STMC Board Designer

Introduction

STMC Board Designer tool provides the user the expected support and the freedom to define the Motor Control Hardware providing an easy and friendly way to create Power, Control, and Inverter boards. This hardware will be used in the ST Motor Control Workbench tool.

This Document explains the main features of the STMC Board Designer tool.

Contents

List of figures

Related documents

Motor Control Boards Description wiki pages.

1. ST Motor Control Board Designer

The STMC Board Designer GUI presents a home area (start-up page) containing the following sections:

1. The 'Board Type Area' (Id. 1 in Figure 1: STMC Board Designer –Home View) to select the type of boards to visualize on the “Boards list area”.
2. The 'User Buttons Area' (Id. 2 in Figure 1: STMC Board Designer –Home View) provides options to create a new board from scratch, combine existing power and control boards to create an inverter board, or import an external board.
3. The 'Boards List Area' (Id. 3 in Figure 1: STMC Board Designer –Home View) enables the modification or cloning of existing boards.

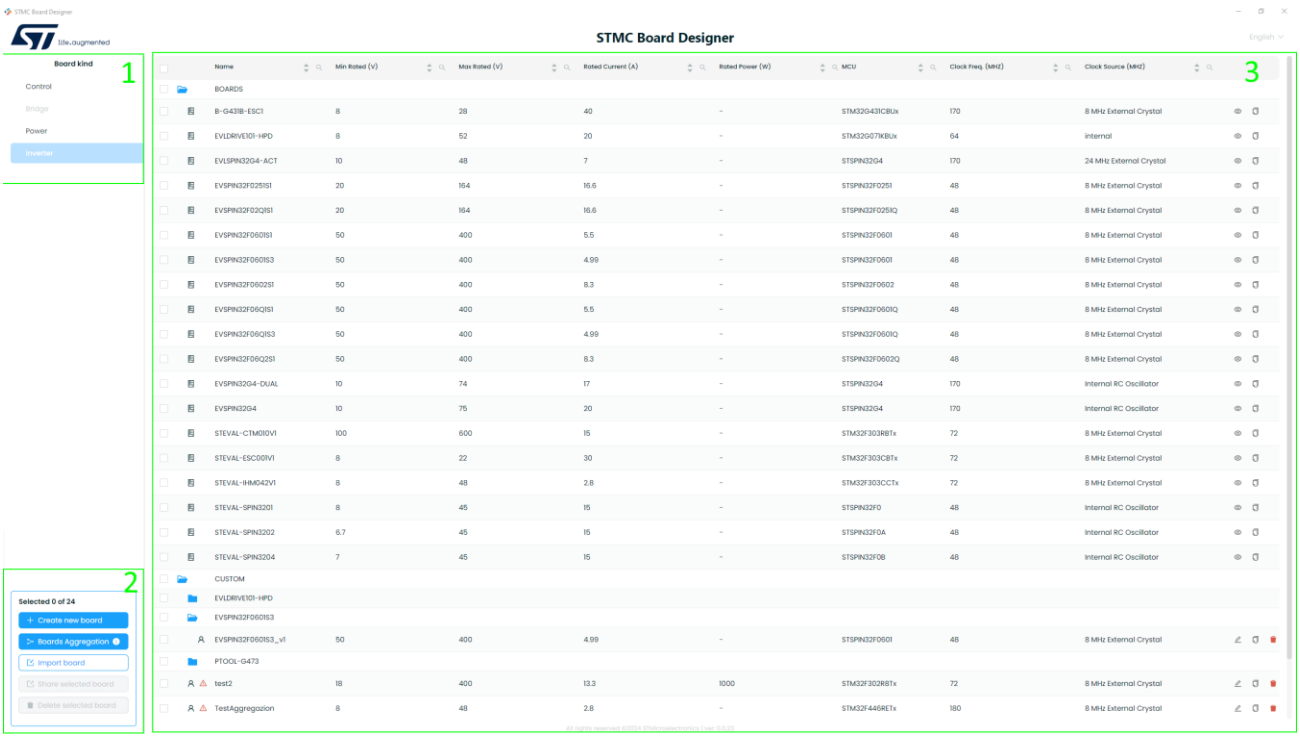


Figure 1: STMC Board Designer –Home View

2. Boards List Area

This area showing the Boards List of the type selected.

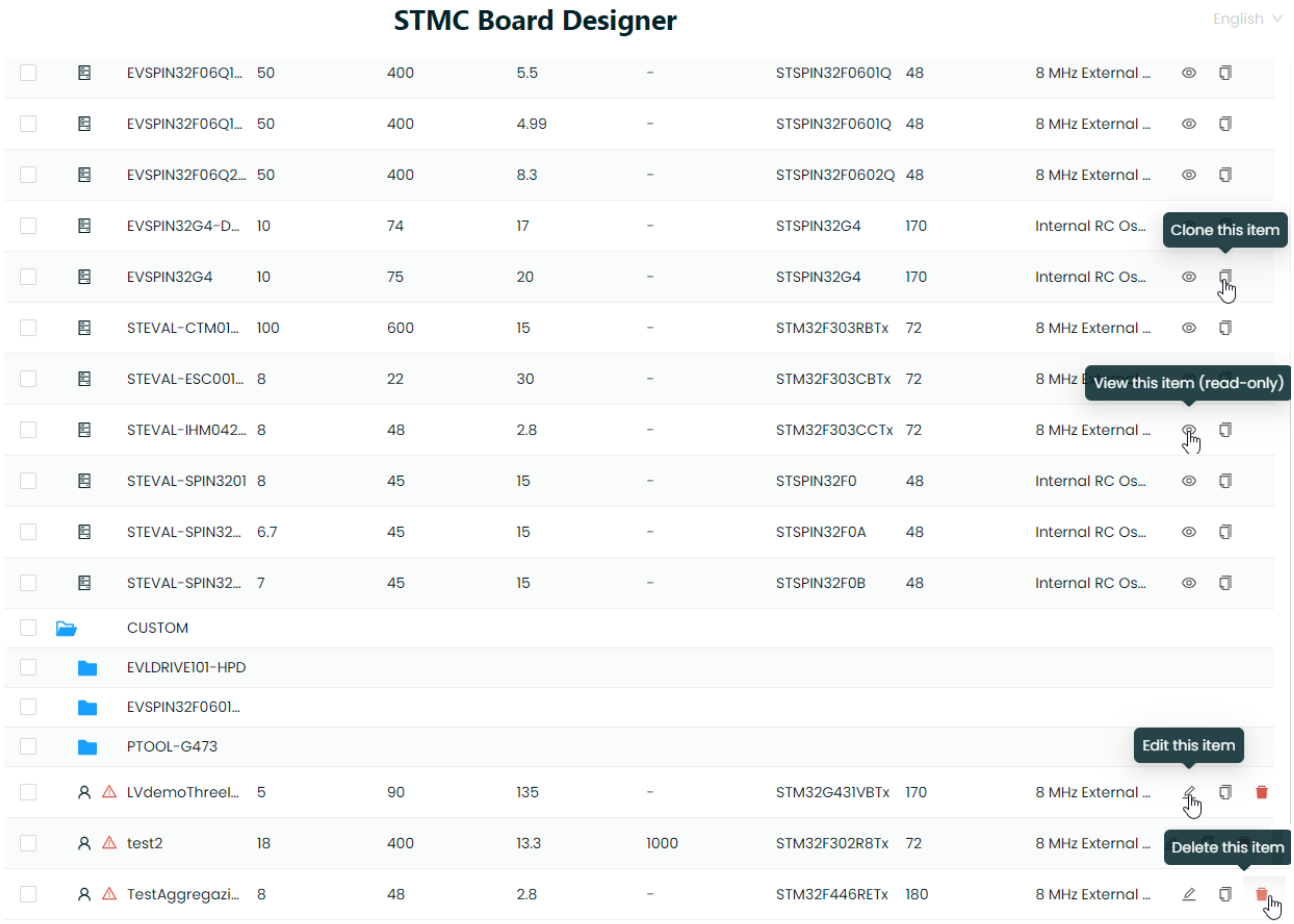


Figure 2: STMC Board Designer – Home View – Boards List

There are different icons to:

	Identify boards in stock.
	Identify custom boards.
	Identify boards with errors.

Additional actions include :

	Clicking the icon visualizes the board without allowing changes. This icon is only for boards in stock.
	Clicking the icon create an unsaved clone of the board.
	Clicking the icon allows for board modifications. This icon is only for custom boards
	Clicking the icon deletes the board. This icon is only for custom boards.

3. Create a new Board

Clicking on the 'Create a new board' button initiates the process to create a board from scratch.

The first step involves selecting the type of board to create.

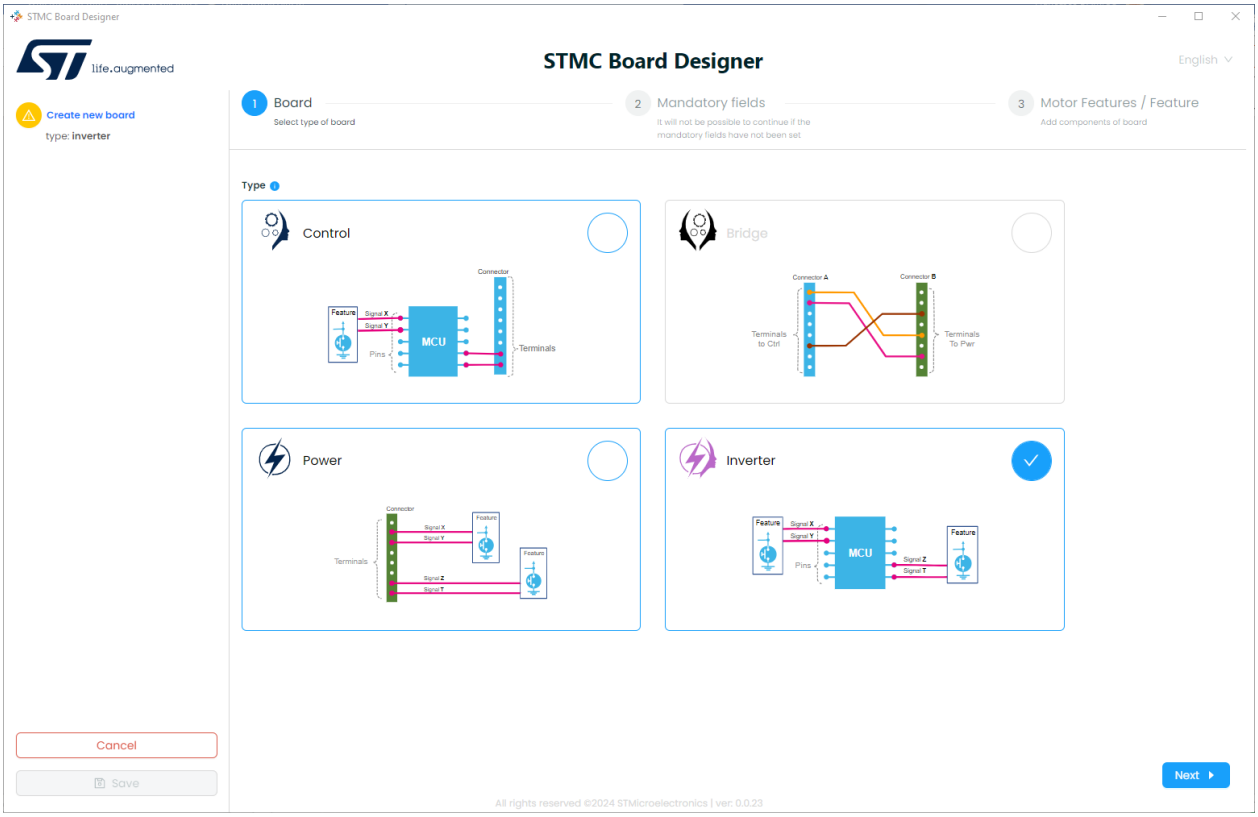


Figure 3: STMC Board Designer – Create new board

The second step requires entering initial information about the board, which varies depending on the board type being created.

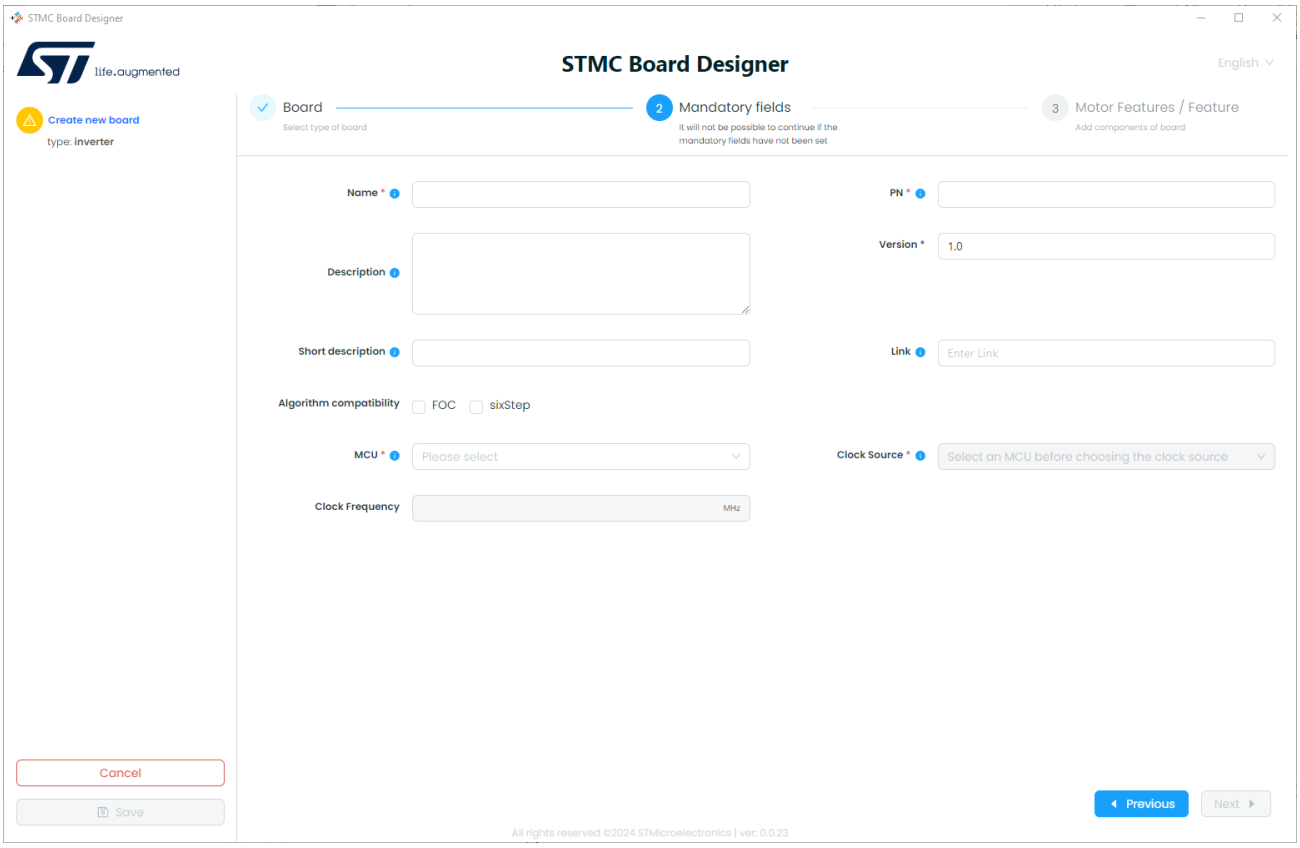


Figure 4: STMC Board Designer – Create new board – Mandatory fields

In the third step, you describe the board's functionality. Different views will be provided depending on the board type.

Clicking on at least one field under 'algorithm compatibility' helps users understand the mandatory features (the minimum required) that must be described to use the board in STMC Workbench with the selected algorithm.

3.2 Power Board

On a Power Board, a connector is considered an entry point for driving a motor. Beyond this entry point, the power board provides its features.

A motor features groups the features installed on the board that are accessible through the connector it represents.

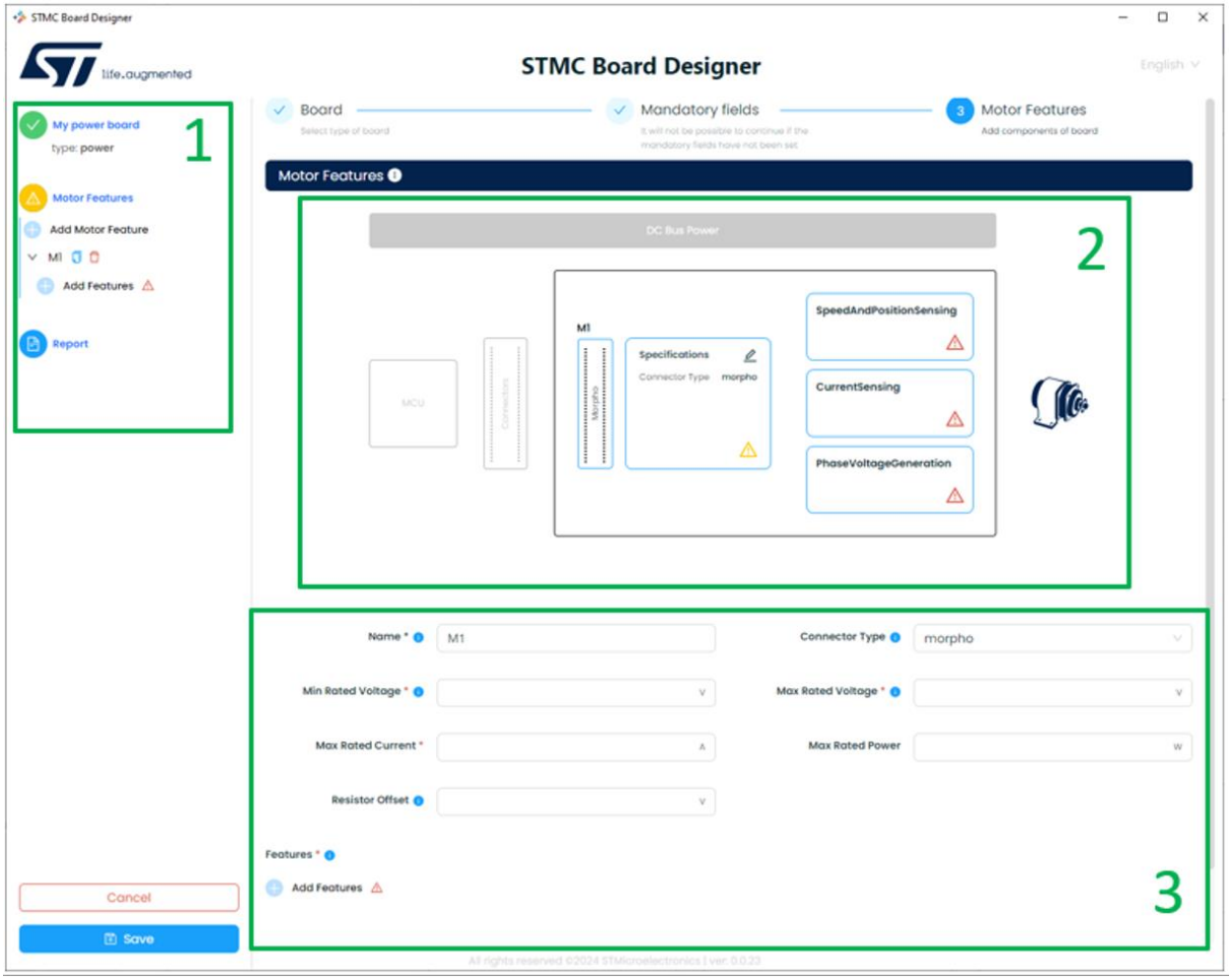
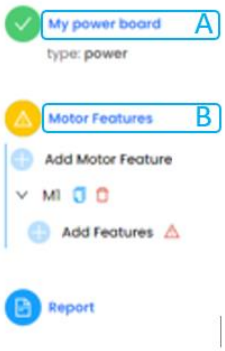


Figure 5: STMC Board Designer – Power board

The view contains three distinct sections:

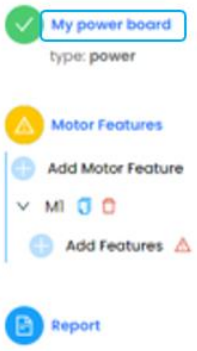
1. This section allows users to navigate to the General Information view of the board (area A) or add features for each Motor Feature and support additional motors by adding new Motor Feature (area B). There is also a dedicated area for the Report; clicking on it displays a view with a report of potential inconsistencies in the Feature/HwVariant.



2. This section displays an interactive schema of the power board highlighting the selected connector and the mandatory feature required.

3. This section presents information relevant to the part of the Section 1 selected:
    a. General Information about the power board.
    b. Details about the Motor Feature showing all previously described features and allowing the addition of new ones.

3.2.1 General Information



The General Information area is accessible by clicking on the designated part.
This area displays the basic information of the Power Board, including:

- Name
- Part number (PN)
- Board Version
- Description and short description
- Algorithm Compatibility

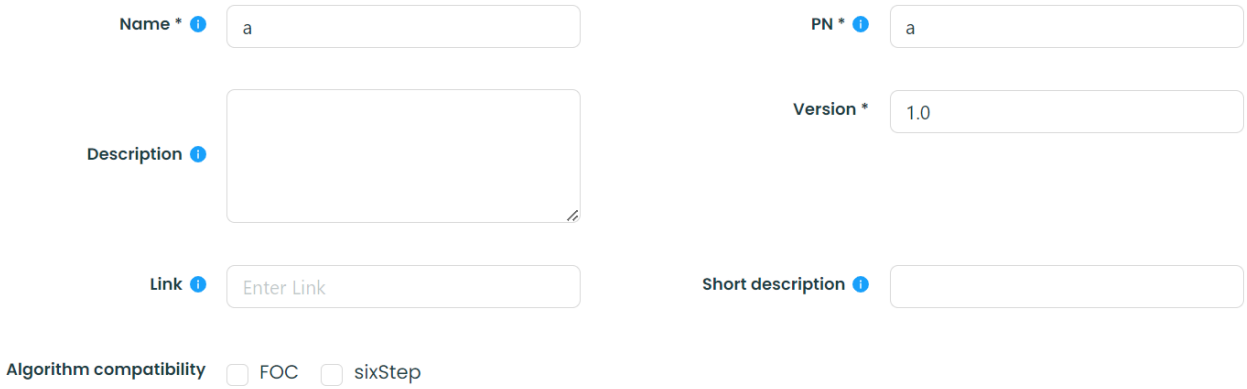
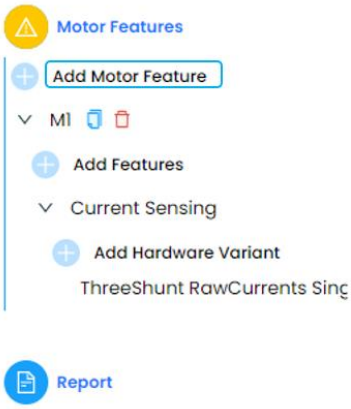


Figure 6: STMC Board Designer – Power board – General Information

3.2.2 Motor Feature



The Motor Features area is accessible by clicking on the designated part. Within this area :

- Clicking on the icon removes the selected Motor Feature.
- Clicking on the icon creates a clone of the Motor Feature.
- Clicking on the button Add Features displays a view of all the features supported by the Power Board.
- Clicking on the button Add Hardware Variant opens the view to create a new Hardware Variant for the chosen feature.

All previously described features will be displayed in the Motor Feature area, and there is an option to add new ones..

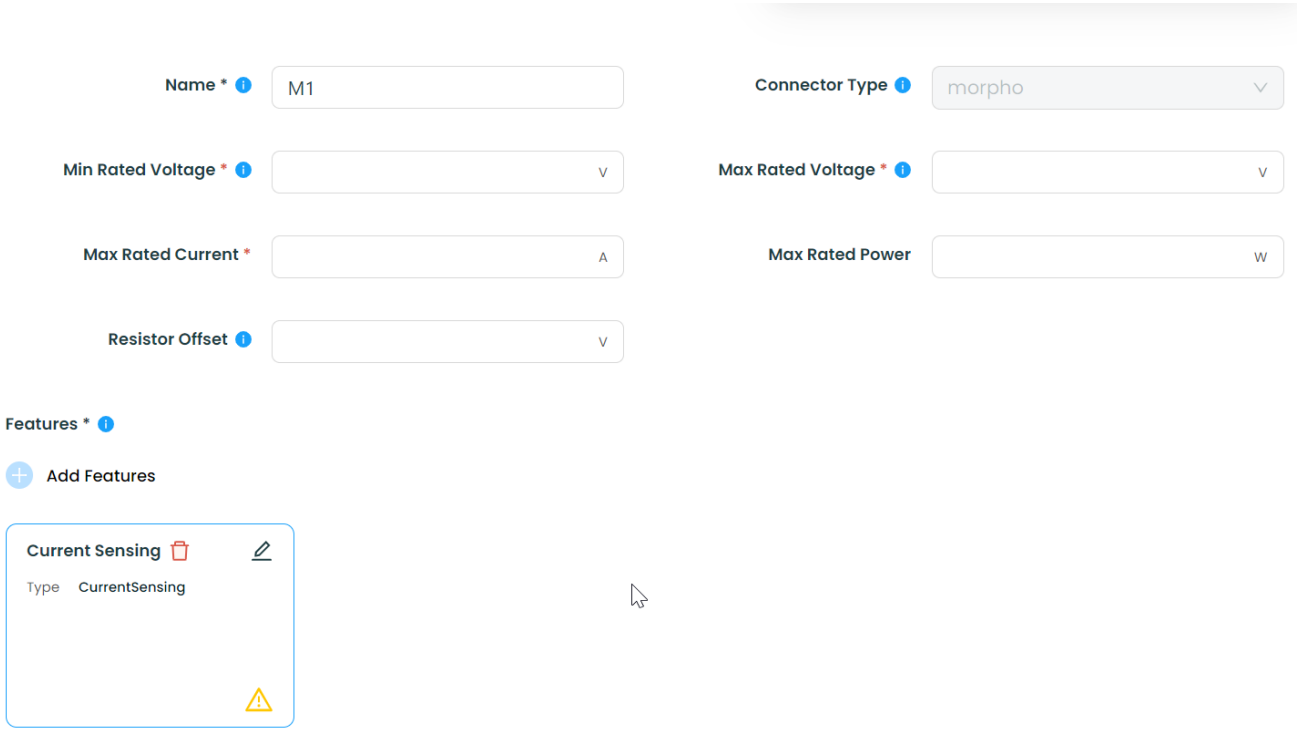
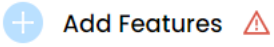


Figure 7: STMC Board Designer – Power board – Motor Feature

3.2.2.1 Add Feature

Clicking on the button 

displays a view listing all the features supported by the Power Board.

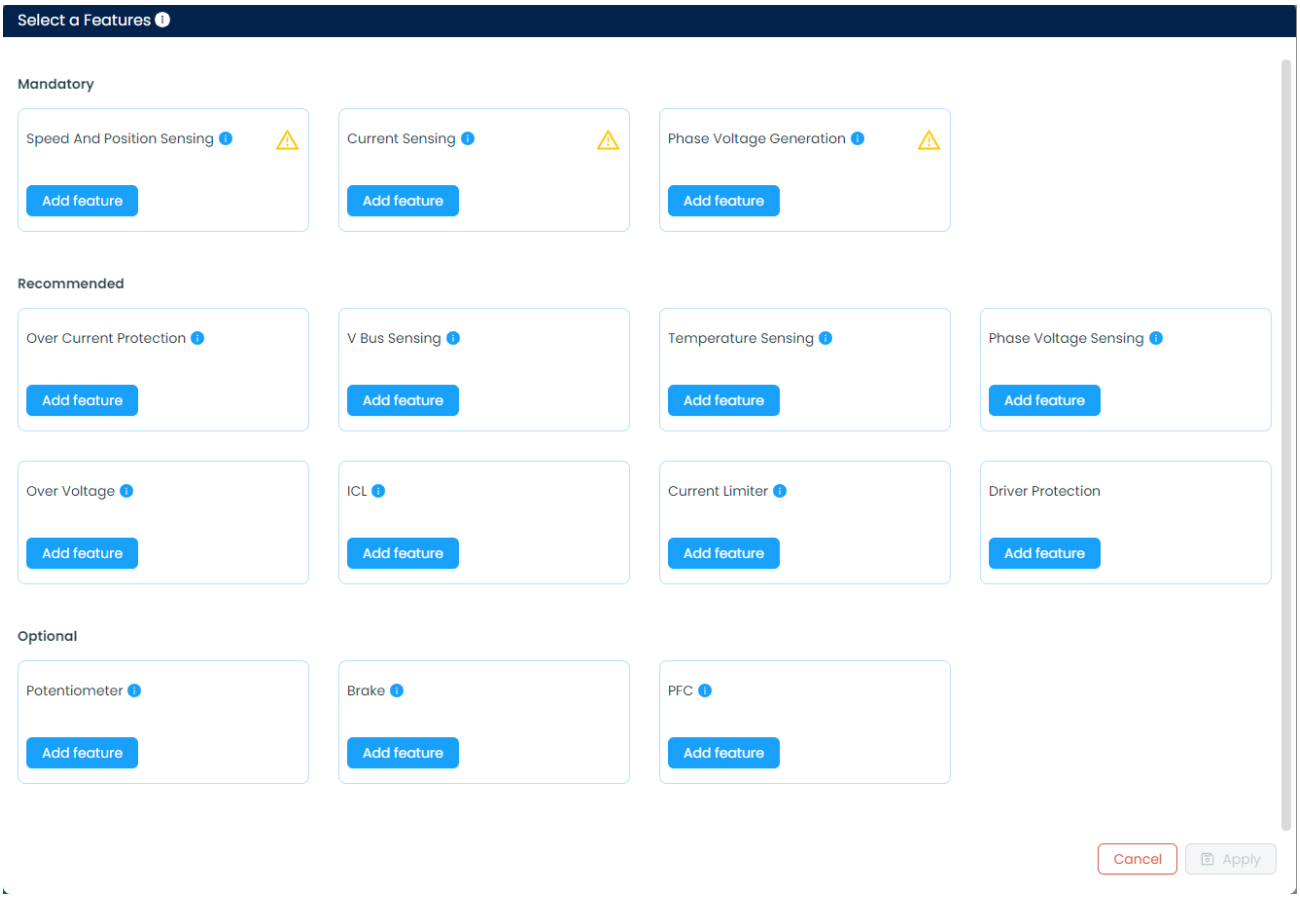


Figure 8: STMC Board Designer – Power board – Add Features

The features are grouped in:

- **Mandatory** – These are the essential features required for FOC and/or Six Step algorithms, which a board must support for compatibility with Workbench.
- **Recommended** – These features can enhance the motor control (MC) application.
- **Optional** – These features may or may not be included on a board.

The view for the selected feature displays its name, all the fields that characterize the feature, and a button to add all the Hardware Variants implemented on the board.

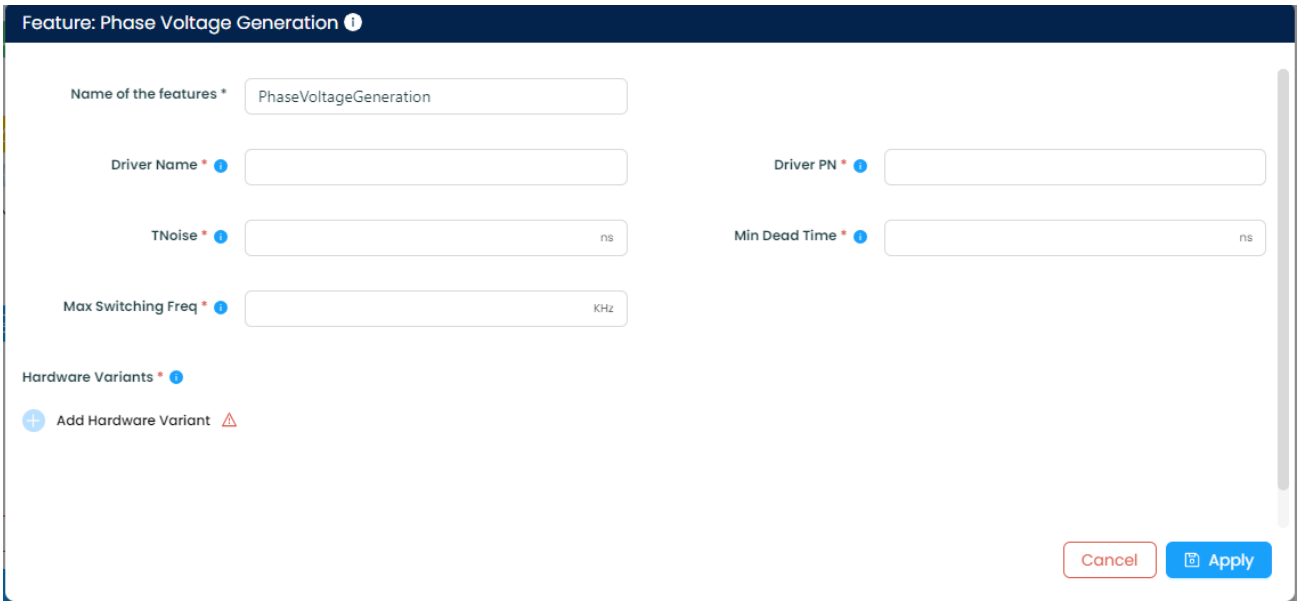


Figure 9: STMC Board Designer – Power board - Feature

3.2.2.2 Add Hardware Variants

Each Hardware Variant is detailed in a view that outlines its characteristics.

Generally, the Hardware Variant view includes :

- ***Description*** – a detailed explanation of the variant.
- ***Schema*** – a visual representation of the variant.
- ***Help*** – a brief text providing guidance on how to activate this variant.
- ***Complessity*** – a value indicating the 'difficulty' level associated with using the variant.
- ***Fields*** – Specific to the Variant.
- ***Signals*** – these represent the physical interface that the hardware variant provides for the MCU. The implemented signals are routed throught the connector terminals, which are then linked to the MCU pins via the connector on the control board.
  For each signal multiple connections may be possibile, and the user can specify activation details for each connection, including the complexity of implementation.

  When the ***Motor Control Connector*** is utilized, the tool automatically establishes the connections between signals and connector terminals.

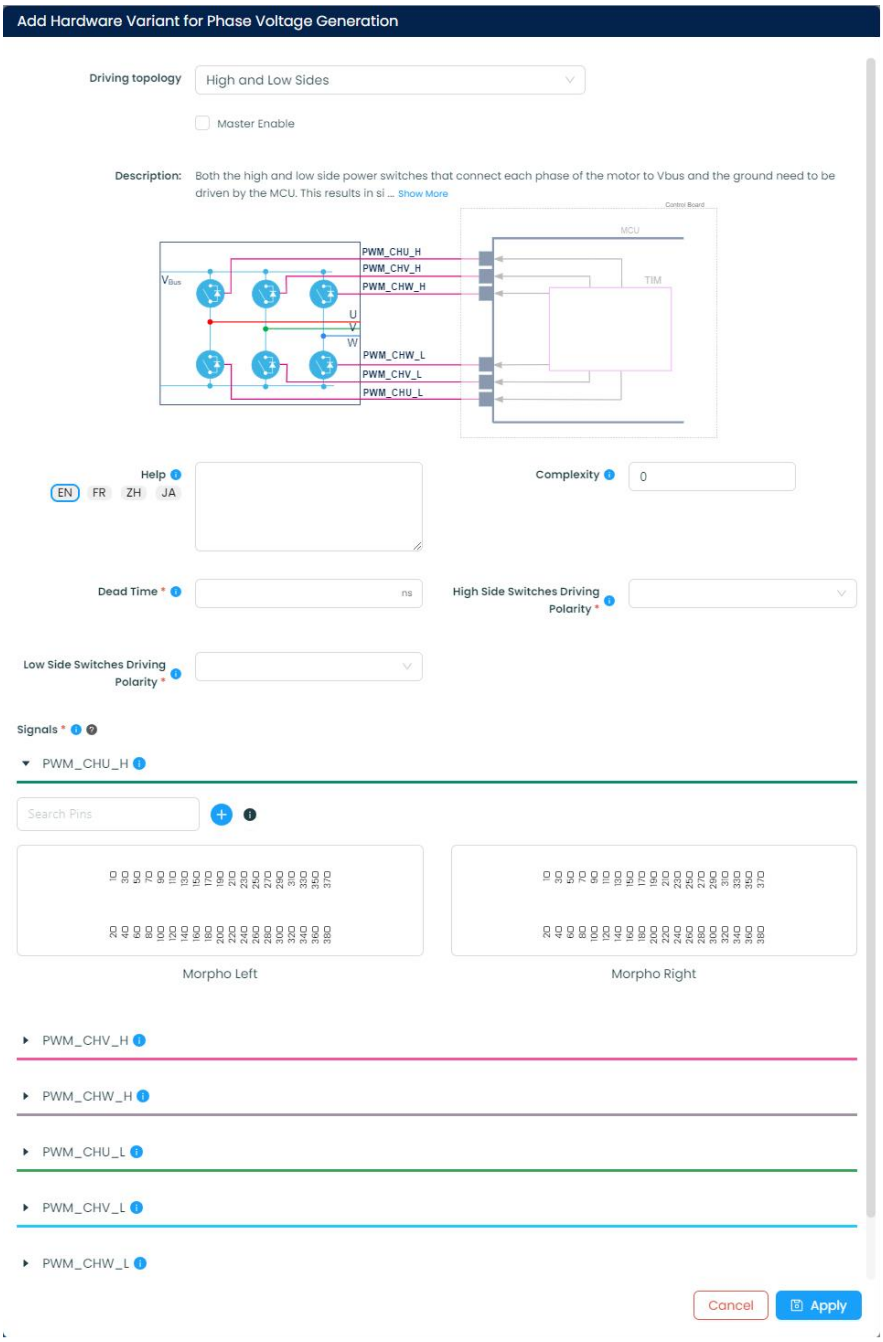


Figure 10: STMC Board Designer – Power board – Hardware Variant

3.2.3 Report

The 'Report View' provides a report of any potential inconsistencies in the Features/HwVariants.

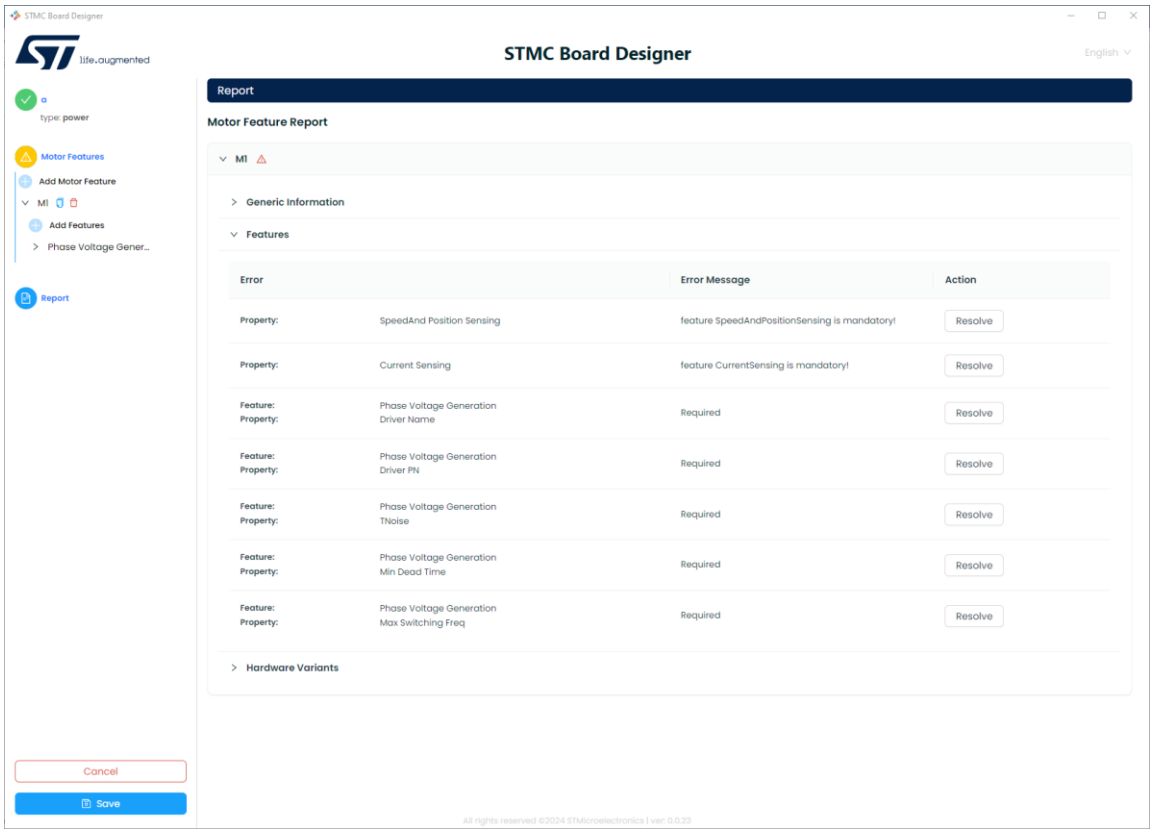


Figure 11: STMC Board Designer – Power board - Report

Clicking the 'Resolve' button allows the user to switch to the dedicated view to address the issue.

3.3 Control Board

A control board hosts exactly one STM32 MCU. It can implement features and it provides one or more connectors. Each connector can be used to plug a Power board.

Some of the features implemented by a control board are independent of its connectors.

Some other features can only be used with a connector to the board.

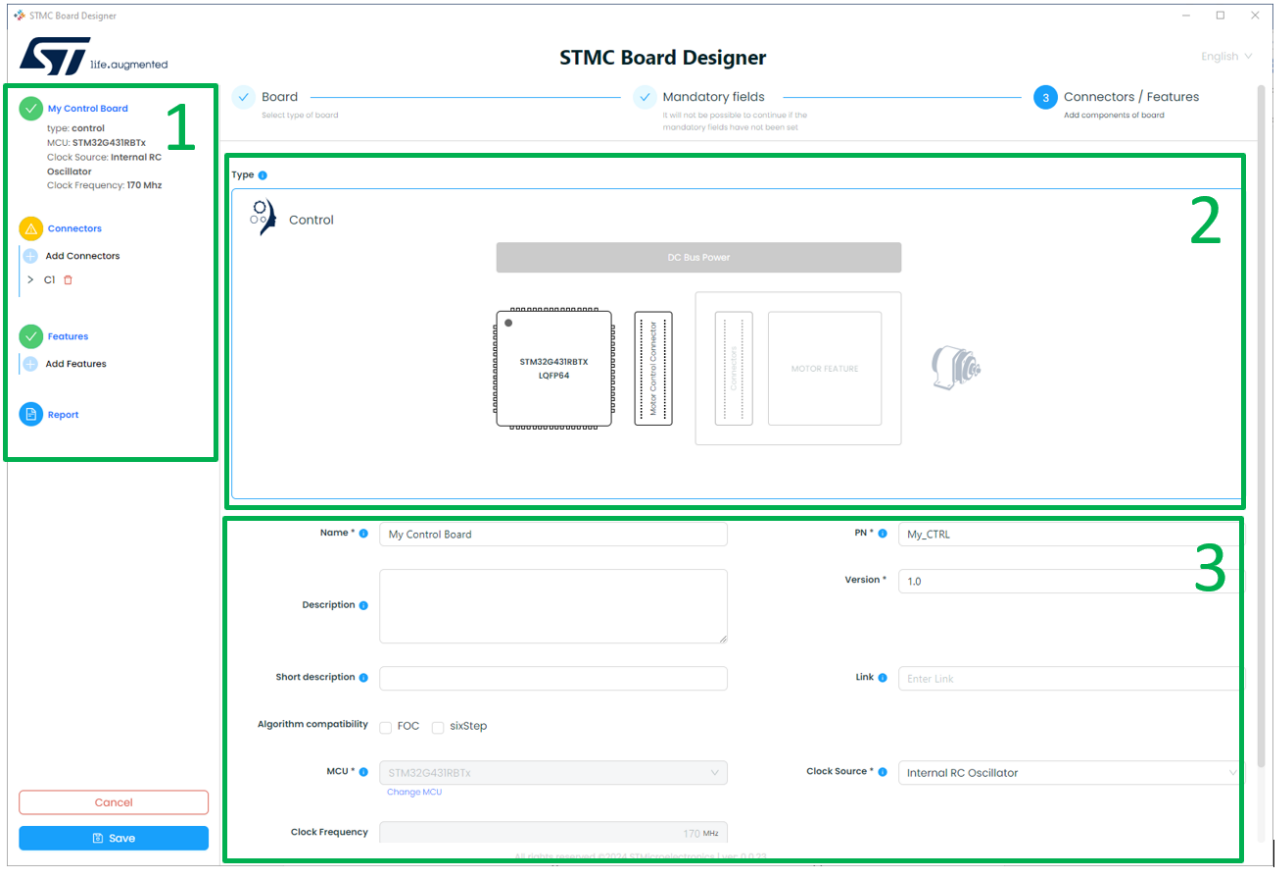
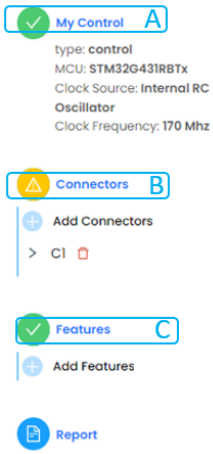


Figure 12: STMC Board Designer – Control board

In the view there are three different sections:

1. This section allows users to navigate to the General Information of the board (area A), add feature for each connector, or add a new Connector (area B). It is also possible to add Feature implemented by the board and that are independent of connectors (area C). Additionally, there is an area dedicated to the Report ; clicking on it a view will display a view providing a report of any possible inconsistencies in the Feature/Hardware Variant.

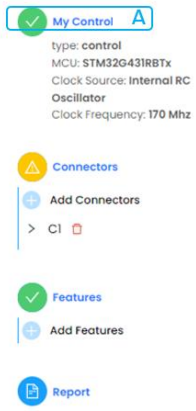


2. This section displays a schematic of the control board highlighting the selected connectors

and MCU. The schema is interactive.

3. This section presents information based on the part of section 1 selected:
    a. General Information about the control board.
    b. Information about the connectors including the connections between the terminals of the connector and MCU, and the features already created, that the board can implement using the connector. It is also possible to add additional features.
    c. The Features already created, that are independent of connectors; with the option to add more.

3.3.1 General Information



In this view the basic information of the control Board is displayed:

- **Name**
- **Part Number** (PN)
- **Version** of the board
- **Description** and **Short Description**: A detailed description and a brief summary of the board.
- **Link** to a board website: A hyperlink to the board's website for more information.
- **MCU** mounted on the board: The MCU used on the board. Users can change the MCU by clicking the “Change MCU” button.
    - **Clock source**
    - **Clock Frequency**

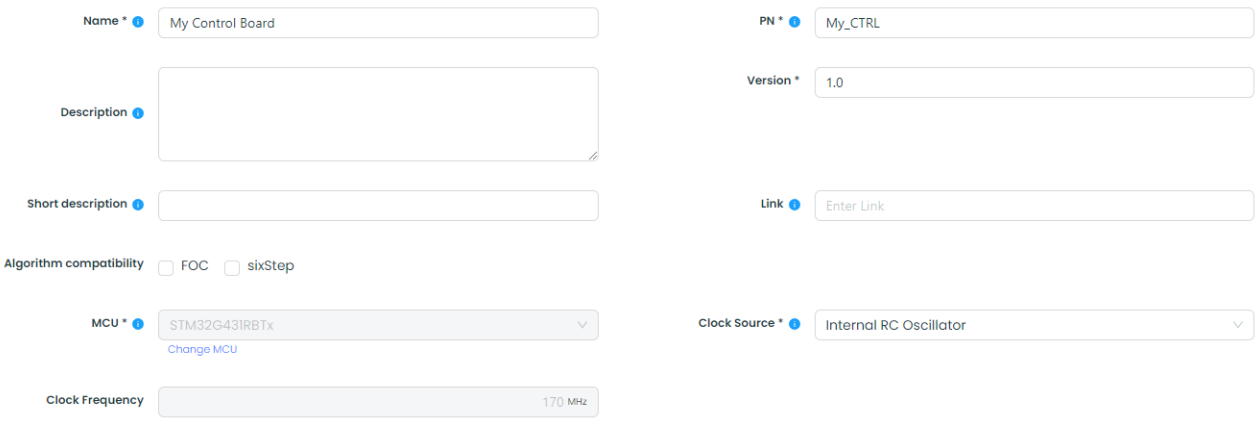
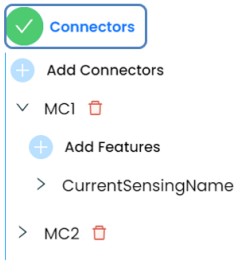


Figure 13: STMC Board Designer – Control board – General Information

3.3.2 Connectors



To access the Connectors area, click on the designated part, and the Connectors view will be displayed:

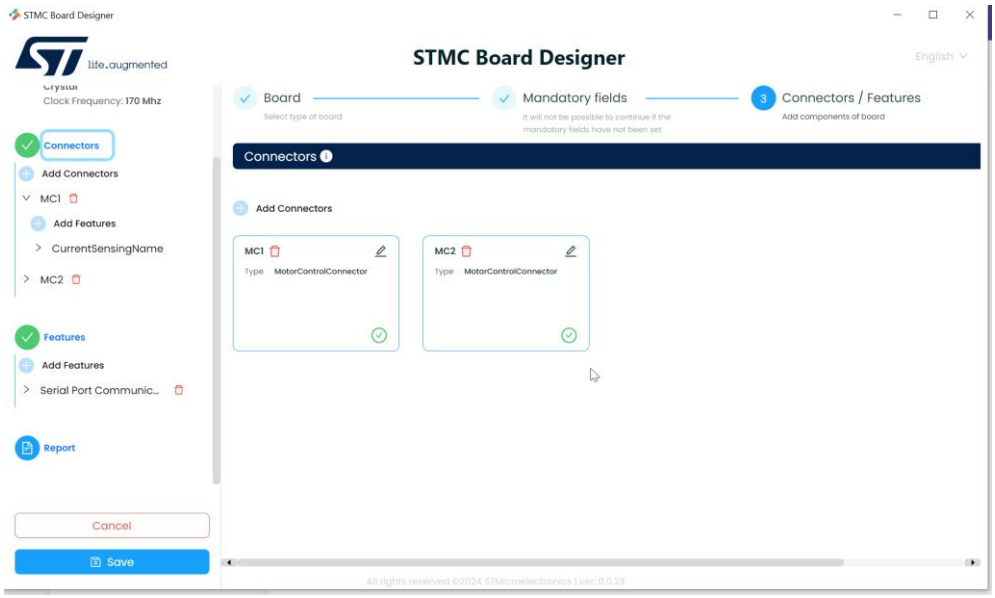
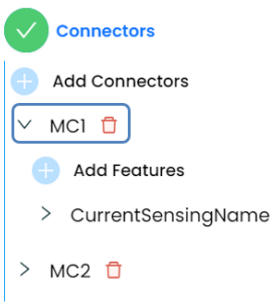


Figure 14: STMC Board Designer – Control board - Connectors

3.3.2.1 Add Connectors

To create a new Connectors, click the Add Connectors button either in the Connectors view or on the left panel of window.

3.3.2.2 Connector connections



When you click on the name of the connector, the view displaying the connections between the terminal of the connector and the board, and/or the pins of the MCU mounted on the control board, is shown. Once the connection is established, it will be visible on the right part of the view.

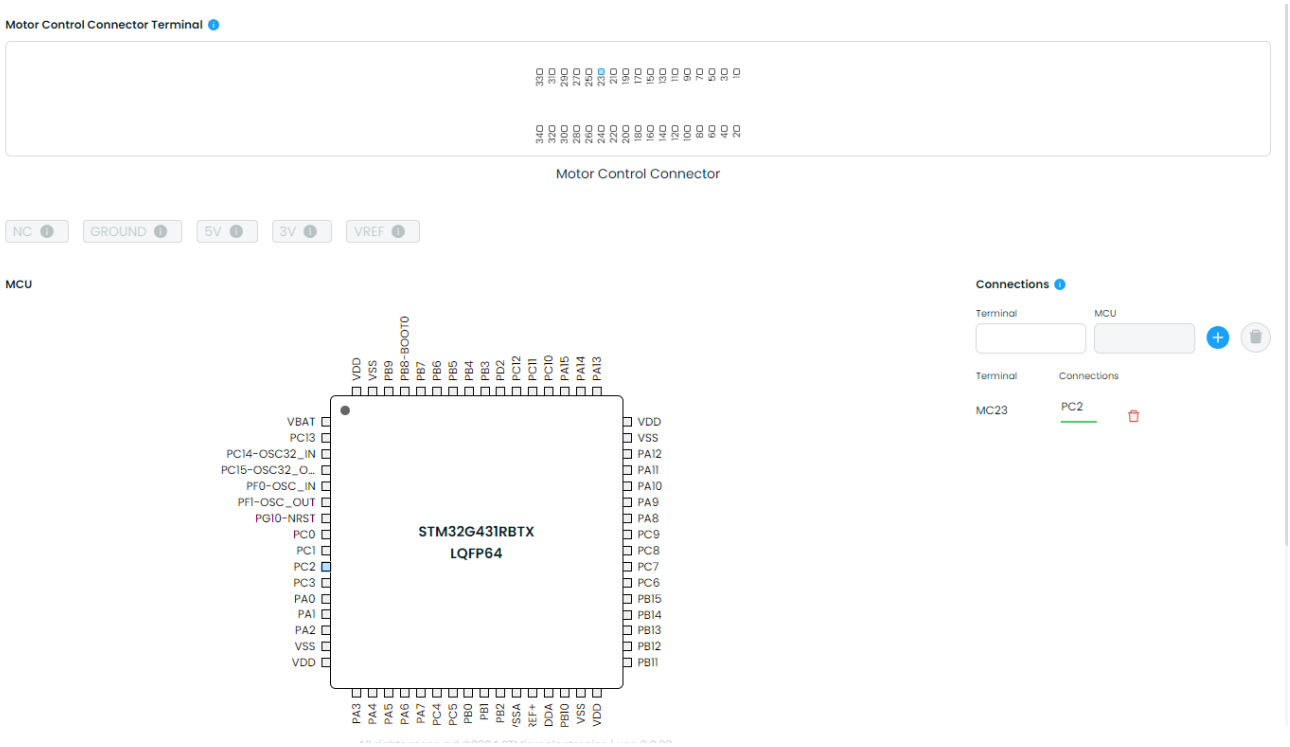


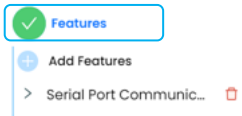
Figure 15: STMC Board Designer – Control board - Connector

3.3.2.3 Add Feature on the Connector

Some control boards may have a features that are only usable with a connector. To add such a feature, click the

button located at the bottom of the connector connection view or in the left panel of the window. The procedure for adding a feature is similar to the one described for the power board.

3.3.3 Feature implemented on board



To access the view of the features implemented on the board, you would click on the designated area 

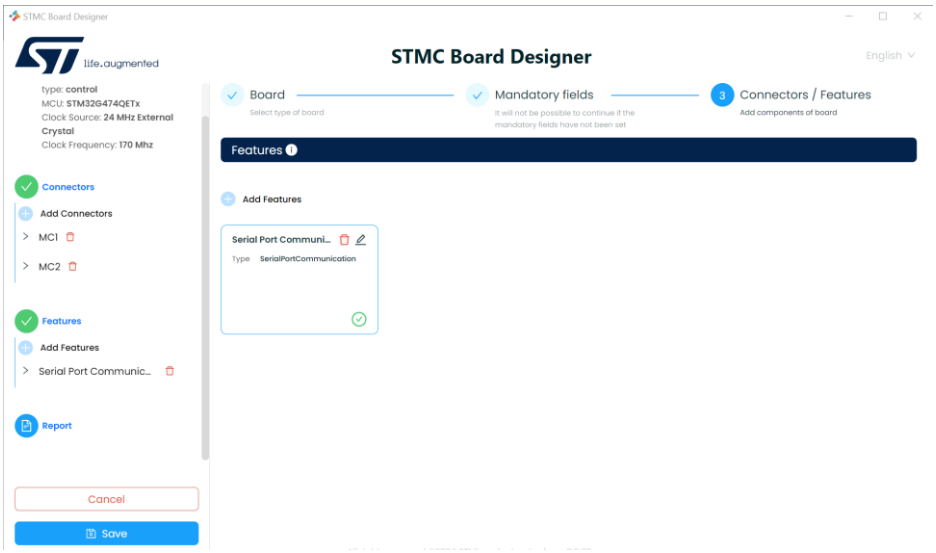


Figure 16: STMC Board Designer – Control board – Feature on board

3.3.3.1 Add Feature

To add a feature, click on the Add Features button either in the view or in the left panel of the window. The procedure of adding a feature is similar to that described for the power board.

3.4 Inverter Board

Inverters board consist of an MCU, a control stage, and one or more power stages. They can be seen as a control board on which one or more power boards are plugged.

Like a Control Board, an Inverter hosts one STM32 MCU.

Like a Power Board, an Inverter implements one or more Motor features, each having the features needed to drive one motor.

Finally, still like a Control Board, an Inverter can implement features that are connector-independent. In the context of an Inverter, such features do not relate to any of the Motor Drives implemented on the board.

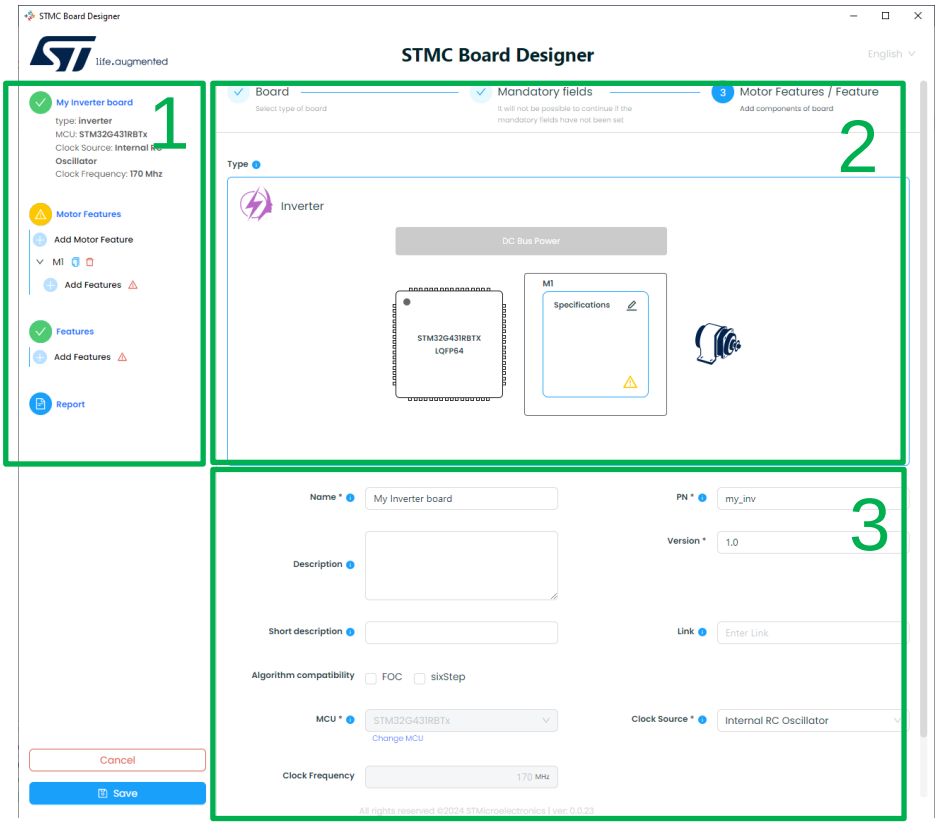
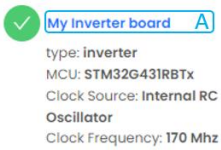
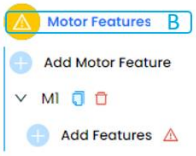


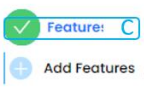
Figure 17: STMC Board Designer – Inverter board

The view consists of three different sections:

1. This section allows users to navigate to the General Information of the board (area A), add features for each Motor Feature, or add a new Motor Feature to support multiple Motors (area B). Additionally, users can add the Feature implemented by the board that are independent of Motor Features (area C).
   There is also a dedicated area for the Report, clicking on it will display a view providing a report of any potential inconsistencies in the Feature/Hardware Variant.





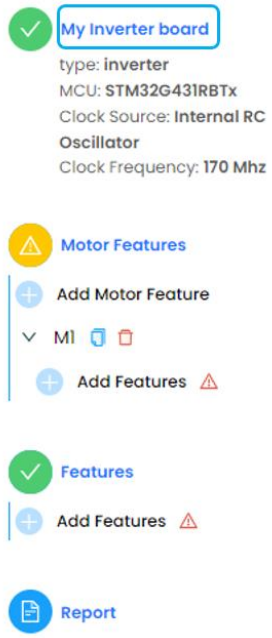


2. This section display a schematic of the inverter board, highlighting the Motor Features and the

selected MCU. The schematic is interactive.

3. This section presents information based on the selected which part of the section 1:
    a. General Information about the inverter board
    b. Information about the Motor Features, including the connections between the terminals of the connector and MCU, and the features already created that the board can implement using the connector; users can also add additional features.
    c. The Features already created, that are independent of Motor Features; users can add add more.

3.4.1 General Information



In this view there are the basic information of the inverter Board:

- **Name**
- **Part Number** (PN)
- **Version** of the board
- **Description** and **Short Description**: A detailed description and a brief summary of the board.
- **Link** to a board website: A hyperlink to the board's website for more information.
- **MCU** mounted on the board: The MCU used on the board. Users can change the MCU by clicking the “Change MCU” button.
    - **Clock source**
    - **Clock Frequency**

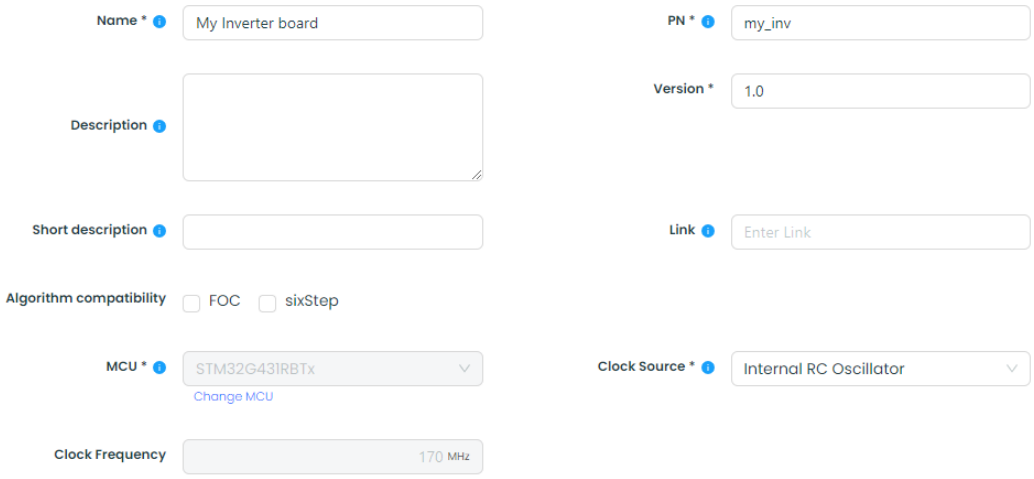
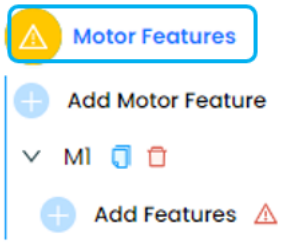


Figure 18: STMC Board Designer – Inverter board – General Information

3.4.2 Motor Features



The Motor Features area is activated clicking on the corresponding part  and offers the same functionality as the power board.
Similar to the power board, the area dedicated to Motor Feature will display all the features already described, and it will be possible to add new ones.

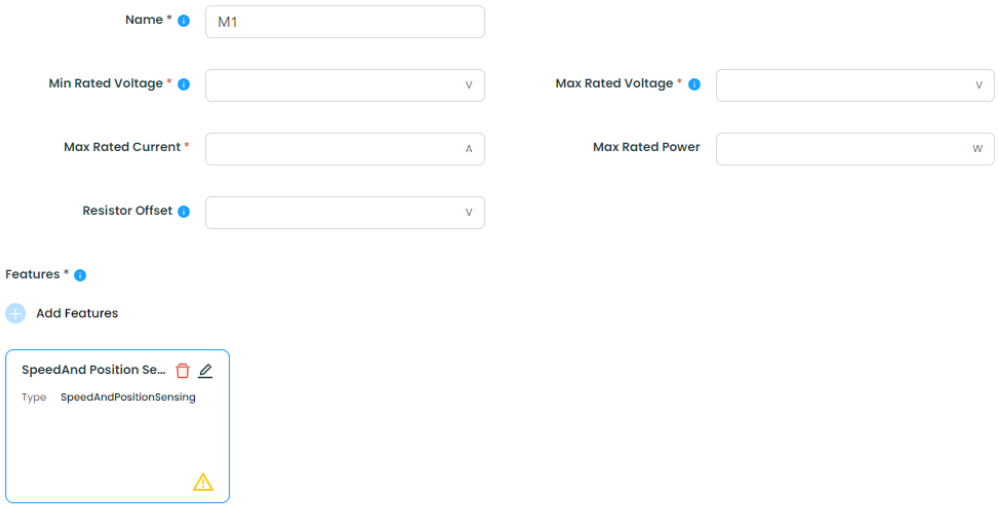
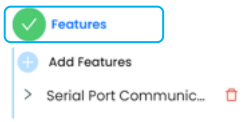


Figure 19: STMC Board Designer – Inverter board – Motor Feature

The different with the Motor Features of the power board is that for the inverter, there are no connectors, therefore, the signal connections in the Hardware Variants are made directly with the MCU.

3.4.3 Feature implemented on board



The inverter board offers identical functionality to that of the control board.

4. Board Aggregation

Clicking on the “Board Aggregation” button initiates the process of creating an inverter board by combining the existing control board and power board. This process consist of three steps:

1. **Select the existing Control and Power boards**: Choose the specific control and power boards to be combined.
2. **Identify how to combine them**: Select how each connector from the control board could be connected with one of the motor feature of the power board.
3. **Finalize the process**: Add the specific information for the new inverter board.

4.1 Select Boards

In this step, you will select the control and the power boards that will be used to define the new inverter.
A summary of the each board’s functionality will be displayed.

Figure 20: STMC Board Designer – Board Aggregation – Select Boards

4.2 Connections

After selecting the Control and Power boards, it is necessary to choose the connections between the boards. For the Control Board, select which connector to use and determine which Motor Feature of Power board to connect it to.

A summary of the selected connector's features and "Motor Feature" features will be displayed.

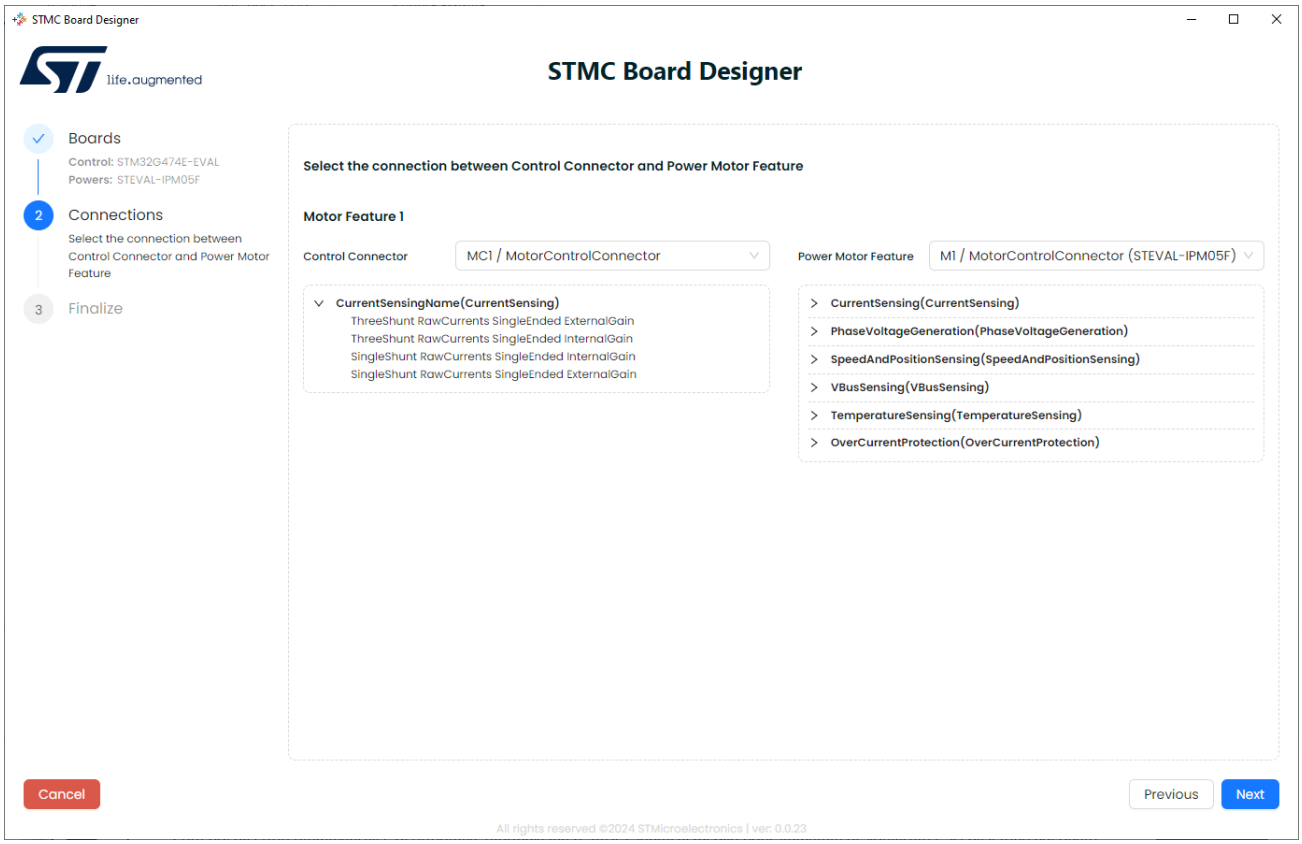


Figure 21: STMC Board Designer – Board Aggregation – Connection

4.3 Finalize

In this step the Inverter board is created.

A Report concerning Features, Hardware Variants will be generated, highlighting any éléments that were not created.

To finalize the process, you need to provide a name and a Part Number (PN) for the board.

Afterward, two option are available:

1. **Save the board**.
2. **Edit the board**. If you choose to edit, the board will not be saved automatically. It is the user's responsibility to save the board after making the necessary changes.

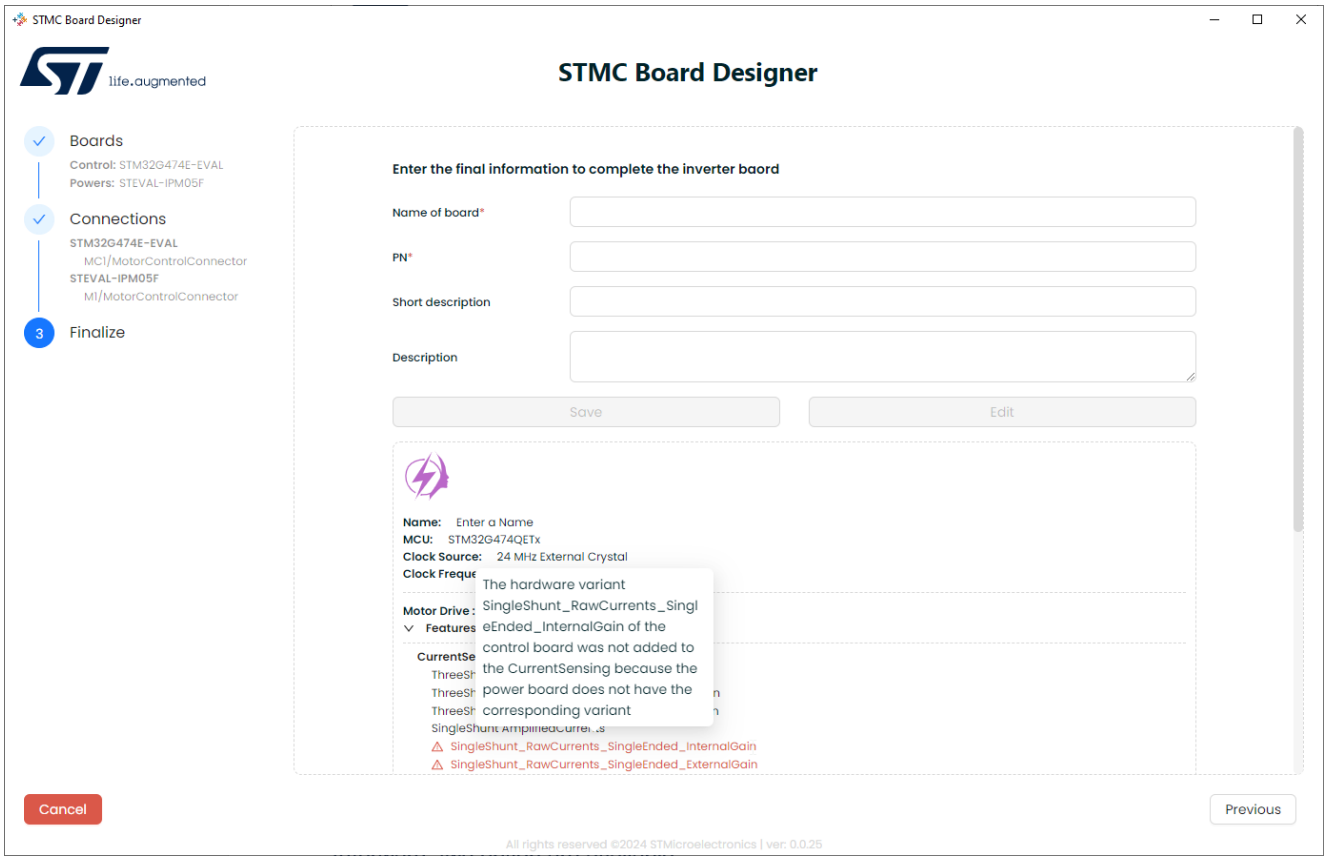


Figure 22: STMC Board Designer – Board Aggregation – Finalize