ALTAIR

Altair® FluxMotor® 2024

Supervisor

General user information

Contents

1   SUPERVISOR OVERVIEW

1.1   Overview

The aim of the supervisor is to group all the needed applications to build and manage the motors.
Supervisor is the first dialog the user comes across and it displays all applications used to build, test and compare motors.
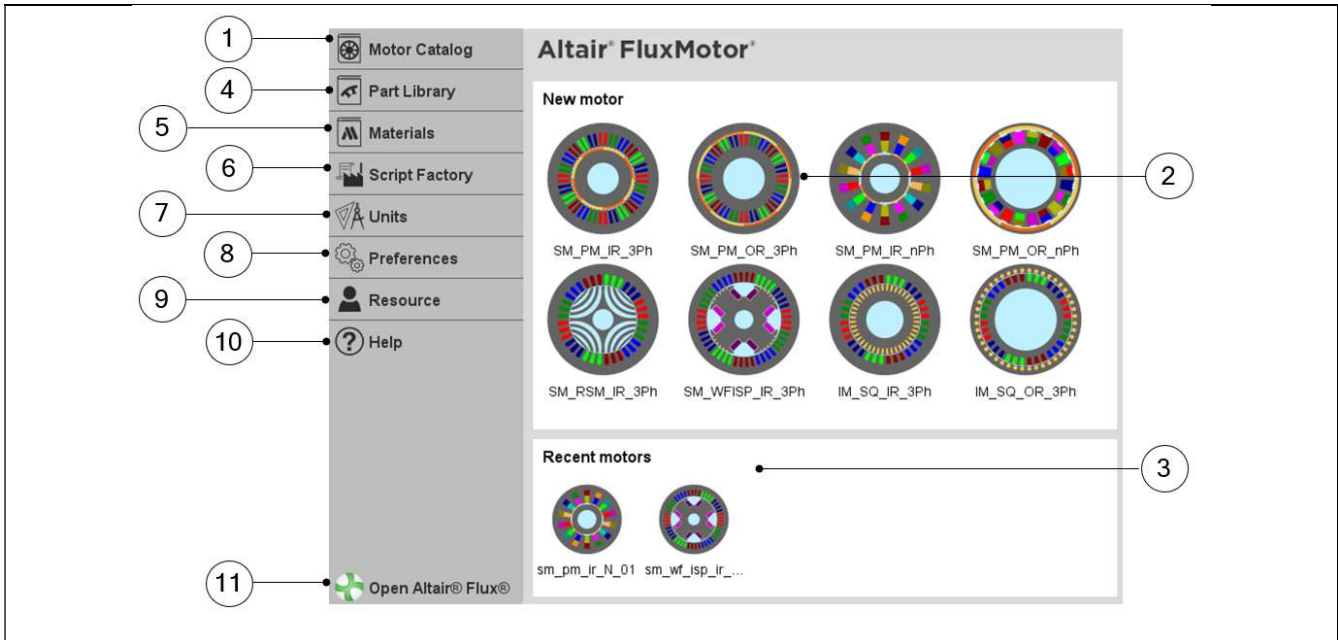
	Applications available from the Altair® FluxMotor® supervisor
1	Click on Motor Catalog. Refer to and manage catalogs, compare, and choose motors.
2	Click on a type of motor and get into Motor Factory for designing and testing motors. 8 types are available: – SM_PM_IR_3Ph: 3-Phase synchronous machines with permanent magnets – Inner rotor – SM_PM_OR_3Ph: 3-Phase synchronous machines with permanent magnets – outer rotor – SM_PM_IR_nPh: 3-Phase synchronous machines with permanent magnets – Inner rotor – SM_PM_OR_nPh: 3-Phase synchronous machines with permanent magnets – outer rotor – SM_RSM_IR_3Ph: 3-Phase Reluctance Synchronous Machines – Inner rotor – SM_WF_ISP_IR_3Ph: 3-Phase Wound Field Inner Salient Pole Synchronous Machines – Inner rotor – IM_SQ_IR_3Ph: 3-Phase induction machines with squirrel cage – Inner rotor – IM_SQ_OR_3Ph: 3-Phase induction machines with squirrel cage – outer rotor
3	Click on a recent studied motor and get into Motor Factory for designing and testing motors
4	Click on Part Library. Refer to and manage parts: choose, modify or create
5	Click on Materials. Refer to and manage materials: choose, modify or create.
6	Click on Script Factory to create and run scripts for driving FluxMotor® applications. Available in user beta mode (See user preferences).
7	Click on Units. Refer to and choose the units available in FluxMotor®.
8	Click on Preferences to choose user preferences.
9	Click on Resource gives access to Altair Connect.
10	Click on Help gives access to Online help, Licensing system and information about FluxMotor® and Altair® HyperWorks®
11	Click on "Open Altair® Flux®" to launch Flux® directly and quickly from FluxMotor® supervisor

Altair® FluxMotor® applications are briefly described in the next chapter.

1.2   Application to access motors.

1.2.1   Motor Catalog

Motor Catalog is a **Powerful project management** to refer to and manage catalogs, compare and choose motors

Motor catalog environment allows easy management of motors and projects.
An embedded comparator is available. The general data and performances of several machines can be compared thus simplifying the process to choose a machine.

For more information, refer to **Motor Catalog user guide.**

1.2.2   Motor Factory

With Motor Factory, get into a dedicated space for designing and testing motors.

Designing and testing electrical motors

- The dedicated design environment helps user define machines within minutes.
- Then using a step-by-step process, a dedicated interface will help users to finalize machine design which includes the shaft, rotor, magnets to the slots, winding, and housing of the stator.

- The dedicated test environment enables users to assess motor performance.
- Standard and relevant test portfolio is available and predefined tests are ready to be performed.

For more information, refer to **Motor Factory user guide.**

1.3   Building blocks of machines

1.3.1   Part Library

Part Factory allows an **Effective management of machine parts.** Refer to and manage parts: choose, modify or create.

- In Part Library area, libraries are provided containing standard parts.
- Many slots, magnets and bars are available, and all the topologies are parameterized.

For more information, refer to **Part Library user guide.**

1.3.2   Part Factory

Part Factory can be accessed from Part Library. Get into a dedicated space for visualizing, modifying, or creating parts.

- Customization of parts (slots, magnets)
- Standard parts, slots and magnets are provided, which can be edited and customized for various configurations.

For more information, refer to **Part Factory user guide.**

1.3.3   Materials

A comprehensive and scalable material database. Refer to and manage materials: choose, modify, or create.

- Many typical materials are provided: Lamination, Solid, Magnet, Electrical Conductor, Electrical Insulator and Fluid.
- Users can also create their own materials.

For more information, refer to **Materials user guide.**

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1.4   Miscellaneous functions to manage FluxMotor®

1.4.1   Choice of units

Refer to and choose the units available in FluxMotor®.
For additional information, refer to chapter below.

1.4.2   Resource

To get into Altair Connect.
Access Altair support and information with your Altair account.
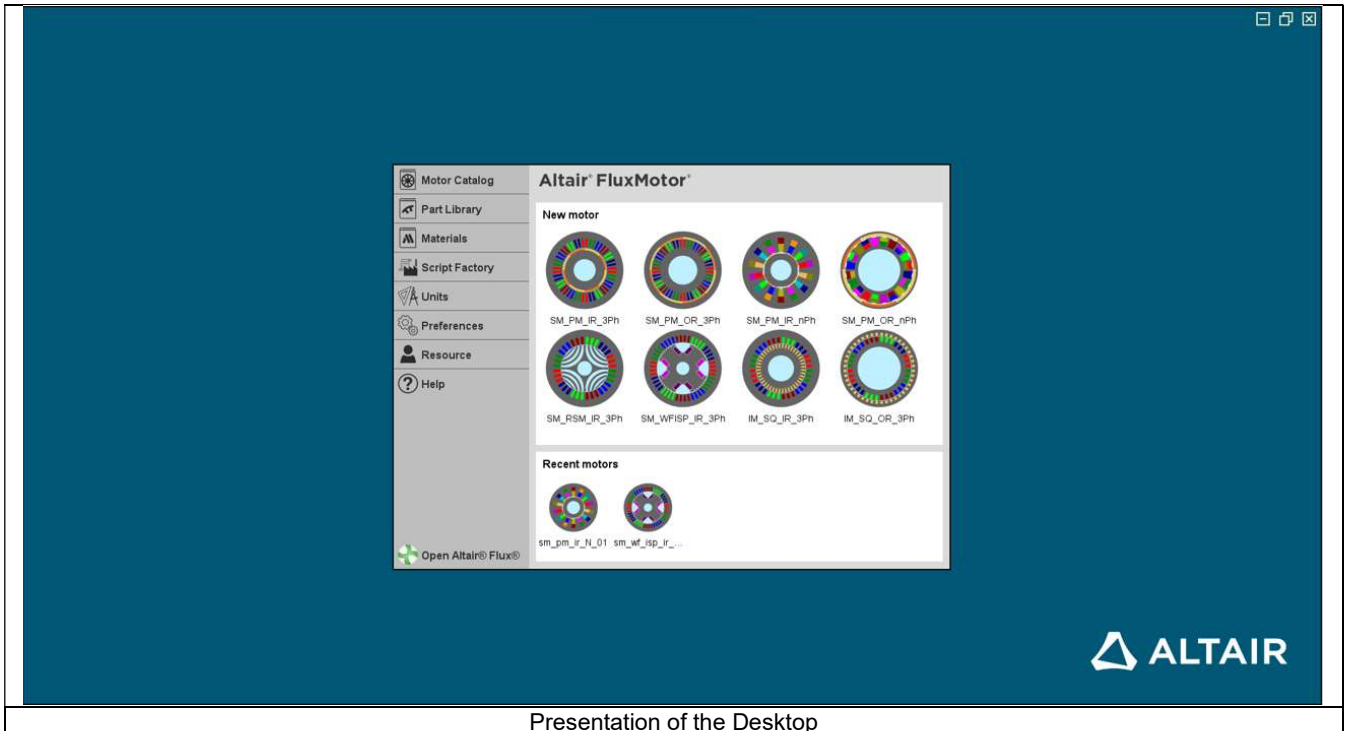
1.4.3   User preferences

Choose user preferences.
For additional information, refer to chapter below.

1.4.4   Help

This gives access to Online help, Licensing system and information about FluxMotor® and Altair® HyperWorks®
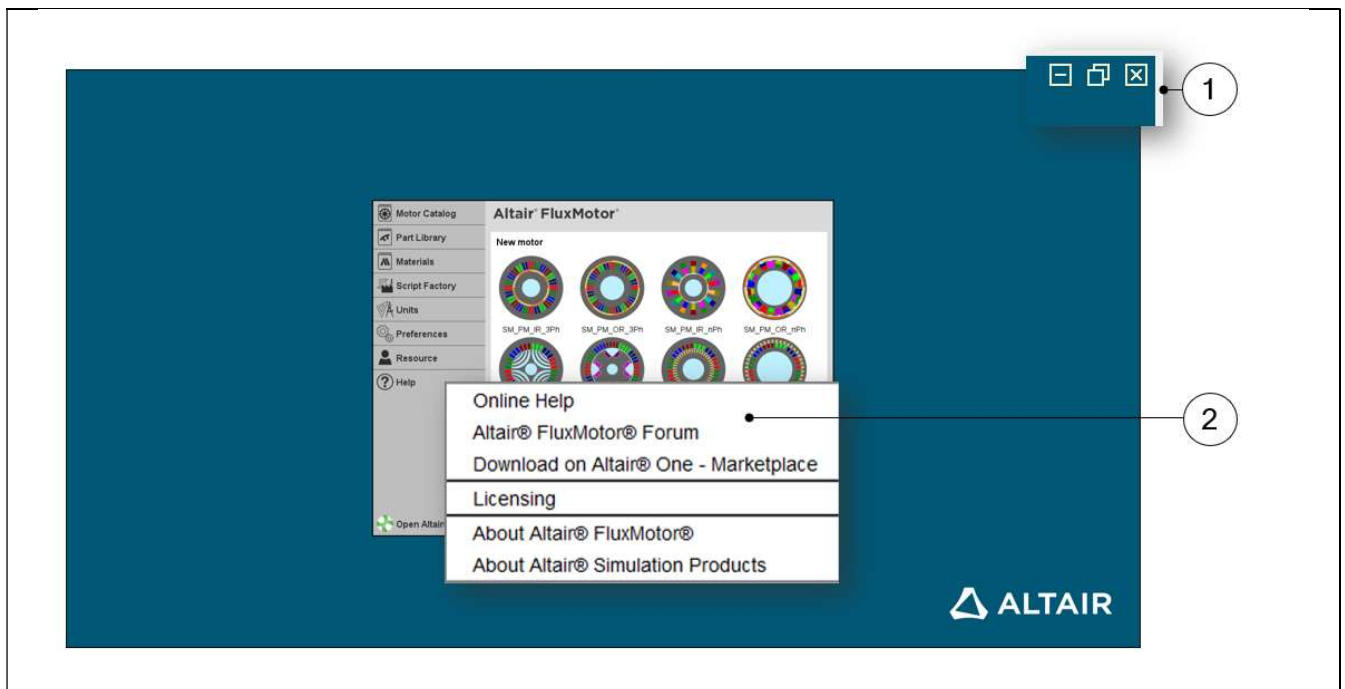
1.5   Desktop of Altair® FluxMotor®

The desktop contains the Supervisor.

Presentation of the Desktop

The supervisor (desktop) of FluxMotor® can be reduced by using functions (buttons) on the right top part of the screen.

|	Miscellaneous functions of FluxMotor® Desktop
1	Management of the size of FluxMotor® Desktop.
2	Expand the menu "Help" to access to "Online help", FluxMotor® Forum, Altair One™ -Marketplace, "Licensing" system and information about FluxMotor® and Altair® HyperWorks® Note: The section "About FluxMotor®" allows finding the reference of the current version of FluxMotor®.

2   UNITS

2.1   Overview

To get into "Units" application from the supervisor, click on "Units" button.
The "Units" area is shown on the picture below. It is composed of four main zones.
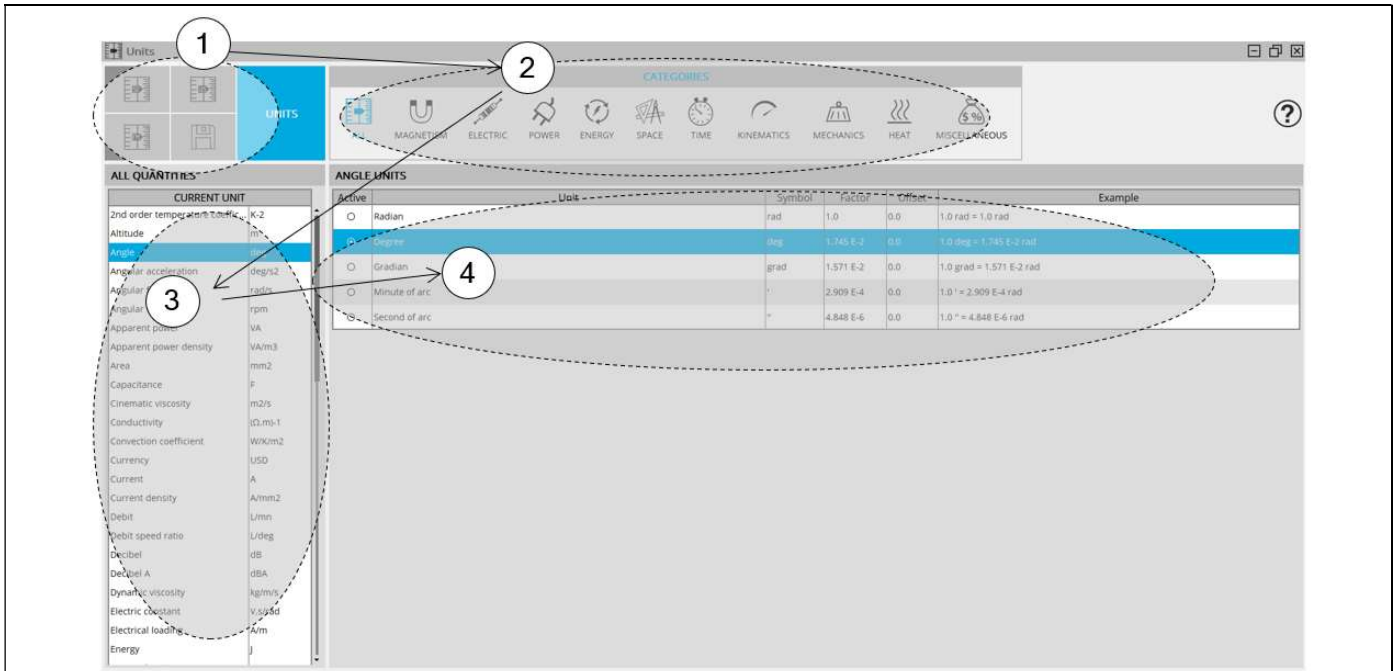
1	Main functions to directly select a general unit system (US, SI, FM) and save modifications. • US = Anglo-Saxon system of Units • SI = International System of Units • FM = FluxMotor® system of Units Disk = Save changed units
2	Presentation of the ten quantities of families is available in "Units" application. Selecting an icon will display the units belonging to the selected family. See illustration below.
3	List of current units.
4	When a quantity is selected in the list (2), the corresponding available units are displayed. Symbol, conversion factor and an example to illustrate the principle of conversion are presented.

Note: In Units application, the icons at the top part of the screen display the available units in different categories. See illustration below.
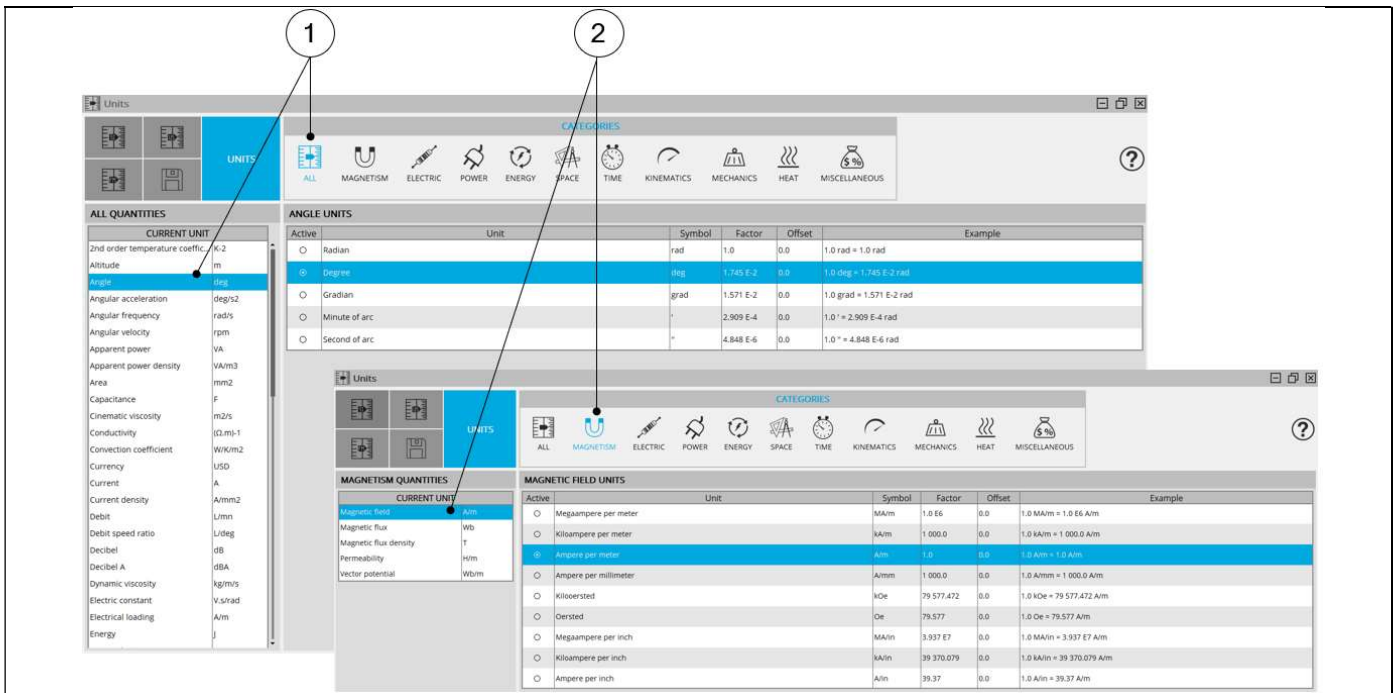
	Selection of a unit family
1	All types of physical quantities are displayed.
2	Only physical quantities relative to magnetism are displayed.

2.2   How to choose and save a unit?

1	Select the physical quantity family in which the concerned unit is present.
2	Select the unit which is to be modified.
3	Select the new unit.
4	Save unit changes.
5	It is possible to select the units proposed by FluxMotor® (FM) or select one of the two international system of units (SI or US).

2.3   Expanding the menu in Units

This menu gives access to system functions like help documentation and Exit.

1	Expand the menu in the top left corner in Units dialog box.
2	List of actions available: • Save (=Save unit changes) • About • Debug mode • Help to open the online help documentation directly on the chapter dealing with Units. • Exit for closing Units dialog box
⊠	Closing Units dialog box is also possible by using this icon on the top right corner of the Units dialog box.
*	Closing Units dialog box is also possible by using the shortcut CTRL-Q defined in the user preferences. For more information, refer to the chapter "Preferences" below.

3   PREFERENCES

3.1   Common Preferences

	Common Preferences screen
1	The Preferences dialog box is opened from the Supervisor.
2	First tab is: Common Preferences.
3	Choice of language used in FluxMotor® application: only English is available in the current version.
4	Number of decimals to consider after dot for all the numbers displayed in FluxMotor®.
5	Number of most recently used motors. When clicking on the icon Motor Factory, from the supervisor, it is possible either to create a new motor or to choose among a list of most recently used motors. The number of most recently used motors available must be defined in the user preferences. The default value is 5.
6	When "Yes" is selected several Motor Factory sessions can be opened at the same time. "Yes" is set by default.
7	Button to apply changes and close the Preferences dialog box.
8	Button to close the Preferences dialog box without applying the changes.

3.2   Default Path Preferences
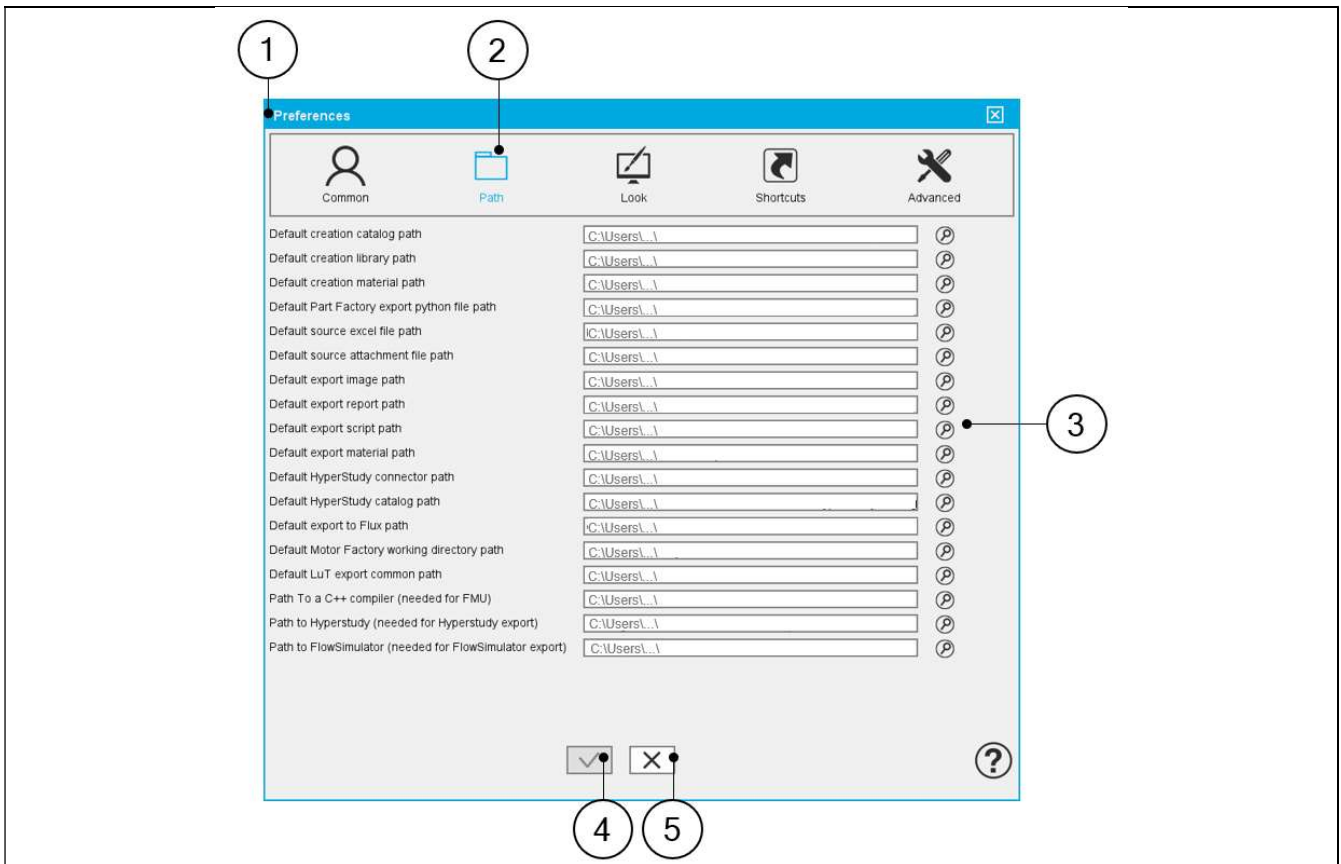
	Path Preferences Screen
1	The Preferences dialog box is opened from the supervisor.
2	Second tab is Path Preferences.
3	Define default paths for application by browsing the folders.
4	Button to apply changes and close the Preferences dialog box.
5	Button to close the Preferences window dialog box without applying the changes.

3.3   Look Preferences

	Look Preferences Screen
1	The Preferences dialog box is opened from the Supervisor.
2	Third tab is Look Preferences.
3	Two types of look and feel are available in the current version: Dark and Light.
4	Graphic background color changes for the Motor Factory and Part Factory areas.
5	Maximum magnitude of the displayed flux density for visualizing the flux density into the magnetic circuit. The default value is 2.5 Tesla.
6	Button to apply changes and close the Preferences dialog box.
7	Button to close the Preferences dialog box without applying the changes.

3.4   Shortcuts Preferences

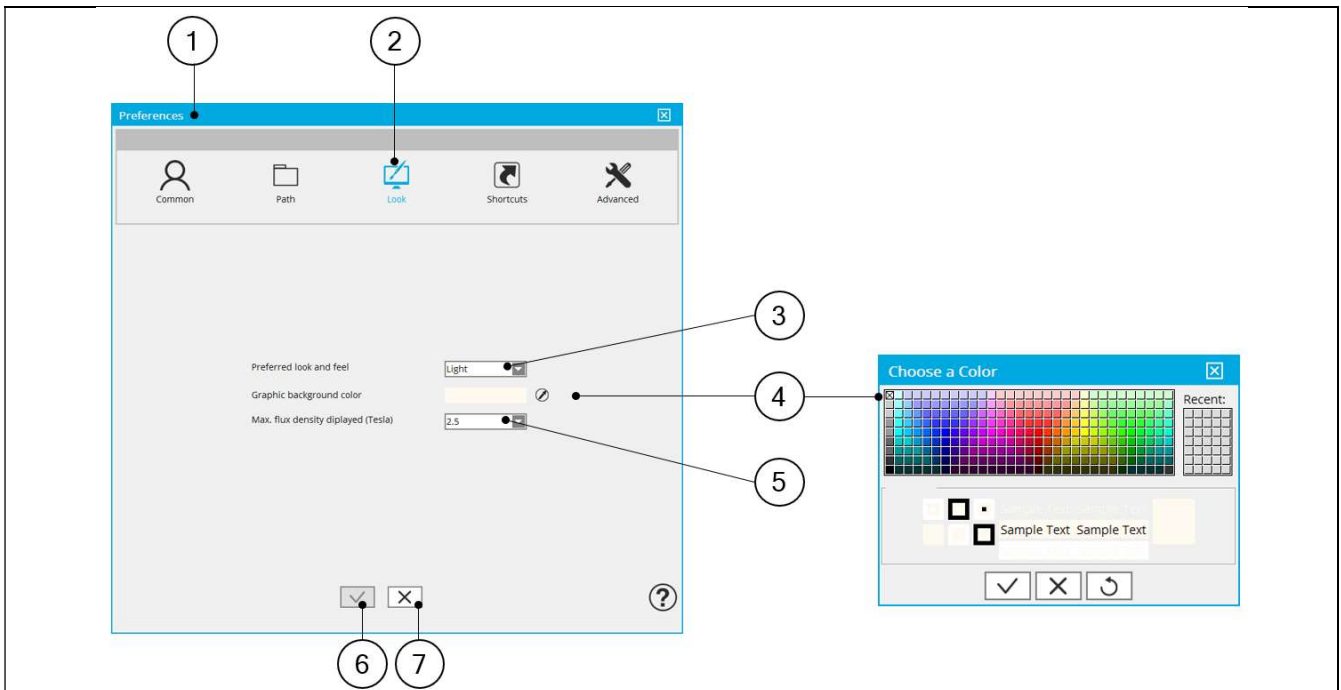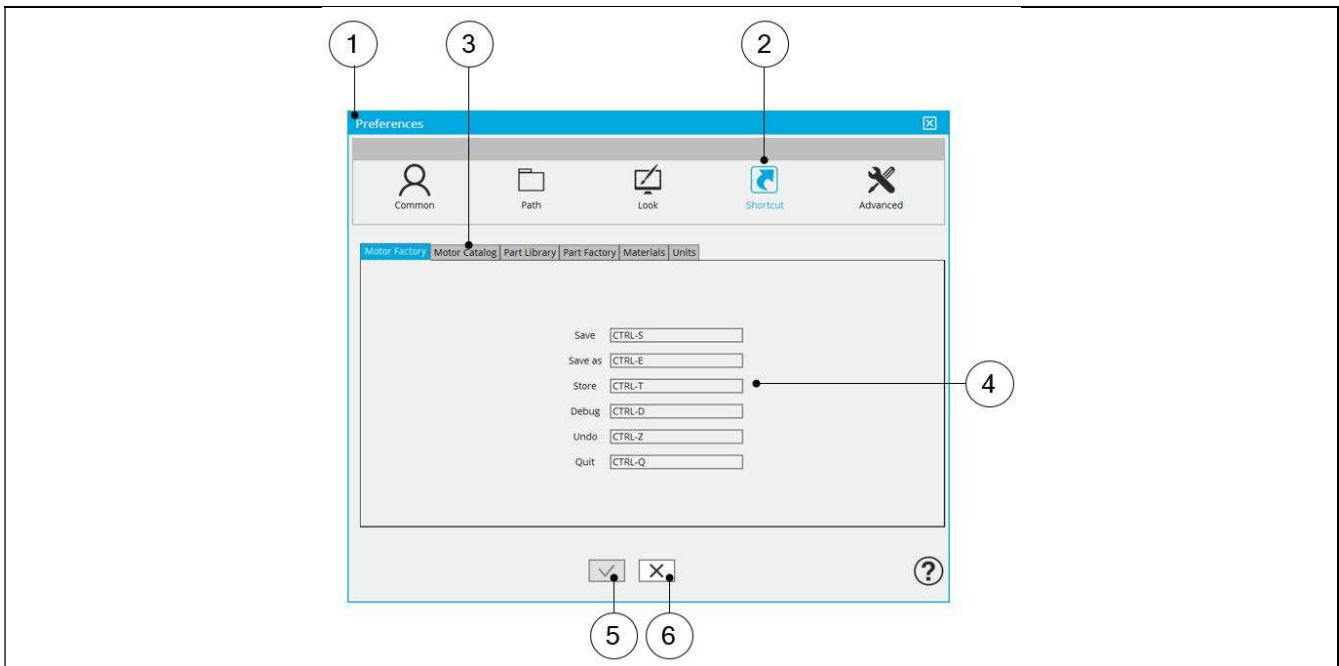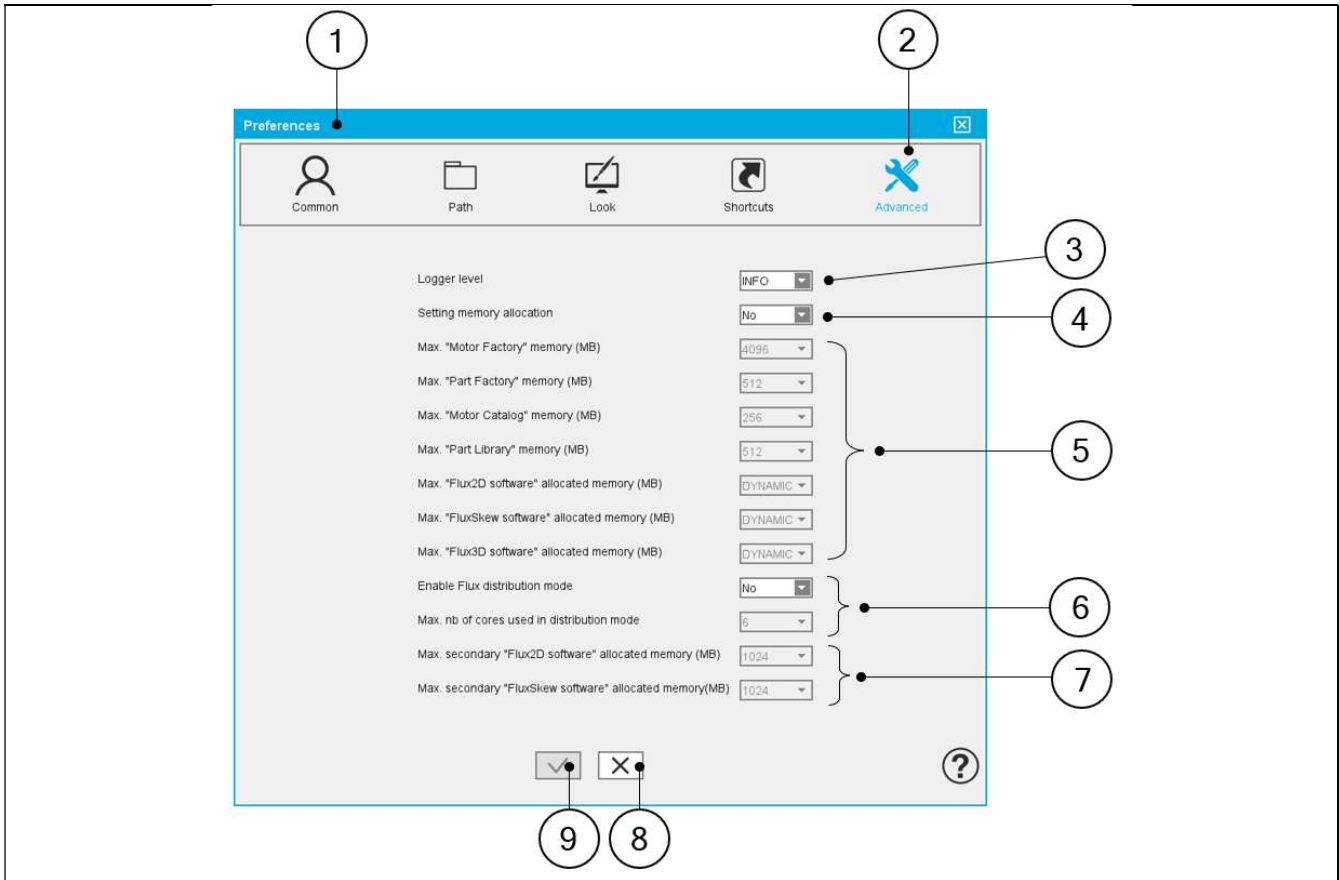|	Shortcut Preferences Screen
1	The Preferences dialog box is opened from the Supervisor.
2	Fourth tab is Shortcut Preferences.
3	Tabs by Application Names are present at the top of the Shortcut Preferences Screen. Each tab displays available shortcuts. Note: Shortcuts cannot be modified. They are displayed only for user information.
4	List of available shortcuts for the selected application tab.
5	Button to apply changes and close the Preferences dialog box.
6	Button to close the Preferences dialog box without applying the changes.

3.5   Advanced Preferences

3.5.1   Presentation

	Advanced Preferences Screen
1	The Preferences dialog box is opened from the supervisor.
2	Fifth tab is Advanced Preferences.
3	Logger level: INFO, WARN, DEBUG Logger level represents the level of information given by log files provided by FluxMotor®.
4	Setting memory allocation: Yes / No. In case of answer "Yes" the maximum memory allocation for applications can be defined by user.
5	Maximum memory allocation for applications. It is recommended to keep default values as far as possible. In case of a trouble consult our support team. These fields are in write mode in advanced FluxMotor® user level.
6	Buttons to enable the Flux solver distribution mode. By default, this option is set to "No". And to define the maximum number of cores used by the distribution (See note below)
7	Maximum allocated memory for the secondary Flux2D and FluxSkew software when the Flux solver distribution mode is selected. Note: Ony static allocated memory can be used. The dynamic memory allocation is not available.
8	Button to close the Preferences dialog box without applying the changes.
9	Button to apply changes and close the Preferences dialog box.

Note: Information about the Flux distribution mode and how to set up a parametric distribution on a single machine is described in the following section.

3.5.2 Enable Flux distribution mode.

3.5.2.1 Introduction

This section gives information about the establishment of a parametric distribution of the FluxMotor solver, "Flux", on a single machine. Distributed computing allows the user to save computation time. For example, a test "Scalar Maps" may be automatically distributed if the Flux distribution mode is enabled. In this case, several Flux projects will run at the same time to solve all the required test configurations.

The main parameter of a distributed computation is the "Maximum number of cores used in distribution mode" (i.e., the number of running Flux in parallel).

The following topics are covered in this documentation:
- Principles
- How to set up a parametric distribution on a single machine

3.5.2.2 Principles

The "Flux distribution mode" allows the user to save computation time by parallelizing the finite element (FE) solving of a test.
Indeed, FE solving is done by parallelizing several independent configurations of a FE problem (such as the value of the stator current) instead of running them sequentially.
A primary Flux project is launched and controls all the other secondaries projects (distribution). The primary project oversees the gathering of all the results obtained during the solving process by all the sub-projects Flux as shown in the figure below:

Flux distribution mode - Flux process operating principle
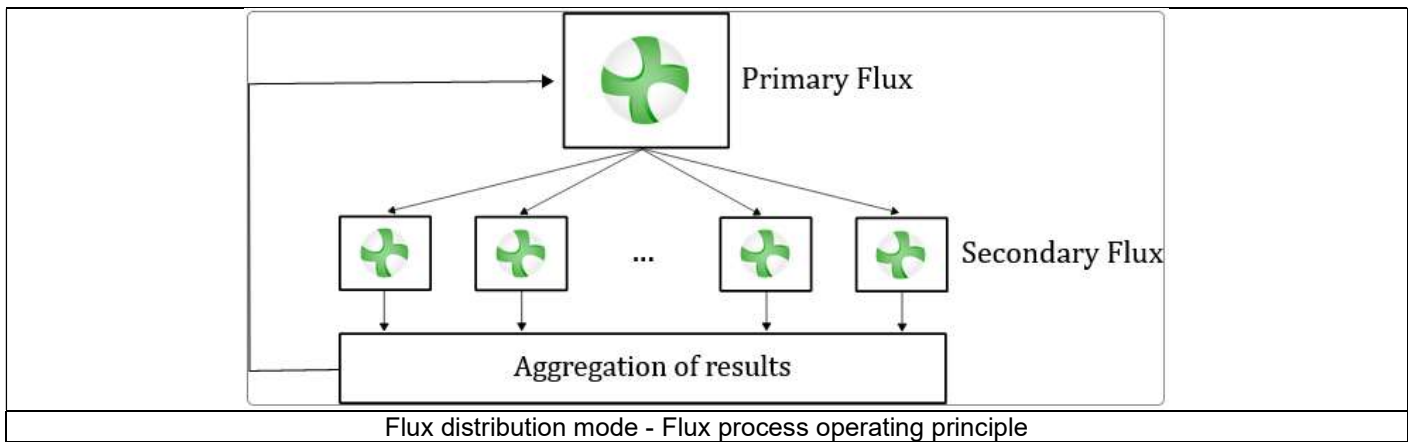
When the Flux distribution mode is activated, FluxMotor automatically uses it and manages the number of cores used to reduce, as far as possible, the computation time.
Depending on the number of computation steps, FluxMotor will adapt the number of cores to have at least 10 steps to solve per core.
In other words, if you select a maximum number of 5 usable cores and solve a test with 25 computation steps ("Characterization - Model - Maps" test with an Id, Iq grid of 5x5), FluxMotor will only distribute the resolution over 2 cores, which is the best configuration according to the FE project to solve.

Tests that use "Flux distribution mode" are listed in the following table:

Machine type	Available with Skew	Tests addressed by the Flux distribution
SM PM IR (OR) 3PH	Yes	- Test "Characterization - Model - Maps" - Test "Working point - Sine wave - T, N" - Test "Performance mapping - Sine wave - Efficiency Map"
SM RSM IR 3PH	Yes	- Test "Characterization - Model - Maps" - Test "Performance mapping - Sine wave - Efficiency Map"
IM SQ IR (OR) 3PH	No	- Test "Characterization - Model - Scalar Maps" - Test "Performance mapping - Sine wave - Efficiency Map scalar U, f" - Test "Performance mapping - Sine wave - Efficiency Map scalar U, I"

An example of the process is shown in the following image for the test "Characterization - Model - Maps" of SMPM IR 3PH:

Flux distribution mode - FluxMotor process operating principle
SMPM IR (OR) 3PH - "Characterization - Model - Maps"
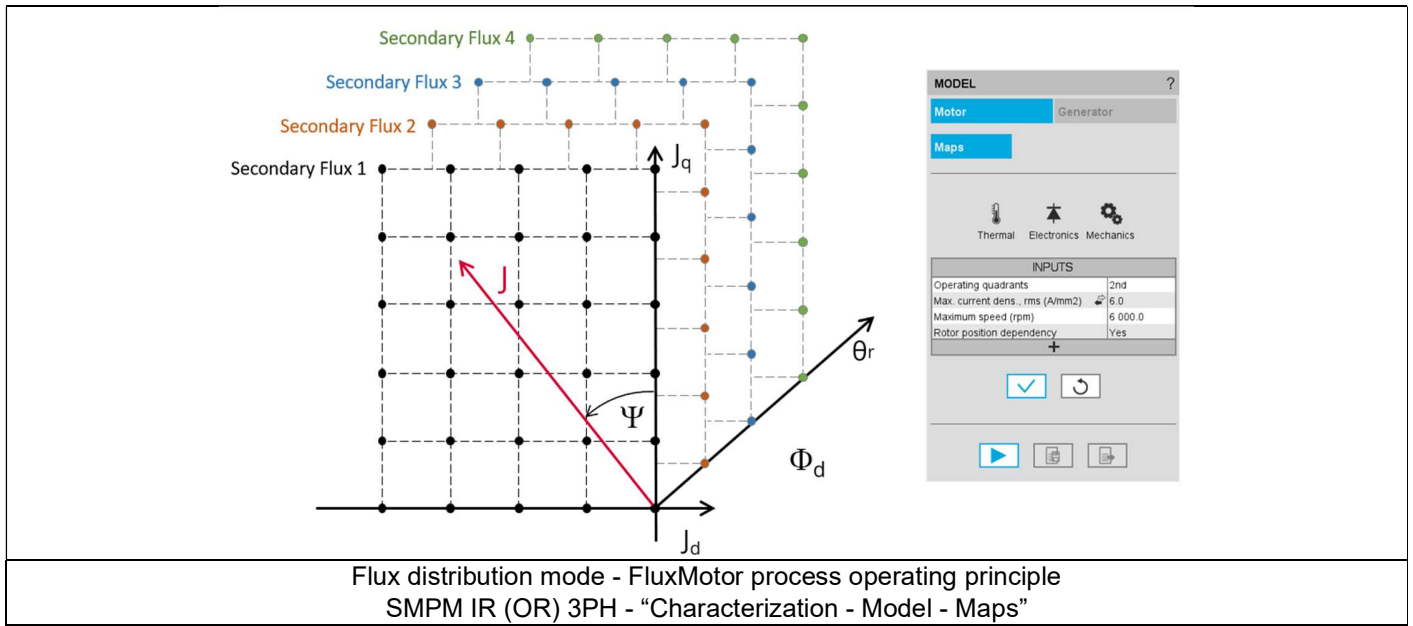
The following graph shows an example of the solving time versus the number of cores used for a Flux project with 2525 computation steps to solve:

Computation time evolution in function of the number – FE Flux project example with 2525 steps to solve
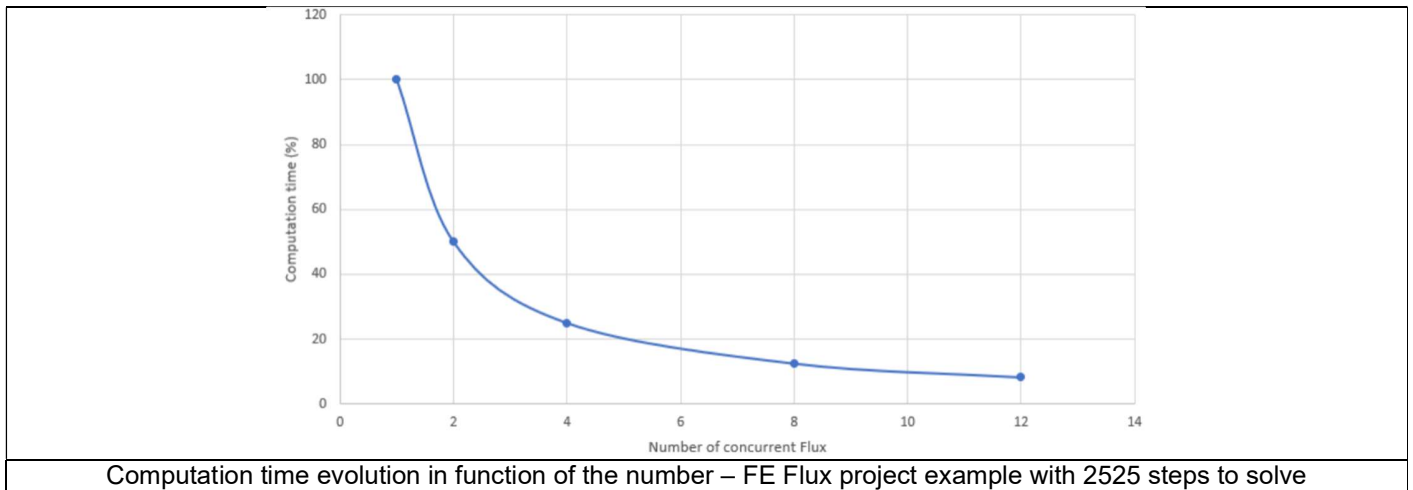
Note in FluxMotor:

- An FE Flux project will be considered of interest for distribution if it contains more than 20 computation steps to solve.

- From the user's point of view, an FE Flux project's computation time includes the creation of the FE project, which can take from 45 seconds to several minutes, depending on the case.

- In most cases, FluxMotor tests involve the sequential solving of several FE Flux projects, and some of these FE Flux projects have no interest in being distributed (less than 20 computation steps).

According to the previous points, the trend presented in the graph above is therefore not exact in the context of a FluxMotor tests, but it gives a general trend, especially for some tests like "Characterization - Model - Maps" (SM PM and SM RSM) or "Characterization - Model - Scalar Maps" (IM SQ).

3.5.2.3   How to set up a parametric distribution on a single machine

In **FluxMotor,** the Flux distribution mode (number of secondary Flux in parallel) must be set in the Preferences in the section Advanced. It's just needed to set "Flux distribution mode" to "Yes" and to select the "Maximum number of cores" you want to use.

Warning:
When using the distribution mode, the primary Flux can be used either with dynamic or static memory allocation. However, it is highly recommended to use the dynamic memory allocation.
When using the distribution mode, only the static memory can be used for the secondary Flux. The dynamic memory allocation is not available.
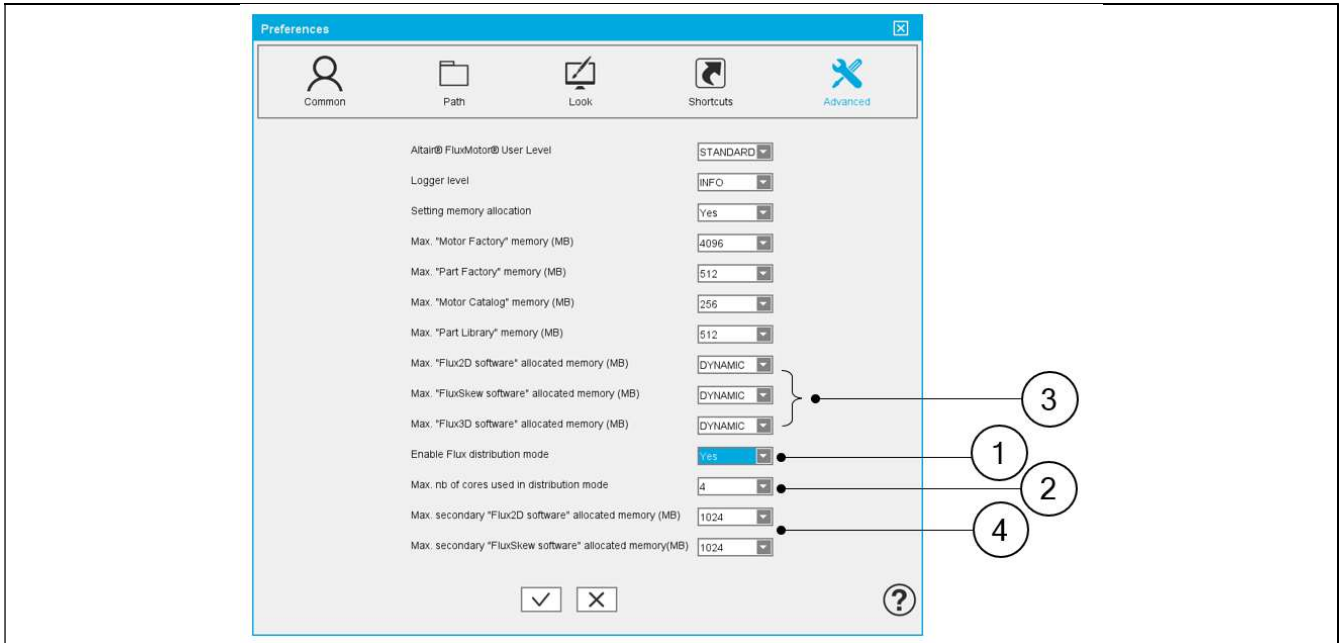
	Flux distribution mode
1	Button to enable the Flux solver distribution mode. By default, this option is set to "No".
2	Button to select the maximum number of cores used by the distribution
3	Button to set the maximum allocated memory for the primary Flux (Dynamic allocated memory is recommended)
4	Button to set the maximum allocated memory for the secondary Flux (Only static allocated memory can be selected)

3.5.3   Warning

Sometime, the **non-entirely qualified feature** like tests for instance are nevertheless available for testing. In this case, a "**Beta version**" banner warns the user to be careful when analyzing the results.

For example, in the current version, evaluation of NVH for induction machines with squirrel cage is concerned by this mode.


	NVH evaluation is available with the beta user level mode
1	Message "Beta version" is displayed in the overview for warning the users

4   SYSTEM FUNCTIONS

4.1   How to report an error?

When a bug or a problem occurs when using FluxMotor® (whatever is the considered application), a dedicated panel is automatically provided for helping the users to report this error.
It allows creating a zip file which stores all the information needed for FluxMotor® support team to understand and solve (as far as possible) the problem.
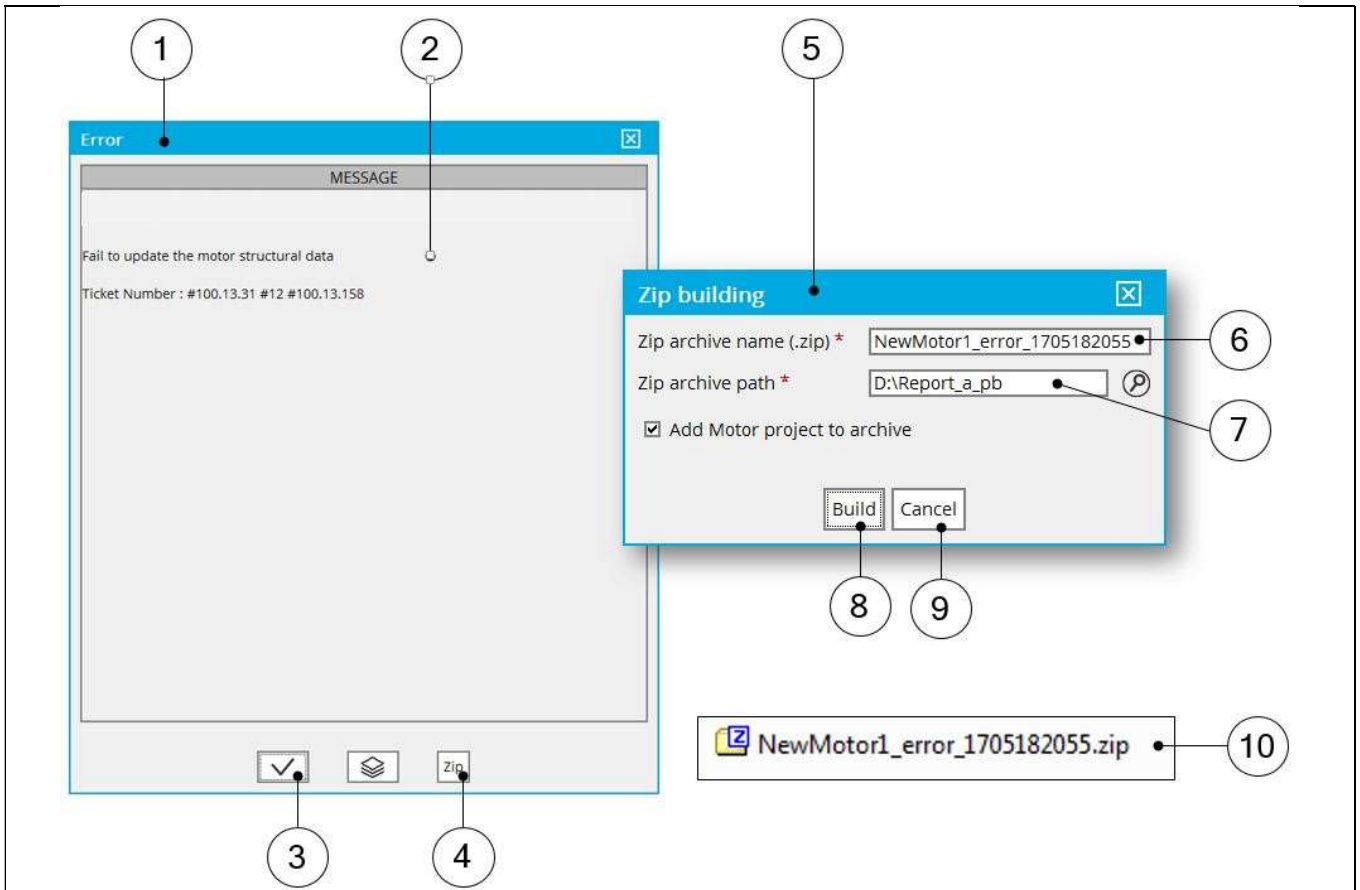
	Process to report a trouble
1	This panel automatically is opened when an error or a bug is occurring.
2	A short message is displayed to explain the origin of the problem.
3	Button to close the panel after reading the message.
4	Button to create the zip file before sending it to the support team.
5	Dialog box to define the zip file.
6	Give a name to the zip file.
7	Store the zip file in a folder.
8	Button to finalize the building of the zip file.
9	Button to close the dialog box without creating the zip file.
10	Resulting zip file automatically built and ready to be sent to the support team.

5   ALTAIR FLUXMOTOR® LICENSING

5.1   License manager - Overview

5.1.1   Description

From the FluxMotor Supervisor, one can access to the license manager by clicking on the "Help" icon and then on the sub-menu Licensing that displays the "License setup" window.
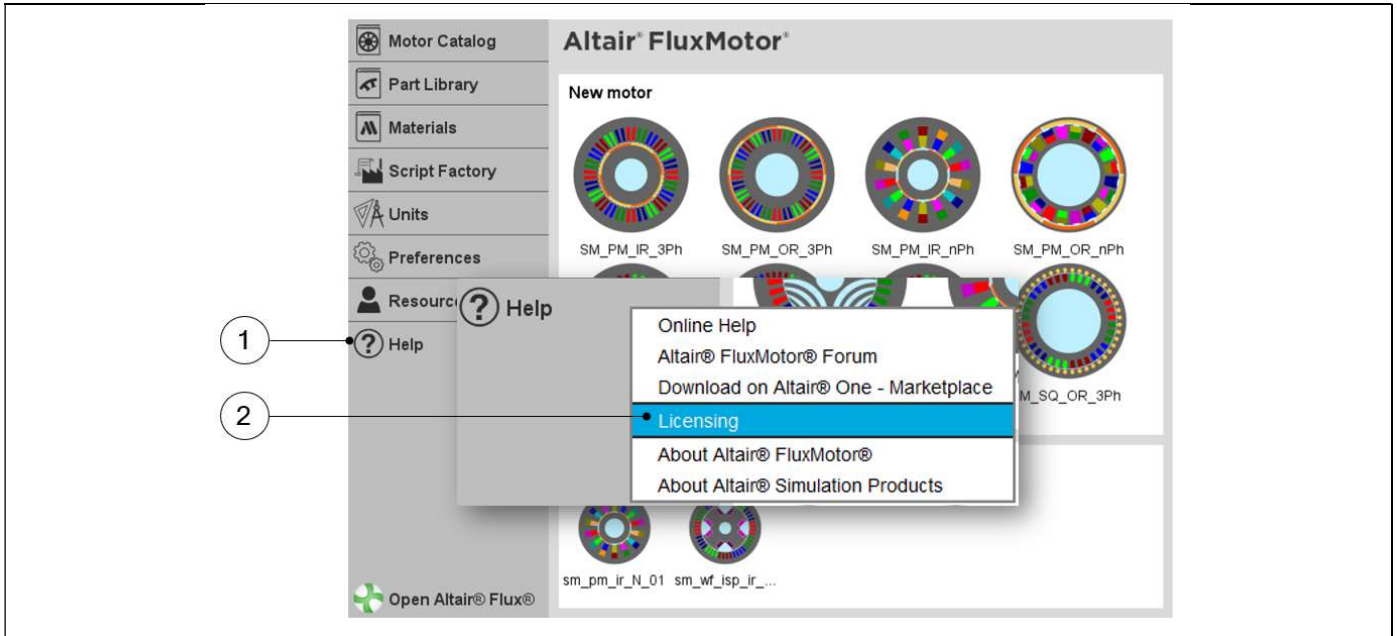
	Selection of the "License setup" window
1	Access to the Help functions
2	Access to the "License setup" window

This feature allows checking whether a license for FluxMotor is defined or not, when the FluxMotor supervisor is launched.
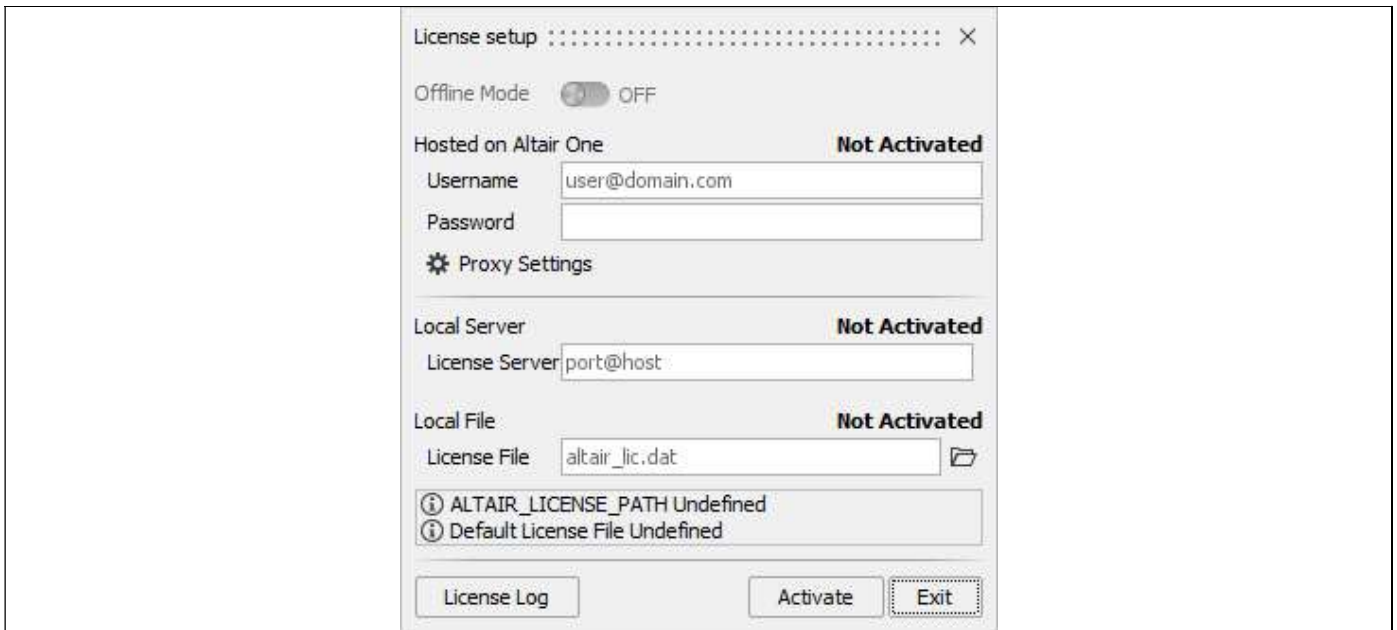
"License setup" window

5.1.2   Different cases

There are two cases:
- If the license is defined and active, then, after launching the FluxMotor supervisor:
    - It is possible to use FluxMotor directly.
    - The license setup window will not be displayed automatically.
   Note: It is possible to open the "License setup" window by clicking on the Help icon and then on the sub-menu Licensing that displays the "License setup" window.

If the license is not defined or not active, then after launching the FluxMotor supervisor:
- Firstly, the License Log window will open automatically and display an error message indicating that no license has been defined or that no FluxMotor feature is valid.
- Secondly, the "License setup" window will open automatically.
  You will be able to set up the license for the current FluxMotor supervisor session.

License Log window indicating that no license has been defined or that no FluxMotor feature is valid.
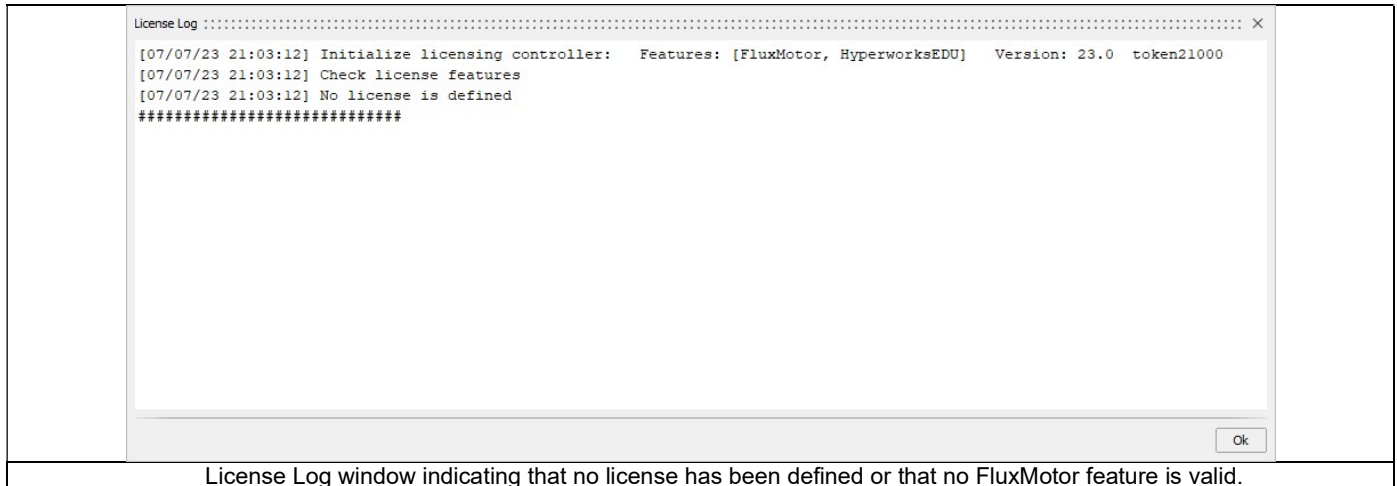
Note:
- The information will be kept from one time to another.
- The environment variable ALTAIR_LICENSE_PATH will not be updated with this information.

- Once the license has been defined in this window and if it is active, then it will be possible to use FluxMotor.

5.1.3   License setup window

The "License setup" window has five areas:

- Hosted on Altair One™
  If you want to use the license from Altair One™, then you will log in by entering:
    - Username (email address)
    - Password

  Potentially, if your company uses a proxy for internet access, then you will enter the proxy configuration settings using the :
    - Proxy Settings button

- Local server

If you have a network license, then you will use the following syntax: port@host

Where port is the TCP/IP port number used by the license server and host is the name of the license server machine, in the field:

    - License Server

- Local file

If you have a standalone license, then you will enter the full pathname to the license file (.dat file) in the field:

    - License File

- Information area

This is an area where messages related to the license are displayed.

It is possible to obtain information on the environment variable ALTAIR_LICENSE_PATH.

- If ALTAIR_LICENSE_PATH is not present, then this information will be displayed.

- If ALTAIR_LICENSE_PATH is present, then you will see its contents.

- License Log

It is possible to obtain information about the license's validity.

To save and use the information you have just entered in the License setup window, click on the Activate button.

Warning:
- If you click on the Close button, no information entered and not previously saved will be considered, and the "License setup" window will close.
- If you click on the Exit button and no license is defined and active, then the "License setup" window will close and the FluxMotor supervisor will close automatically.

5.2   Altair® HyperWorks®

5.2.1   Network server license activation

Prerequisites: You will need the port@host information, which can be obtained from your company's system administrator, to connect to an existing license server. They will first need to set up and install the license server.

Warning:
To use a network server license (port@host information), one must specify this license with the windows environment variable: ALTAIR_LICENSE_PATH.
The following process (points 1 to 3) cannot be applied with the current version.

1) Launch the software. If you do not have a valid license on your workstation, the "License setup" window will open automatically, and the license status will show as "Not Activated".
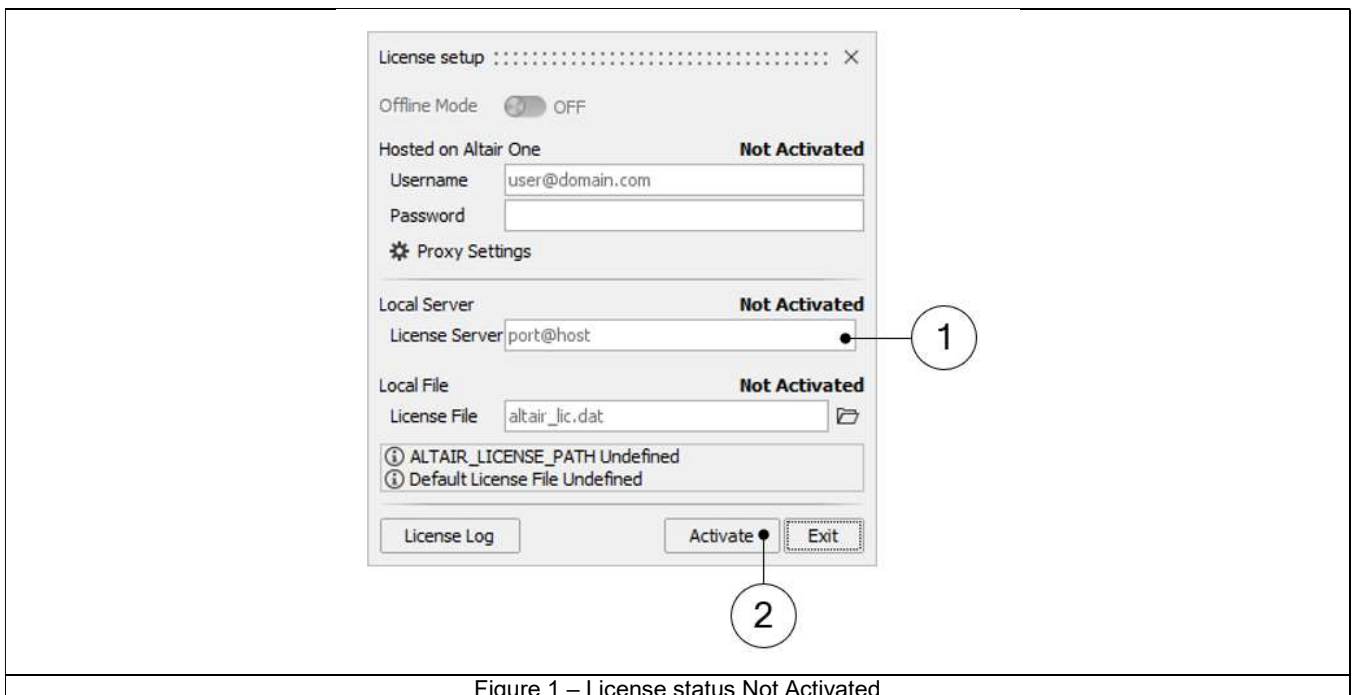

Figure 1 – License status Not Activated

2)   Enter the port@host information for the License Server (Mark 1 - Figure 1 – License status).
     Example: 6200@192.168.100.5

3)   Click on the "Activate" button (Mark 2 - Figure 1 – License status). The status changes to "Activated" when the license is validated, or you will receive an error message if unsuccessful.

Warning: This license activation will be available only during the FluxMotor® session. After the closure of FluxMotor®, you will have to do this action again.
Please refer to section 5.2.3 (Specifying a license with a Windows environment variable) if you want to save your license registration.

Tip: You can also use an environment variable to specify a license file.

5.2.2   Standalone license activation

Certain applications will have standalone licenses available from your reseller. In this case, you will need to specify your license file in the HyperWorks section of the "License setup" window.
Prerequisites: Obtain a valid license file from your Altair Account Manager.

1)   Once your license file has been emailed to you, copy it to your preferred location on your workstation.

2)   Launch the software. If you do not have a valid license on your workstation, the "License Setup" window will open automatically, and the license status will show as "Not Activated".
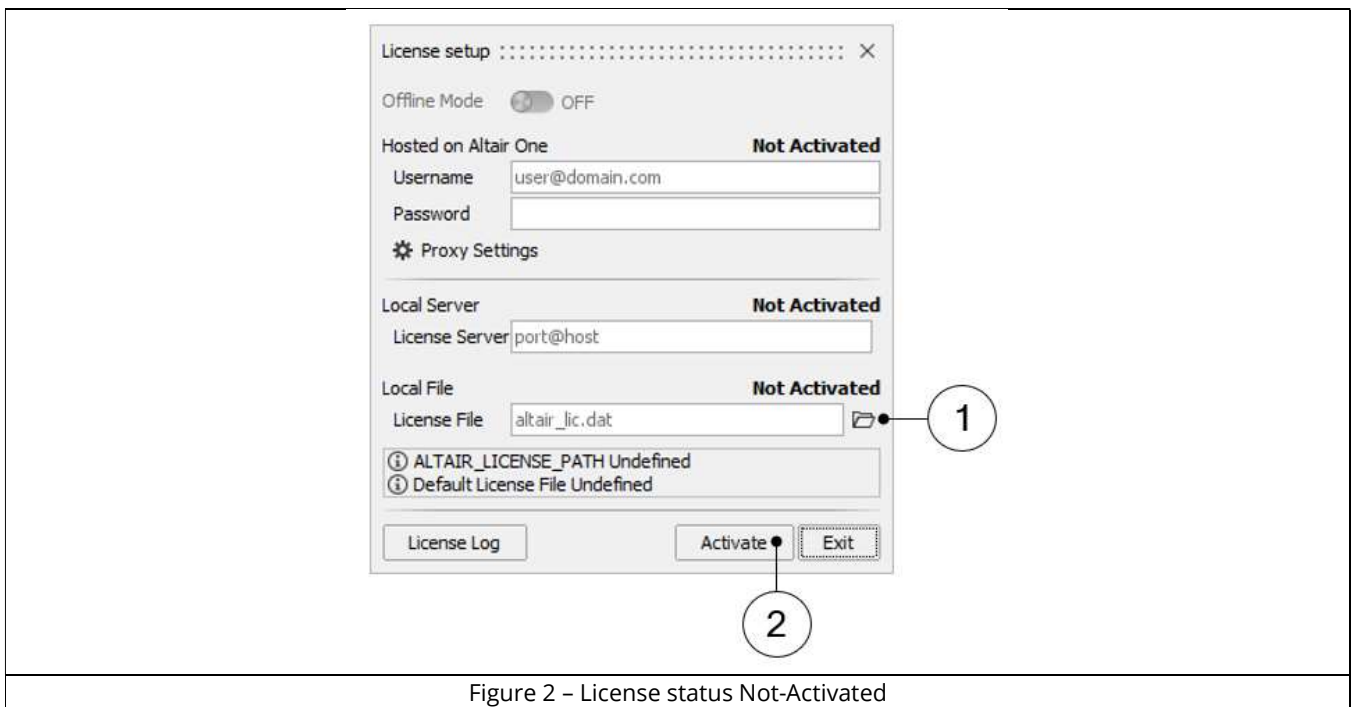

Figure 2 – License status Not-Activated

3)   Click on the browser button (Mark 1 - Figure 2 – License status Not-Activated) and browse to the location of the License File.

4)   Click on the Activate button (Mark 2 - Figure 2 – License status Not-Activated). The status will change to Activated when the license is validated, or you will receive an error message if unsuccessful.

Warning: The license activation will be available only during the FluxMotor® session. After the closing of FluxMotor® session, the license must be reactivated for using FluxMotor®.
Please, refer to the section 5.2.3 (Specifying a license with a Windows environment variable) for specifying a license with a windows environment variable.

Tip: You can also use an environment variable to specify a license file.

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5.2.3   Specifying a license with a Windows environment variable

Some companies prefer to use environment variables for licensing. When setting up an environment variable, you can specify a single-user license file on your local machine or a network server license.
You can also point to multiple files, locally or on a server, with the environment variable.

1)   Click the Windows Start menu and navigate to System Properties.

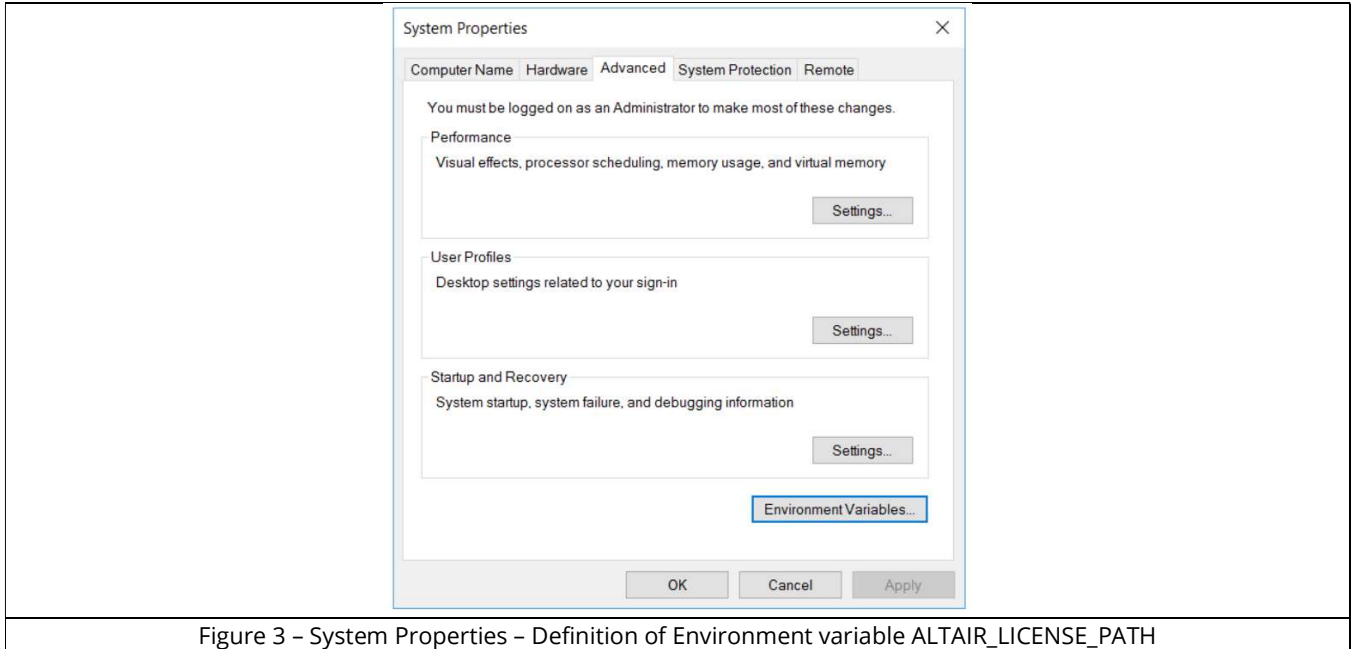Tip: In Windows 10, type "env" and then select Edit the System Environment Variables.

Figure 3 – System Properties – Definition of Environment variable ALTAIR_LICENSE_PATH

2)   Click the Environment Variables button.

3)   Under User variables, click New and create a variable named ALTAIR_LICENSE_PATH. If you already have this variable, highlight it and click Edit.

4)   Set the variable value to point to the single-user license file or the license server.
Enter the complete file path to the license file, for instance:

"C:\Users\name\Documents\licensefile.dat" or enter the port@host for the license server.

Tip: You can use a semicolon to append a value with additional license locations.

5)   Click OK

5.3   Altair One™

5.3.1   Altair One™ account license activation

Prerequisites: You must first activate your Altair One™ account and download the software. If your company uses a proxy server, you will also need the host and port numbers.

1) Launch the software. If you do not have a valid license on your workstation, the "License setup" window will open automatically, and the license status will show as Not Activated.
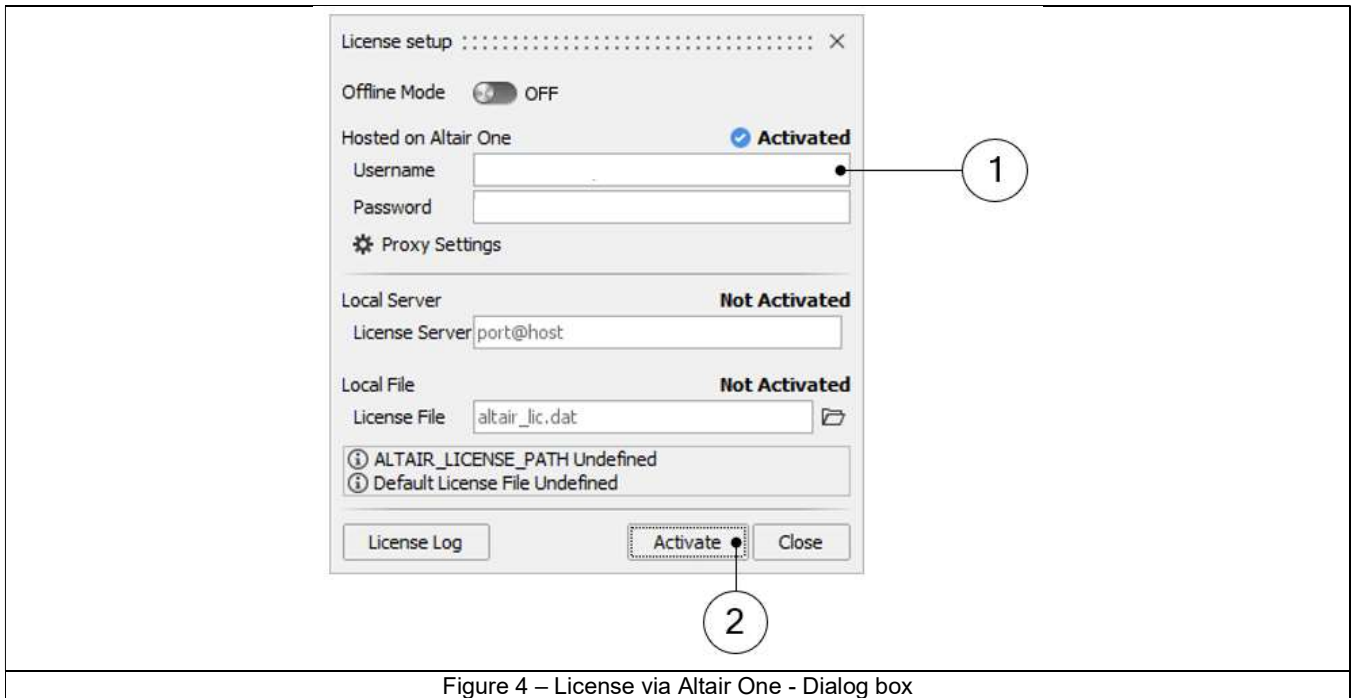

Figure 4 – License via Altair One - Dialog box

2) Enter the Username and Password you created for your Altair One™ account (Mark 1 - Figure 4 – License via Altair One - Dialog **box**).

3) Click on the Activate button (Mark 2 - Figure 4 – License via Altair One - Dialog **box**). The status changes to "Activated" when the license is validated, or you will receive an error message if unsuccessful.

4) If your company uses a proxy server, click Proxy Settings, select Use Proxy, and enter the Host and Port numbers.
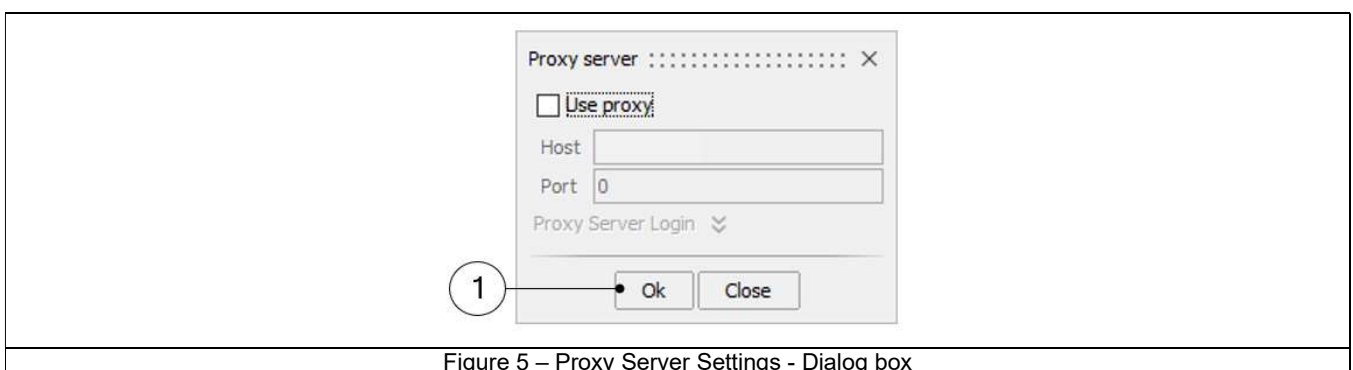

Figure 5 – Proxy Server Settings - Dialog box

5) If your proxy server requires authentication, click Proxy Server Login and enter a Username and Password.

6) Click on the OK button (Mark 1 - Figure 5 – Proxy Server Settings - Dialog box). The status will change to Activated when the license is validated, or you will receive an error message if unsuccessful.

5.3.2   Using Altair One™ account license in offline

Altair One™ units can be checked out and used in offline mode for up to two weeks. Each application must be checked out individually.

1)   Launch the software.

2)   Select File > Licensing to open the "License setup" window.

Figure 6 – License via Altair One – Offline Mode
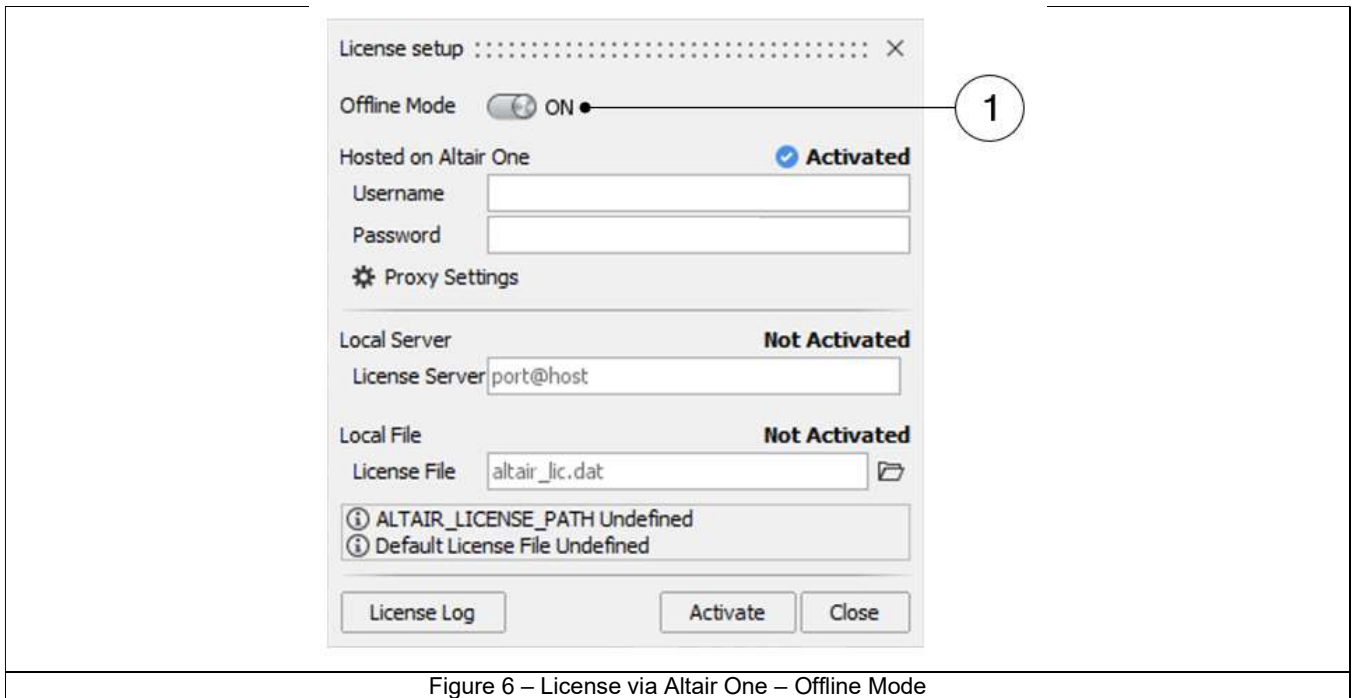
3)   Click the "Offline Mode" slider (Mark 1 Figure 6 – **License via Altair One – Offline Mode**).

You may now run the application without an internet connection for up to two weeks. Note that each application must be checked out individually.

4)   To check the units back in, click the "Online Mode" check box again.

5.4   Altair FluxMotor® 2024 Student edition

The Altair Student Edition license is a node-locked license - a license that will work only on one machine whose Ethernet ID was entered while requesting it.

By downloading the software and license file, you agree not use the software for commercial purposes and not to install the software on any corporate machines.

Copy the file to a location that does not change (like a user directory) and set the environment variable ALTAIR_LICENSE_PATH to the location of the license file.

For all information about FluxMotor® Student Edition, please refer to the following link:

https://altairuniversity.com/altairuniversity-for-students/