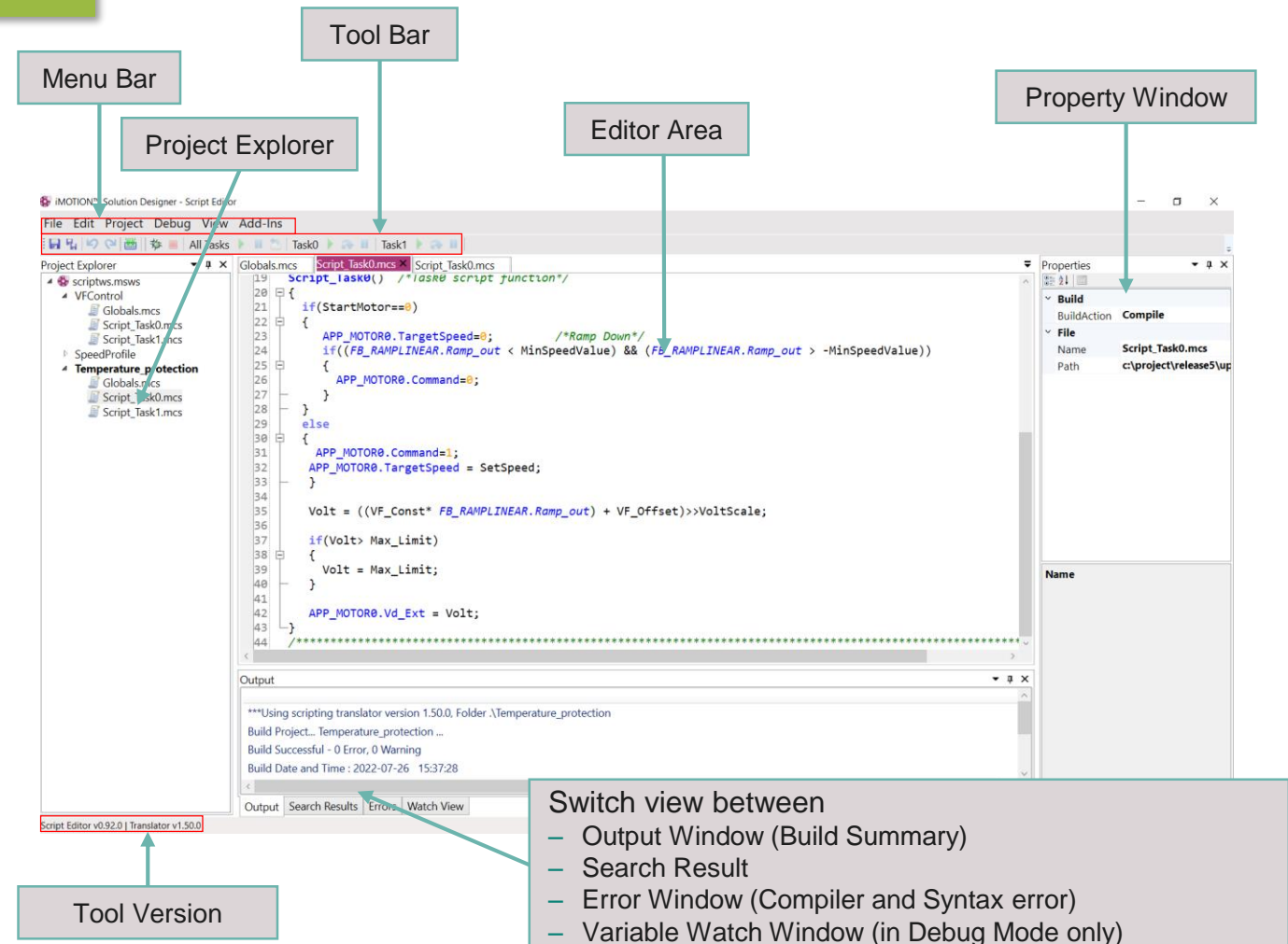
- Runtime syntax checking
- Project management
- Keyword highlighting and auto completion
- Online help system

### – 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

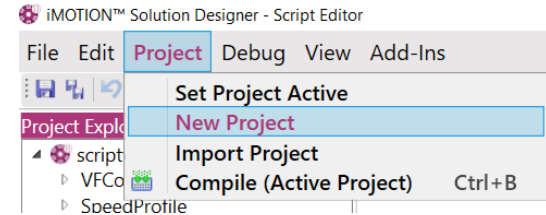
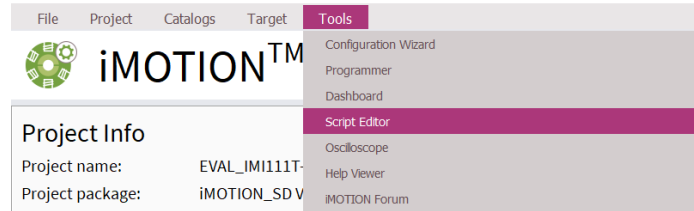




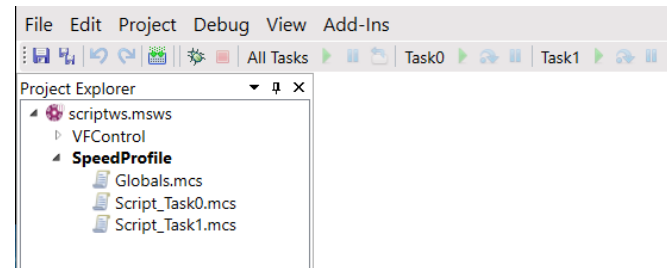
# Script Editor Step by step



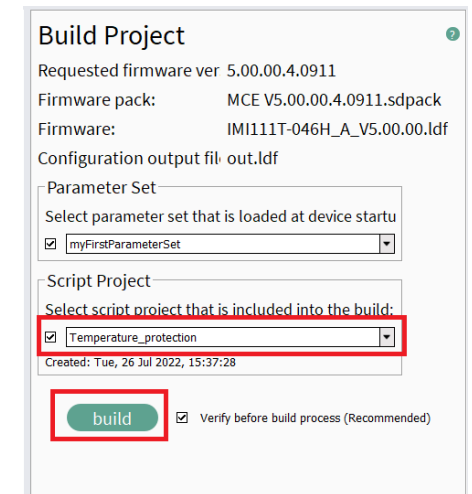
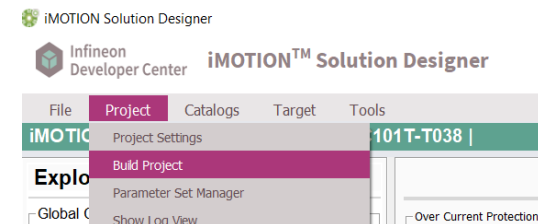
- After opening the Script Editor, a new Script Project **must** be created.



- 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.

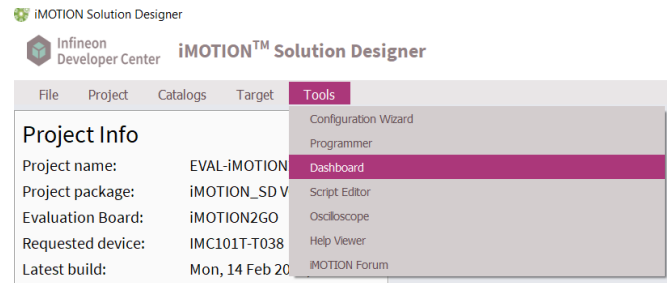


# Table of contents

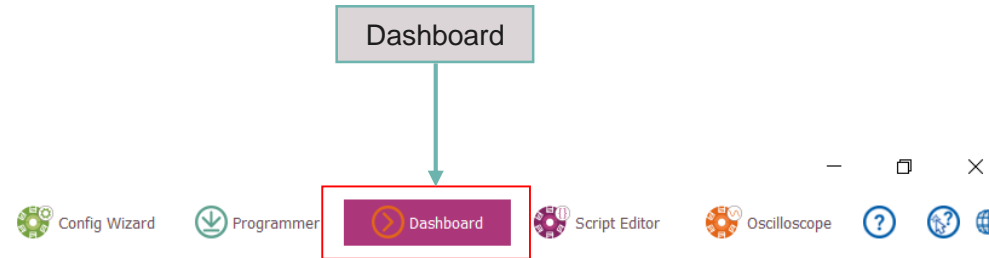
1	Software installation	4
2	<b>iMOTION™ Solution Designer workflow</b>	<b>7</b>
	Project initialization	9
	Parameter configuration	15
	Script	31
	Downloading firmware	34
	Debugging and tuning	40
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# Build, Connect and Program

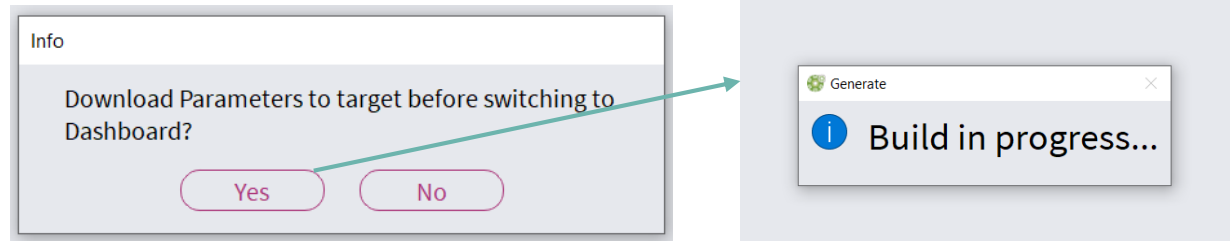
- After opening or creating a project, select **Dashboard** via menu or toolbar.



or

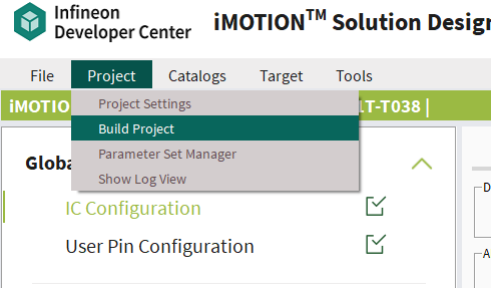


- The **Build, Connect, and Program** steps will be done as required (through popups).

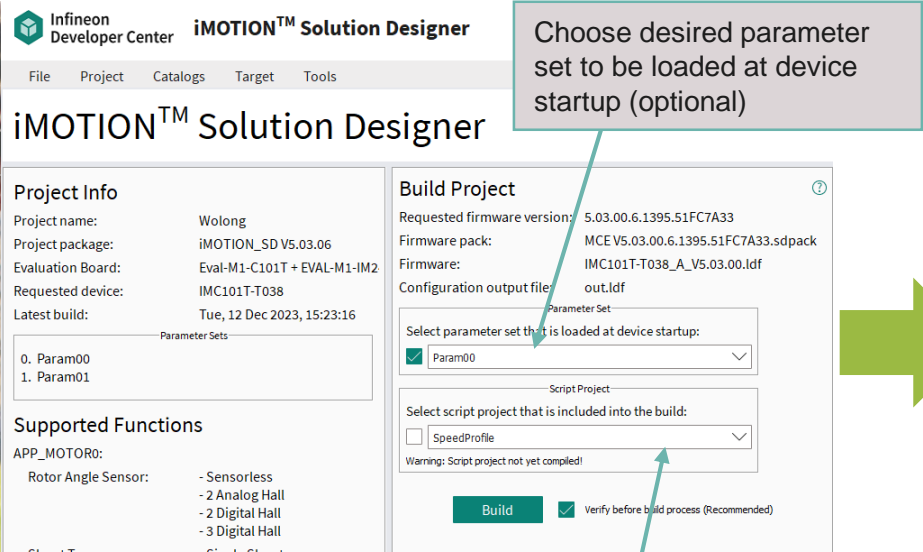


- Steps (Build, Connect, Programmer) can be done individually and are explained on the next slides.

# Build the Program

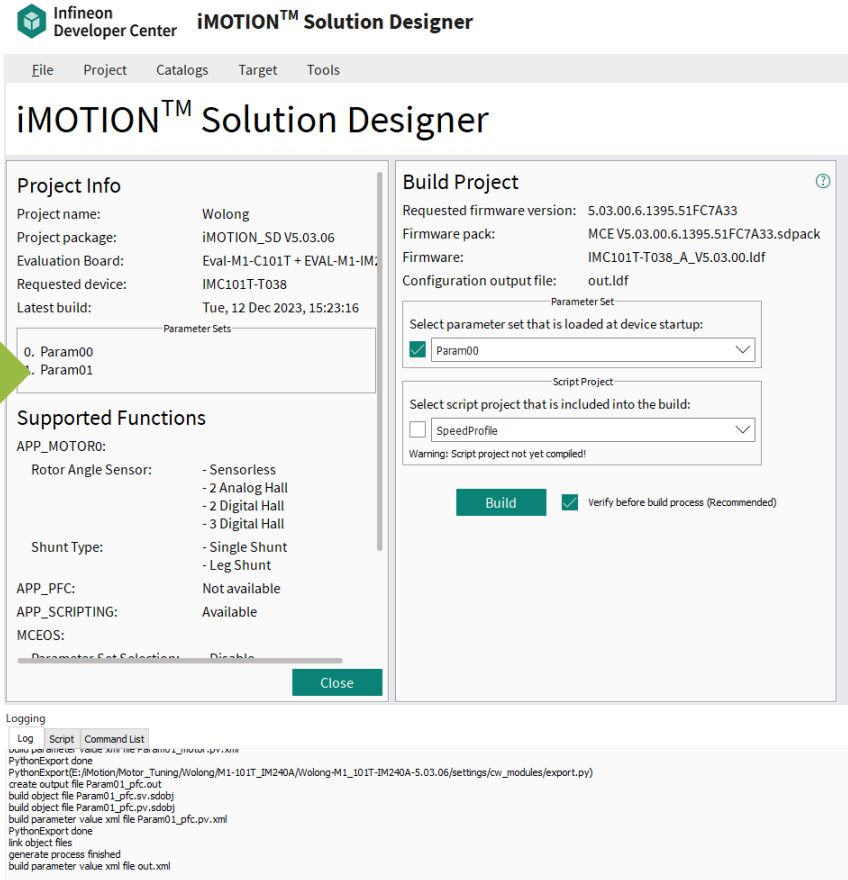


Select Project → Build Project



Choose desired parameter set to be loaded at device startup (optional)

Choose your script (optional)

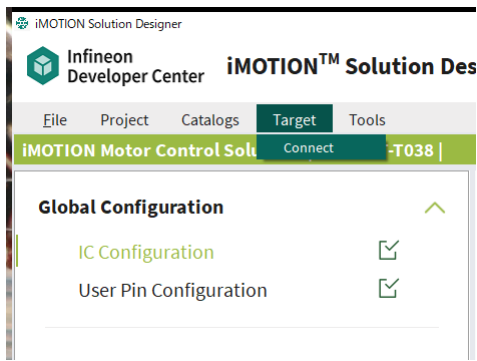


If necessary, select the parameter set to be loaded at startup, and a script. (optional)  
Then press **Build**

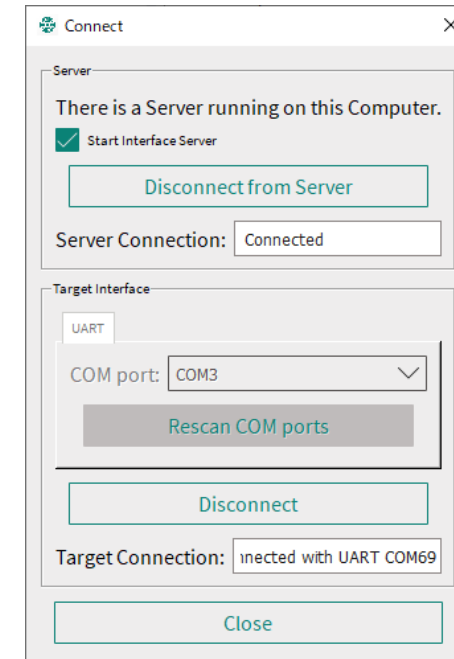
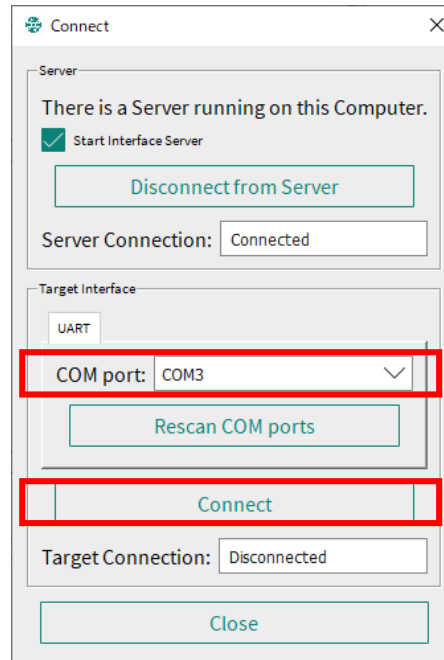
After build process done, log is shown in log window. In order to open log window, select **Project** → **Show Log View**.

# Connect with Target

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



Select Target → Connect

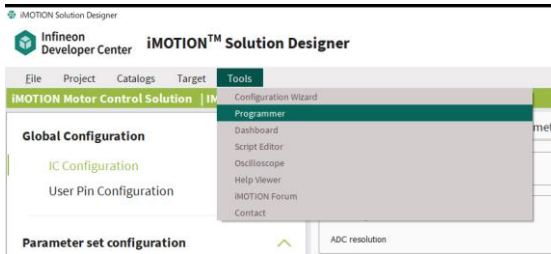


- Select COM port that target device is connected
  - If the desired COM port cannot be found in the list, press **Rescan COM ports** to refresh the port list, and then select the desired COM port.
- Press **Connect**



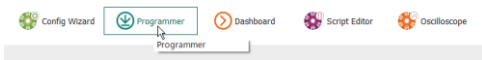
# Connect and Program

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

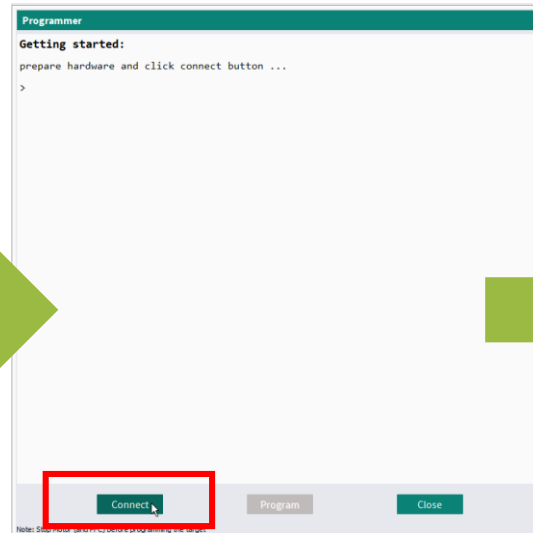


Select Tools → Programmer

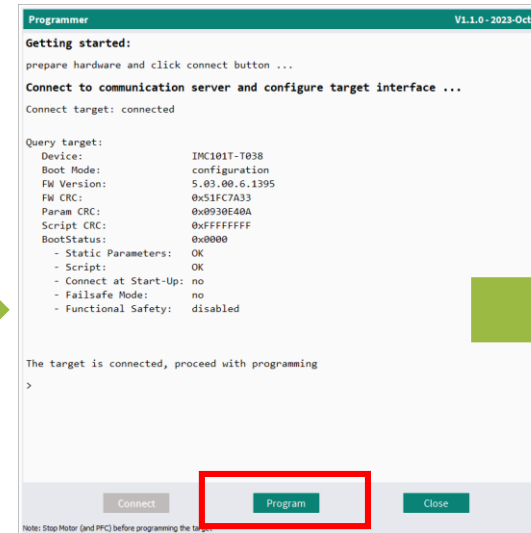
OR



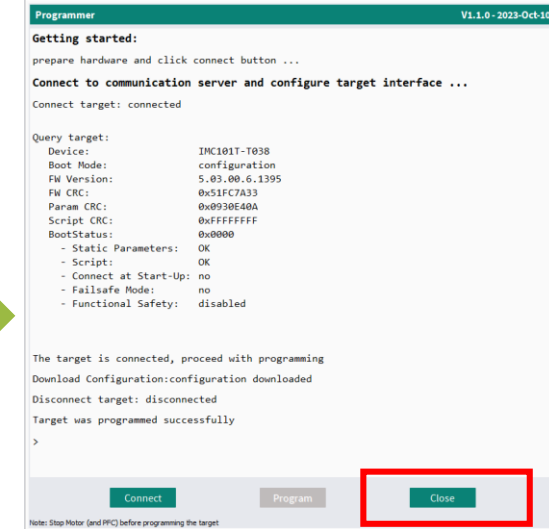
Press **Programmer** icon



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.

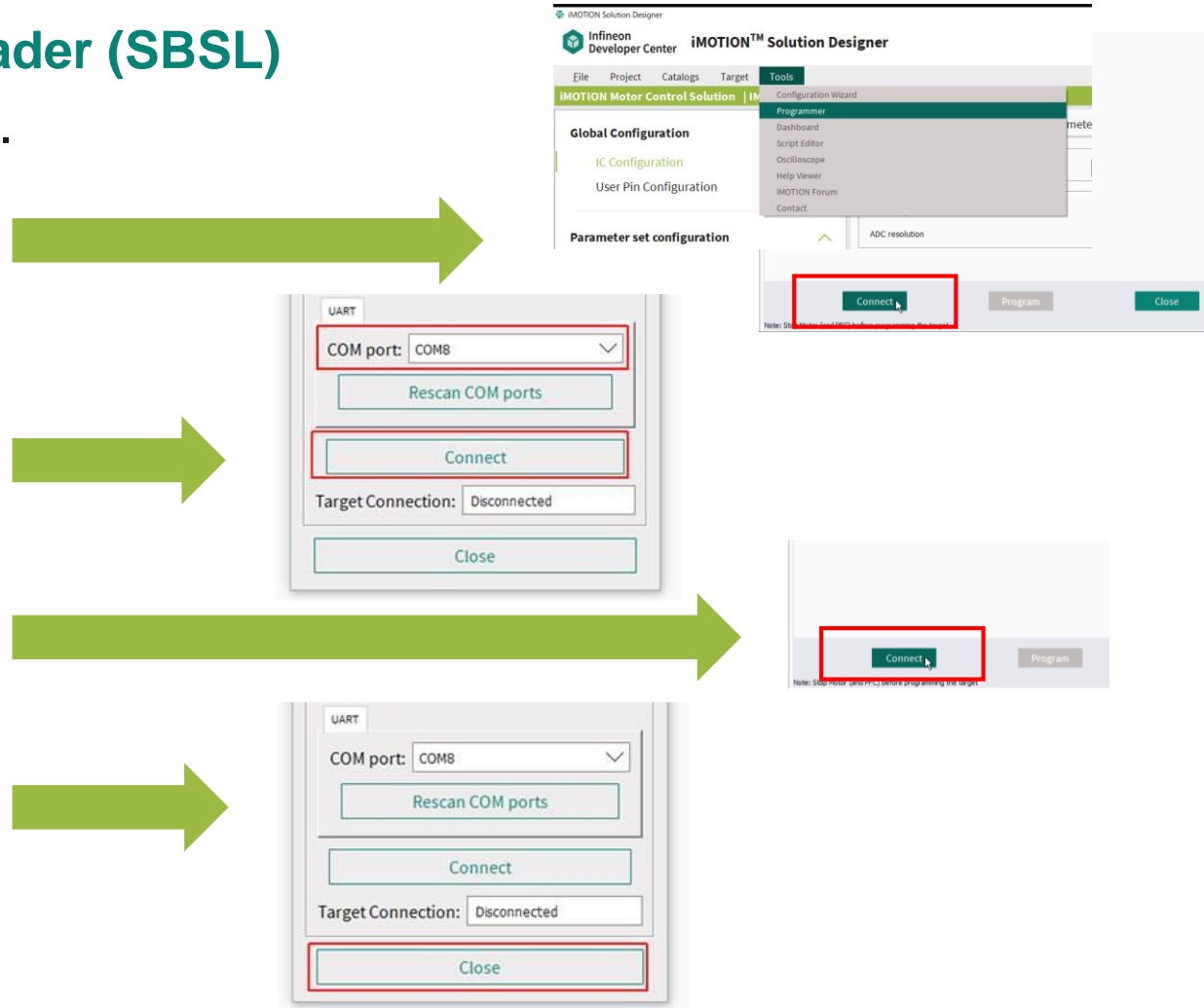


# Connecting to Secure loader

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
```



# Table of contents

1	Software installation	4
2	<b>iMOTION™ Solution Designer workflow</b>	<b>7</b>
	Project initialization	9
	Parameter configuration	15
	Script	31
	Downloading firmware	34
	Debugging and tuning	40
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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

The screenshot displays the Infineon iMOTION™ Solution Designer interface. The top navigation bar includes 'File', 'Project', 'Catalogs', 'Target', and 'Tools'. The main workspace is divided into several sections:

- Parameter Tree (Left):** A tree view showing the project structure with folders like 'APP\_IMOTOR', 'APP\_PFC', 'APP\_Scripting', 'APP\_SYSTEMCONTR...', 'MCE', and 'Global'.
- Parameter set select Config Wizard (Top Center):** A dropdown menu showing 'Param00'.
- VF Diagnostics Parameters (Right):** A table with columns for 'Actual value' and 'Desired value'. It includes sections for 'Motor Control Configuration > Control Modes', 'Variables: Voltage tuning', and 'Variables: Speed tuning'. Parameters include 'Flux PLL', 'Open Loop', 'Speed Control', 'Voltage Control', 'Vd\_Ext', 'Vq\_Ext', 'Target Speed', 'Minimum speed', and 'LowSpeedGain'.
- Motor Control (Middle):** A list of control modes including 'Current Sense', 'Current Loop', 'Speed Loop', 'Angle Estimation', 'Starting', and 'Hall Feedback'.
- Status Bar (Bottom):** Displays 'CPU Load' at 26.8%, 'Target speed: 100 RPM', and 'Motor Rotation' (Clockwise/Counter Clockwise). It also includes 'Start Motor', 'Stop Motor', 'Clear Fault', and 'Clear peak' buttons.
- Faults (Bottom Right):** A list of 'Motor Control Faults' and 'System Faults' with status indicators (green for OK, red for error).

# Dashboard Overview (w/o PFC)



iMOTION Solution Designer

Infineon Developer Center iMOTION™ Solution Designer

Loaded parameter set

Config Wizard Programmer Dashboard Script Editor Oscilloscope

File Project Catalogs Target Tools

FW: 5.03.00.6.1395.0x51fc7a33 | IMC101T-T038

Name	Refresh	Value	Unit
APP_MOTOR0			
APP_MOTOR0			
FB_ANGLEEST...			
FB_CURRENTFE...			
FB_CURRENTRE...			
FB_FIELDCONTR...			
FB_FLUX			
FB_LIMIT_SPEED			
FB_MEASURE			
FB_RAMPLINEAR			
FB_SPEEDREGU...			
FB_SVM			
FB_VOLTAGEGE...			
FB_ANGLESENSE			
FB_OPENLOOP			
FB_PGOUT			
FB_HALL			
FB_TORQUECO...			
APP_PFC			
APP_Scripting			
APP_SYSTEMCONTR...			
MCE			
Global			

Parameter set select Config Wizard

Param00

### Motor Control

- VF Diagnostics
- Current Sense
- Current Loop
- Speed Loop
- Angle Estimation
- Starting
- Hall Feedback

### VF Diagnostics Parameters

	Actual value	Desired value
Motor Control Configuration > Control Modes		
Rotor angle feedback selection	Flux PLL	Open Loop
Motor control mode	Speed Control	Voltage Control
Variables: Voltage tuning		
Vd_Ext	0.00 %	0.00 %
Vq_Ext	0.00 %	0.00 %
Variables: Speed tuning		
Target Speed	500.0 RPM	0.0 RPM
Load > Power		
Minimum speed	100 RPM	100 RPM
LowSpeedGain	1536.000	1535.940

Sync from Config Wizard Update Target Update Config Wizard

Open Oscilloscope

Motor Running Target Connected

CPU Load: 66.6% peak: 66.8%

Target speed: 500 RPM

Motor Rotation: 501 RPM

Motor Control Faults

- GateKill
- Critical Over voltage
- Over voltage
- Undervoltage
- Flux
- GKPIN
- Overheat
- Rotor Lock
- Phase Loss
- Current Offset
- Hall Timeout
- Hall Invalid

System Faults

- Execution
- Parameter Load
- Link Break

Get parameter Save parameter Clear refresh Find parameter Expand

Start Motor Stop Motor Clear Fault

Clear peak

Duration: 352 seconds

Parameter tree

Parameter for the selected tuning case

Parameter update  
Open oscilloscope

Pre-configured tuning cases

Realtime system / motor fault condition

Parameter Control

Motor start/stop control

CPU load indicator

Motor speed & direction control

# Dashboard Overview (w/ PFC)



iMOTION Solution Designer

Infineon Developer Center iMOTION™ Solution Designer

Loaded parameter set

Config Wizard Programmer Dashboard Script Editor Oscilloscope

File Project Catalogs Target Tools

FW: 5.03.00.6.1395.0x51fc7a33 | IMC102T-F064

Name	Refresh	Value	Unit
APP_MOTOR0			
APP_PFC			

Parameter set select Config Wizard  
myFirstParameterSet

### Motor Control

VF Diagnostics

Current Sense

Current Loop

Speed Loop

Angle Estimation

Starting

Hall Feedback

### PFC

PFC Open Loop

PFC Current Sense

PFC Current Loop

PFC FF

PFC ZC Detection

PFC Voltage Loop

### VF Diagnostics Parameters

	Actual value	Desired value
Motor Control Configuration > Control Modes		
Rotor angle feedback selection	Flux PLL	Open Loop
Motor control mode	Speed Control	Voltage Control
Variables: Voltage tuning		
Vd_Ext	0.00 %	0.00 %
Vq_Ext	0.00 %	0.00 %
Variables: Speed tuning		
Target Speed	0.0 RPM	0.0 RPM
Load > Power		
Minimum speed	1000 RPM	1000 RPM
LowSpeedGain	0.000	0.000

Sync from Config Wizard Update Target Update Config Wizard

Open Oscilloscope

Motor Running Target Connected PFC Enabled

Start Motor Stop Motor Enable PFC Disable PFC Clear Fault

CPU Load 51.3% peak: 54.6% Clear peak

Target speed: 1000 RPM

Motor Rotation: Clockwise Counter Clockwise

System Faults Execution Parameter Load Link Break

Motor Control Faults GateKill Critical Overvoltage Overvoltage Undervoltage Flux GKPIN Overheat Rotor Lock Phase Loss Current Offset Hall Timeout Hall Invalid

PFC Faults Over current DC bus open-loop DC bus over-voltage AC input frequency AC input brown-out AC input over-voltage AC input drop-out Current offset

Runtime: 147 seconds

Get parameter Save parameter Clear refresh Find parameter Expand

Target connected

E:\iMotion\Motor\_Tuning\HiSense\_Aircon\ODU\_Comp\HiSense\_Comp-102T\_CM615PN\HiSense\_e\_Comp-102T\_CM615PN-5.03.06\settings\cw\_modules\cwm\_iMOTIONMOTOR.xml - 2022-12-21:5.01.00.5.1085

Parameter tree

Parameter for the selected tuning case

Parameter update  
Open oscilloscope

Realtime system / motor / PFC fault condition

Parameters control

Motor & PFC control & status indicator

CPU load indicator

Motor speed & direction control

# Register Read/Write

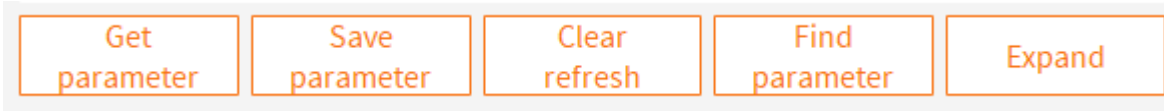


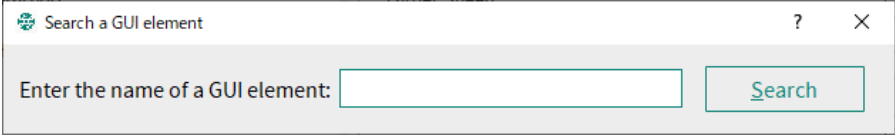
Name	Refresh	Value	Unit
APP_MOTOR0			
APP_MOTOR0			
HwConfig	<input type="checkbox"/>	---	
SysConfig	<input type="checkbox"/>	---	
HallConfig	<input checked="" type="checkbox"/>	0	
AngleSelect	<input type="checkbox"/>	-	
CtrlModeSelect	<input type="checkbox"/>	-	
PwmFreq	<input checked="" type="checkbox"/>	15000.0	Hz
PwmDeadti...	<input type="checkbox"/>	---	s
PwmDeadti...	<input type="checkbox"/>	---	s
TminPhaseS...	<input type="checkbox"/>	---	s
FaultEnable	<input type="checkbox"/>	55103	
RotorLockTime	<input type="checkbox"/>	---	s
FluxFaultTime	<input type="checkbox"/>	---	s
GatekillFilter...	<input type="checkbox"/>	---	s
CompRef	<input type="checkbox"/>	---	V
BtsChargeTi...	<input type="checkbox"/>	---	s
TCatchSpin	<input type="checkbox"/>	---	s
DirectStartThr	<input type="checkbox"/>	---	RPM
ParkTime	<input type="checkbox"/>	---	s
ParkAngle	<input type="checkbox"/>	---	deg
OpenloopRa...	<input type="checkbox"/>	---	RPM/S
IS_Pulses	<input type="checkbox"/>	---	
IS_Duty	<input type="checkbox"/>	---	%
LowSpeedLim	<input type="checkbox"/>	---	%
MinSpd	<input checked="" type="checkbox"/>	100.0	RPM
FluxTau	<input type="checkbox"/>	---	
C...	<input type="checkbox"/>	---	

- 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.



# Parameters Control



Button	Function
Get parameter	Download all parameters from the target device 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



# Parameter Tuning for Use Cases

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

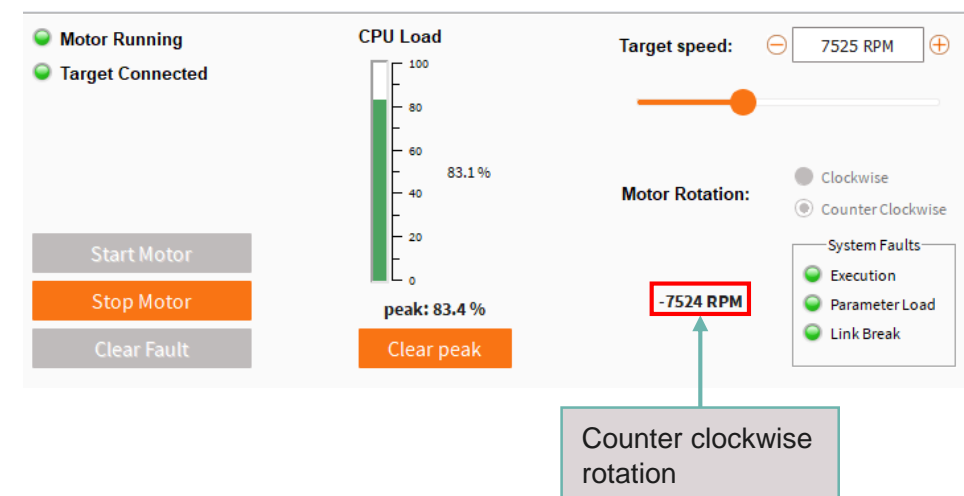
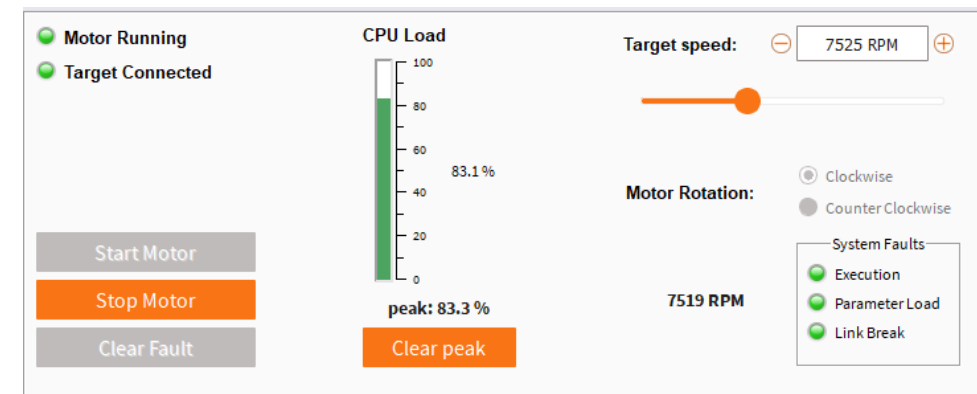
Button	Function
Sync from Config Wizard	Import parameter values from Config Wizard.
Update Target	Upload input parameters to target device in the RAM.
Update Config Wizard	Update parameter values in Config Wizard to the input values
Open Oscilloscope	Open oscilloscope Oscilloscope configuration meets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

The screenshot shows the 'VF Diagnostics Parameters' configuration window. On the left, a sidebar lists 'Motor Control' and 'VF Diagnostics' (highlighted). The main panel is titled 'VF Diagnostics Parameters' and includes a 'Parameter set select Config Wizard' dropdown set to 'myFirstParameterSet'. The parameters are organized into sections: 'Motor Control Configuration > Control Modes' (Rotor angle feedback selection: Flux PLL, Open Loop; Motor control mode: Speed Control, Voltage Control), 'Variables: Voltage tuning' (Vd\_Ext: 0.00 %, Vq\_Ext: 0.00 %), 'Variables: Speed tuning' (Target Speed: 3000.0 RPM, 0.0 RPM), and 'Load > Power' (Minimum speed: 3000 RPM, 3000 RPM; LowSpeedGain: 839.000, 838.999). At the bottom, there are four buttons: 'Sync from Config Wizard', 'Update Target', 'Update Config Wizard', and 'Open Oscilloscope'.



# 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.





# 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

Channel trace settings

Infineon Developer Center Oscilloscope

File View Windows

Channels

Scale all Clear

FB\_MEASURE.Iv [A] 0.1265 A/Div

CH1 0.0000 A

FB\_MEASURE.Iv [A] 0.1265 A/Div

CH2 0.0000 A

Run/Stop Single

Auto

Trigger Settings: T; FB\_ANGLEESTIMATOR.R > X[k-1] (signed) Show events

Horizontal Settings Reset

Zoom

50 ms 1 ms

Sample window

Sample rate 3.2 kHz

Cursor Reset Set HA Set HB Set VA Set VB

Control Panel Analyze

Oscilloscope - Version 1.3.0

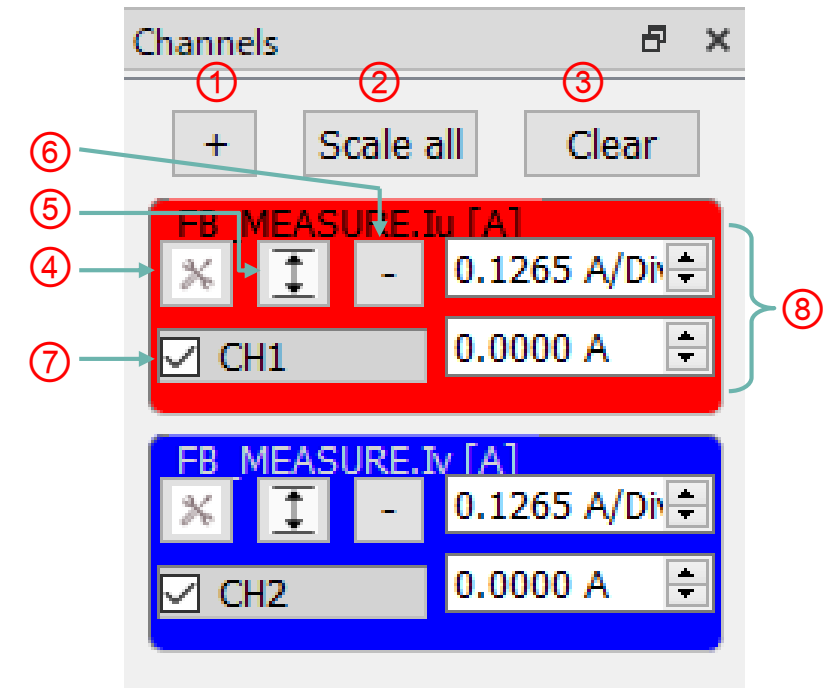
Samples: 4 Streams: 0 | -+--+--+--+| UART COM69





# Channel Configuration

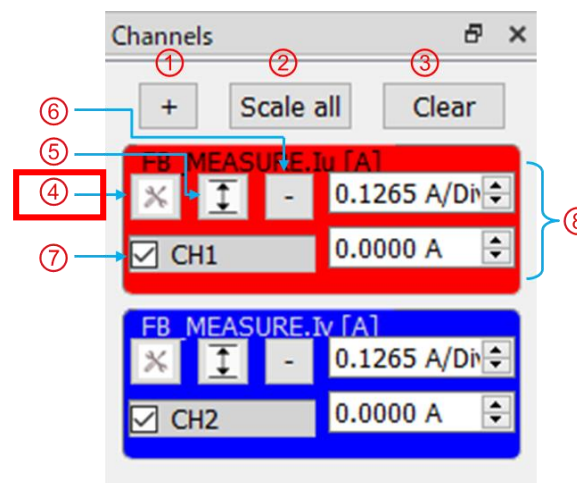
#	Function	Description
①	Add signal	Add channel to Oscilloscope. Maximum 8 channels can be displayed.
②	Autoscale all signals	Auto scale for all channels
③	Clear and reset chart	Clear oscilloscope display
④	Settings	Open channel configuration window
⑤	Autoscale	Auto scale for selected channel
⑥	Remove 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



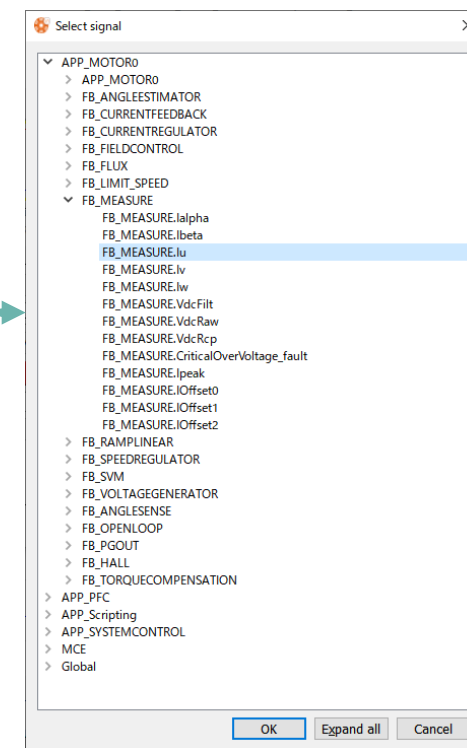
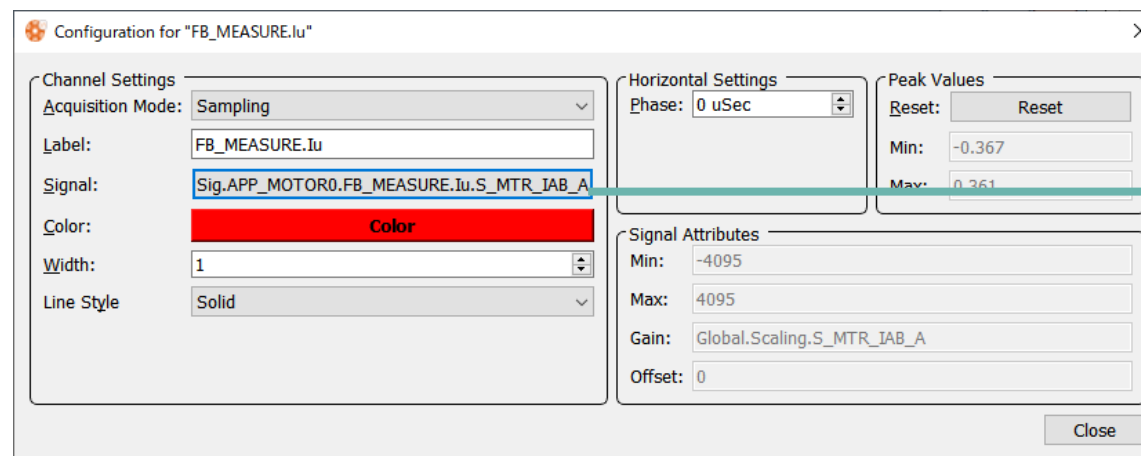


# Channel Setting

1. Press **Settings** icon



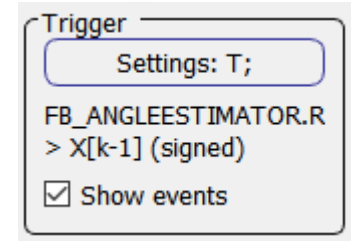
2. Select signal by pressing **Signal**  
Select signal from parameter tree  
Color of the channel is also configured here.



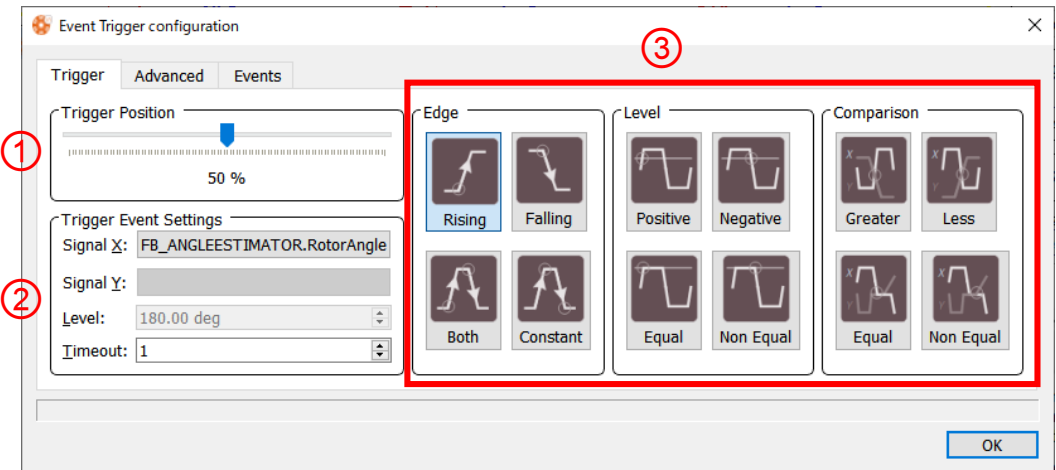
# Event Trigger



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

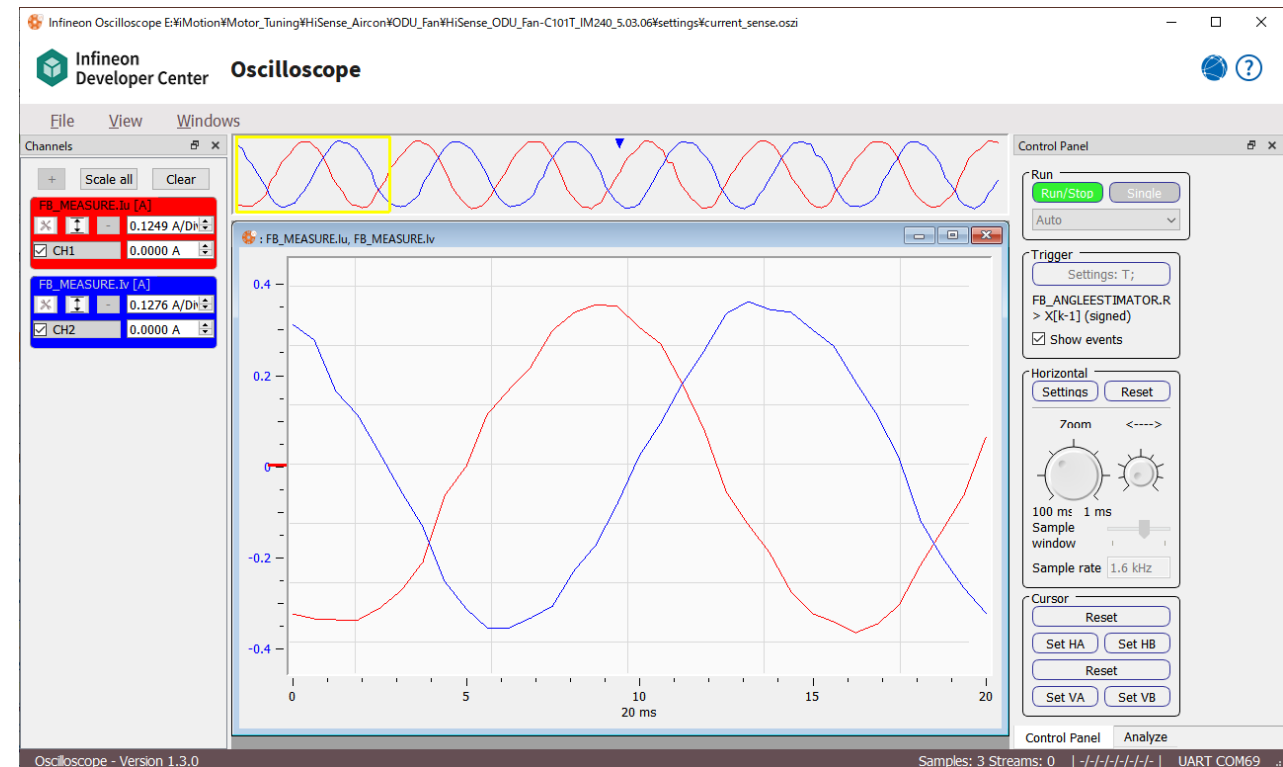
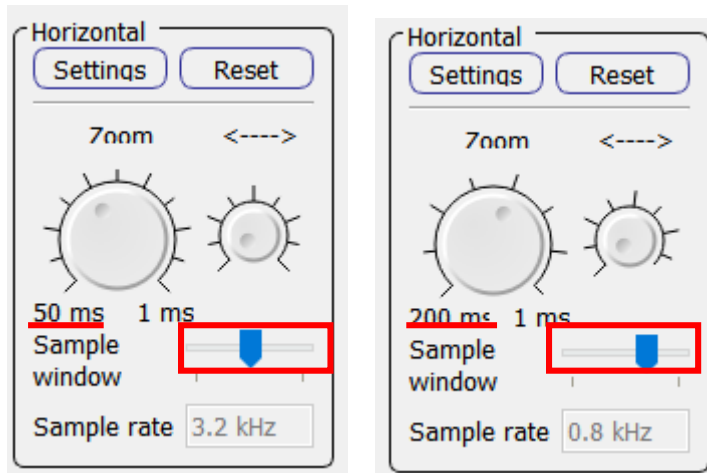




# Configuration of Horizontal Axis

Horizontal range can be configured via slider.

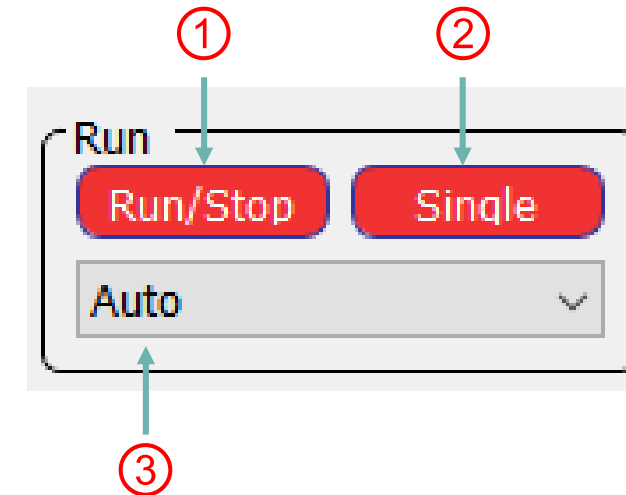
- Whole horizontal range is shown in the upper display.
- It is possible to use zoom and change zoom range by two dials.



# 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 Select Normal to use trigger function

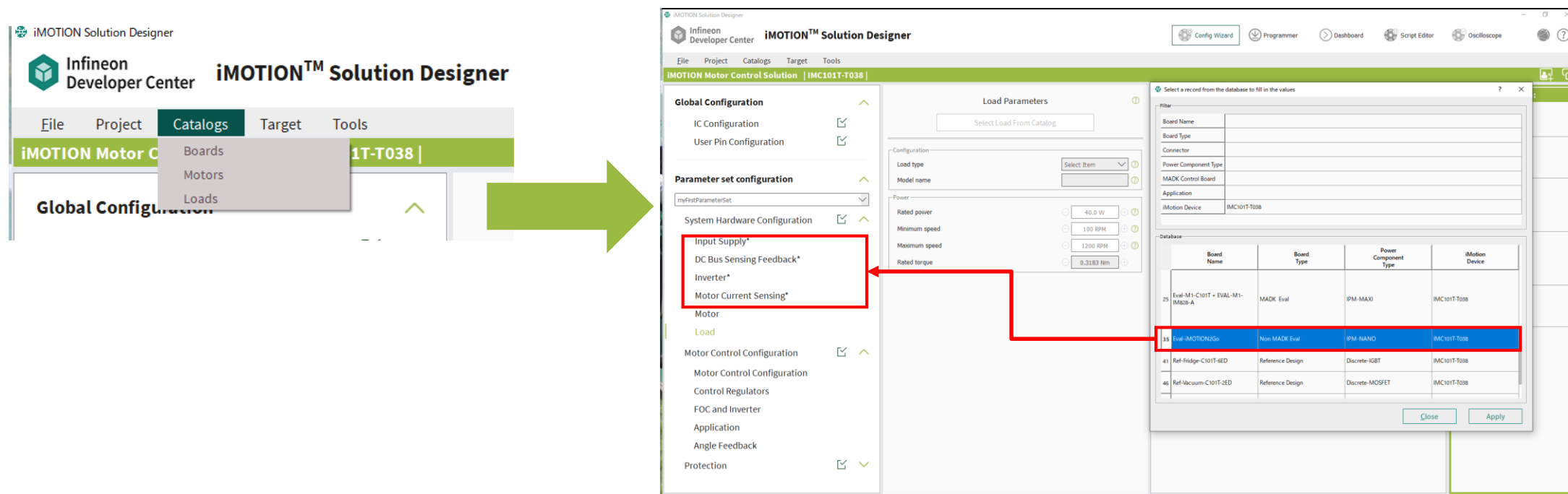


# Table of contents

<b>1</b>	Software installation	4
<b>2</b>	iMOTION™ Solution Designer workflow	7
	Project initialization	9
	Parameter configuration	15
	Script	31
	Downloading firmware	34
	Debugging and tuning	40
<b>3</b>	<b>Using catalog files</b>	<b>54</b>
<b>4</b>	Firmware upgrade and downgrade between release 5.x.x and 1.3.7	58

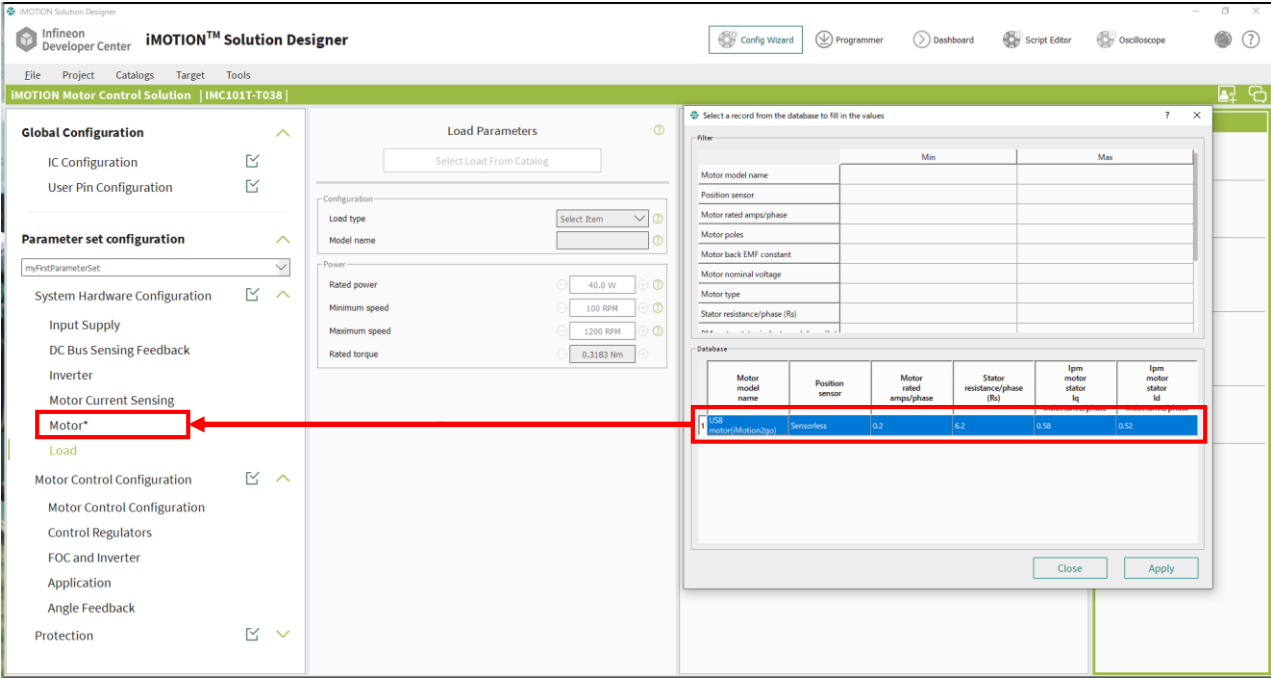
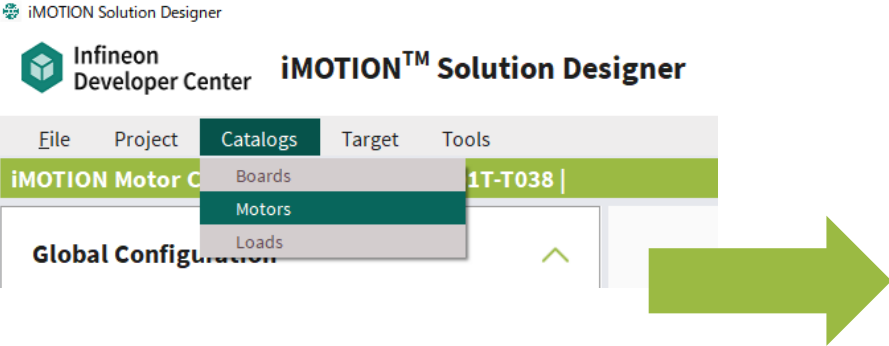
# Using catalog files (1/3)

- 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).



# Using catalog files (2/3)

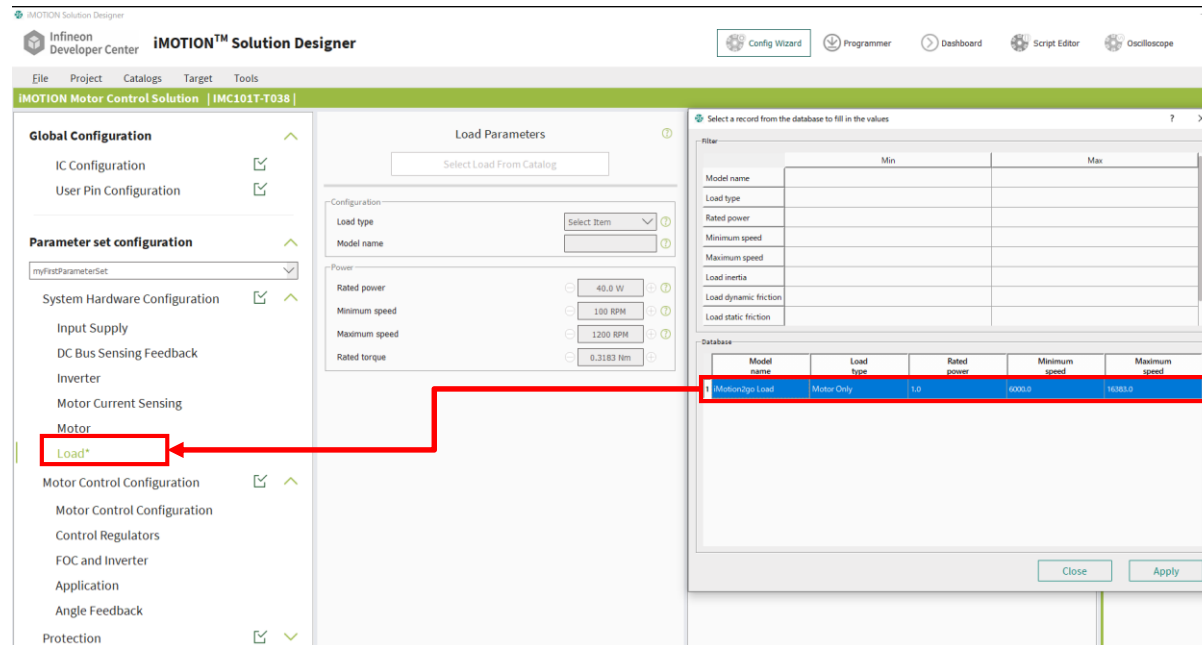
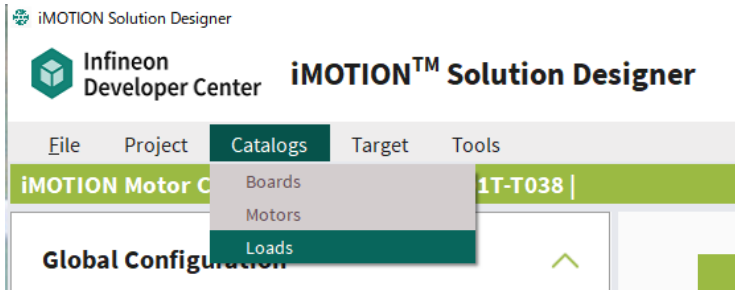
- Click **Motors** to load the default parameters from the motors catalog (USB motor).





# Using catalog files (3/3)

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



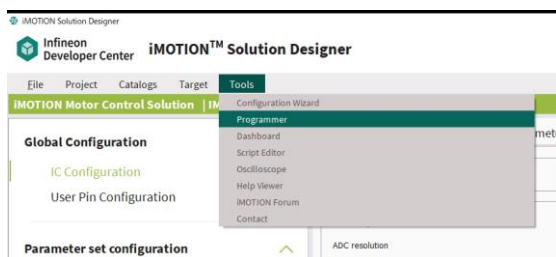
# Table of contents

1	Software installation	4
2	iMOTION™ Solution Designer workflow	7
	Project initialization	9
	Parameter configuration	15
	Script	31
	Downloading firmware	34
	Debugging and tuning	40
3	Using catalog files	54
4	<b>Firmware upgrade and downgrade between release 5.x.x and 1.3.7</b>	<b>58</b>



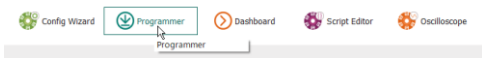
# Upgrade FW to Release #5.x

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

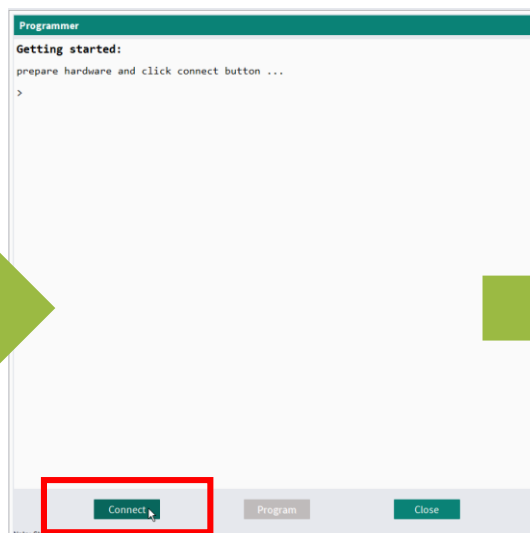


Select Tools → Programmer

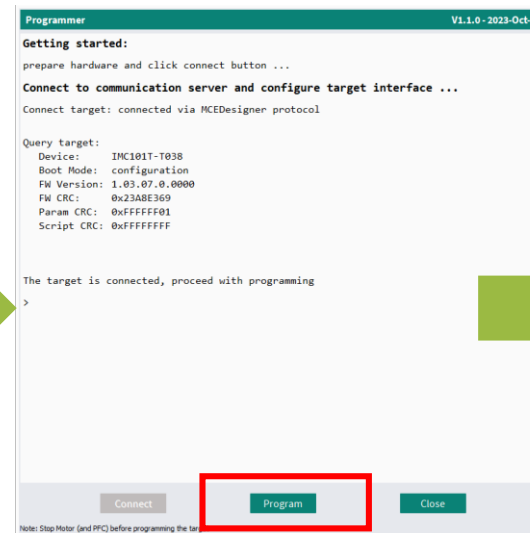
OR



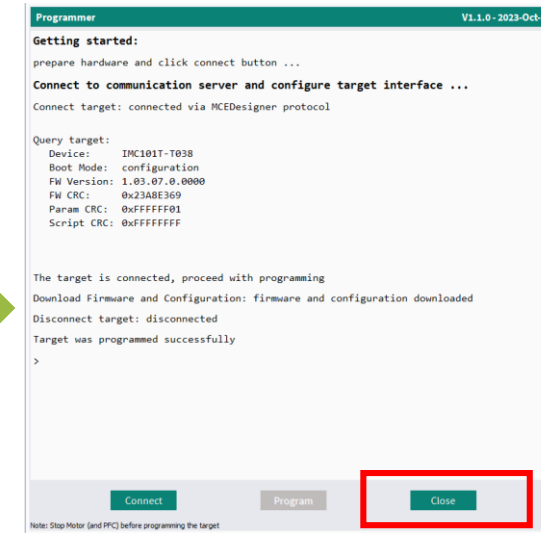
Press **Programmer** icon



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**.

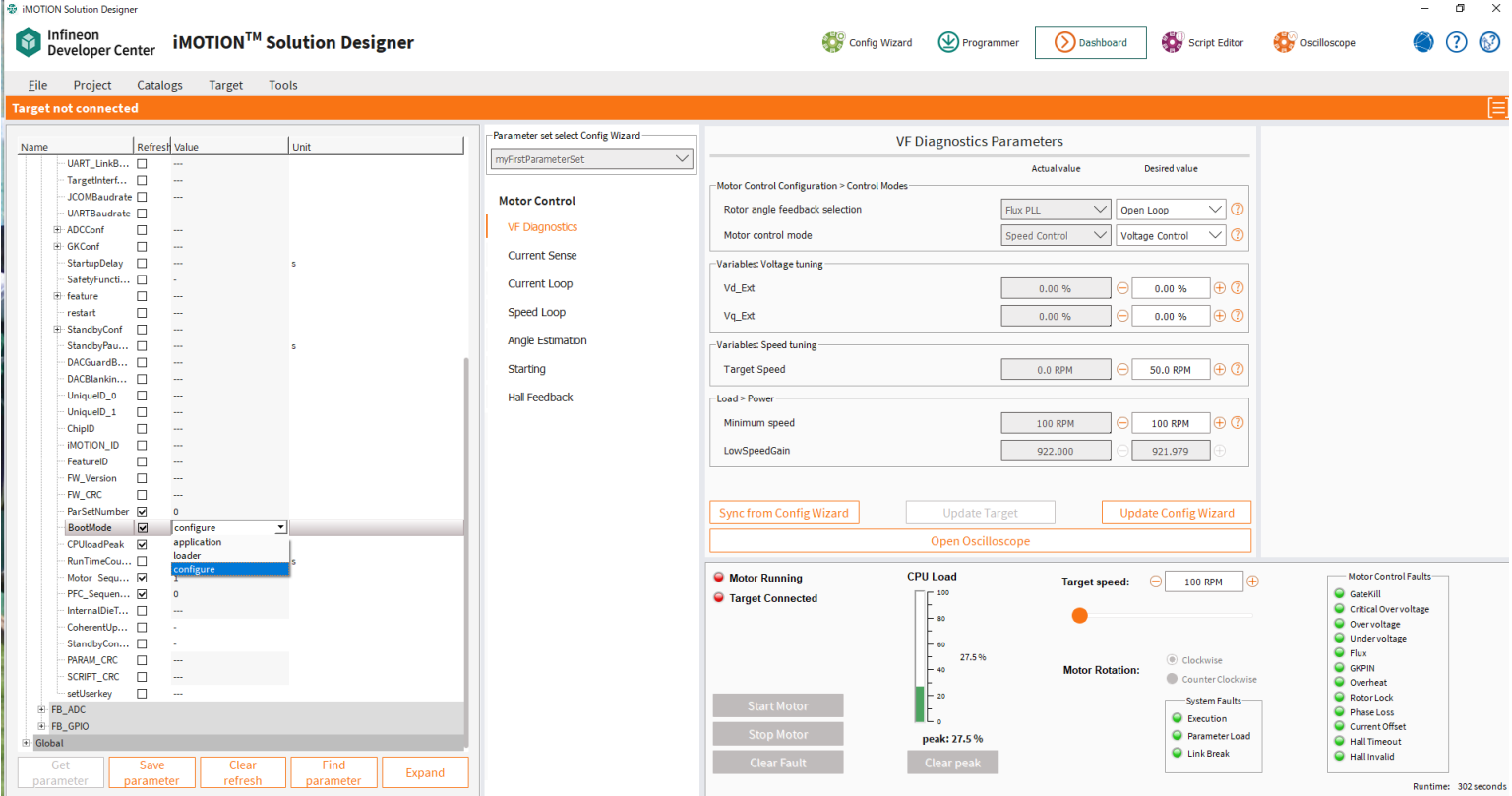


If programming is successfully done, press **Close** to close Programmer window.

# 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.



# 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.

