

Title: **How to use G-Code UI on ctrlX CORE**

App Version: GCO-V-2.6.0

Last modification: 2024/08/16

## Introduction

This documentation describes how to install and use ctrlX G-Code UI. G-Code UI was developed with Node-RED and PLC Engineering. It consists of a PLC project package and Node-RED template which can be customized.

## G-Code UI functionality

G-Code UI supports the following features:

- Editor to create / write / delete a NC program.
- NC program selection.
- Start, stop, reset, and pause the NC program kinematics, respectively.
- Control path velocity by feed rate override.
- Different coordinate systems like ACS and PCS.
- Observe position and state of kinematics.
- System diagnostics.

## Installation and activation of G-Code UI

A licensed installation of following apps (V2.4.x or V2.6.x) is expected before activating G-Code UI.

### Mandatory:

- ctrlX CORE - MOTION App (2.4.2 or V2.6.0)
  - ctrlX CORE - Motion Standard License 4 Axes
  - ctrlX CORE - Motion Cartesian License (add-on)
- ctrlX AUTOMATION - G-Code Runtime App (2.4.0 or V2.6.0)
  - ctrlX OS License - G-Code Runtime
- ctrlX AUTOMATION - Node-RED App (2.4.0 or V2.6.0)
  - ctrlX OS License - Node-RED
- ctrlX AUTOMATION - PLC App (2.4.0 or V2.6.0)
  - ctrlX CORE License - PLC Standard (add-on)

- ctrlX AUTOMATION - G-Code UI (2.4.0)
- ctrlX AUTOMATION - G-Code UI (2.6.0.3)

**Note:** Please install G-Code Runtime App after MOTION App!

### Optional:

- ctrlX AUTOMATION - 3D Viewer App
  - ctrlX OS License - 3D Viewer
- ctrlX AUTOMATION - Oscilloscope App

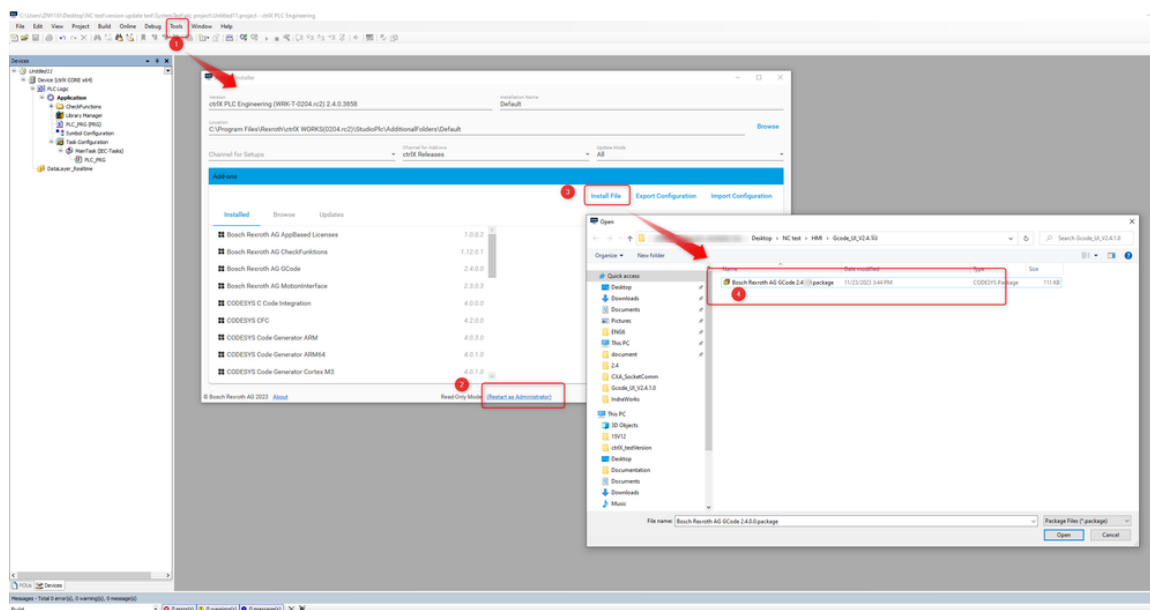
The G-Code UI template includes two parts:

- PLC package: Bosch Rexroth AG GCode \*\*\*\*.package
- Node-RED template flows: GCode\_UI\_\*\*\*\*.json  
(or GCode\_UI\_\*.zip)

Both should be installed to activate and operate the UI.

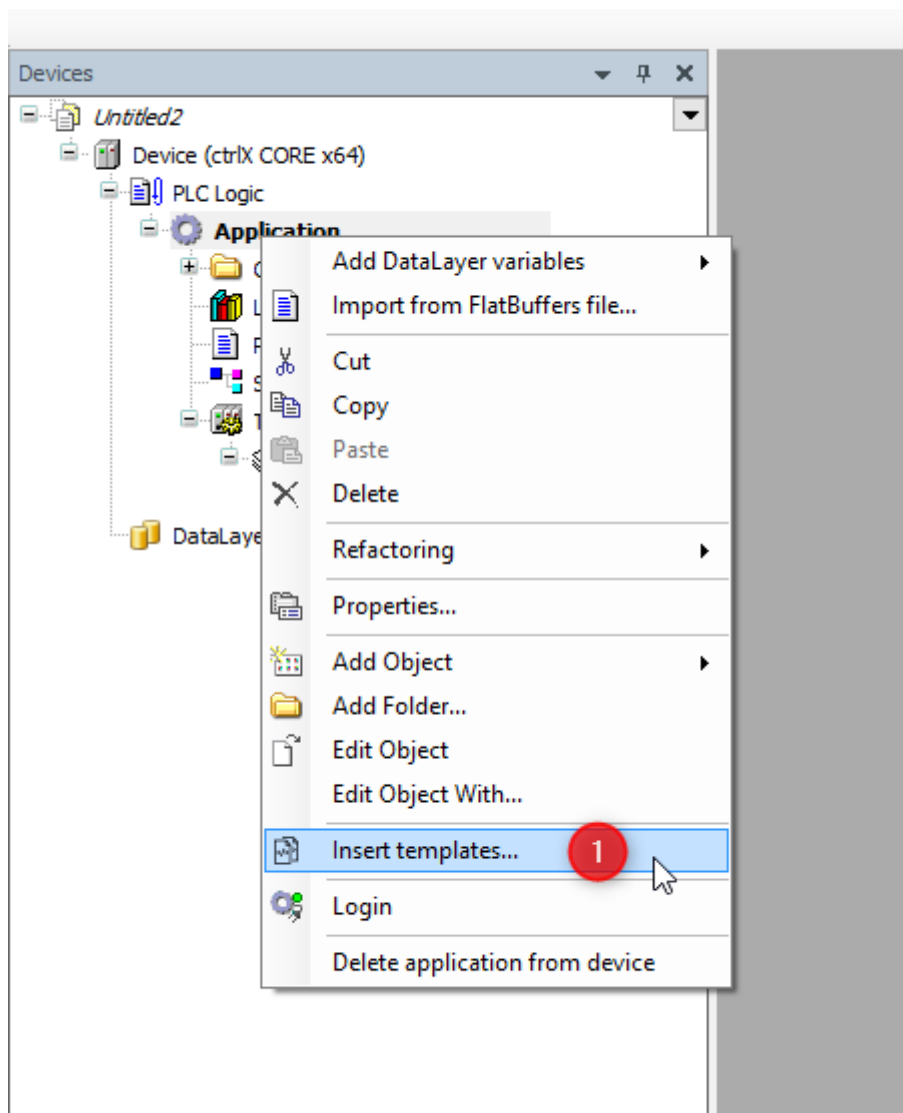
### PLC Part

Install the G-Code template package to the ctrlX PLC Engineering, only need to install for the first time:

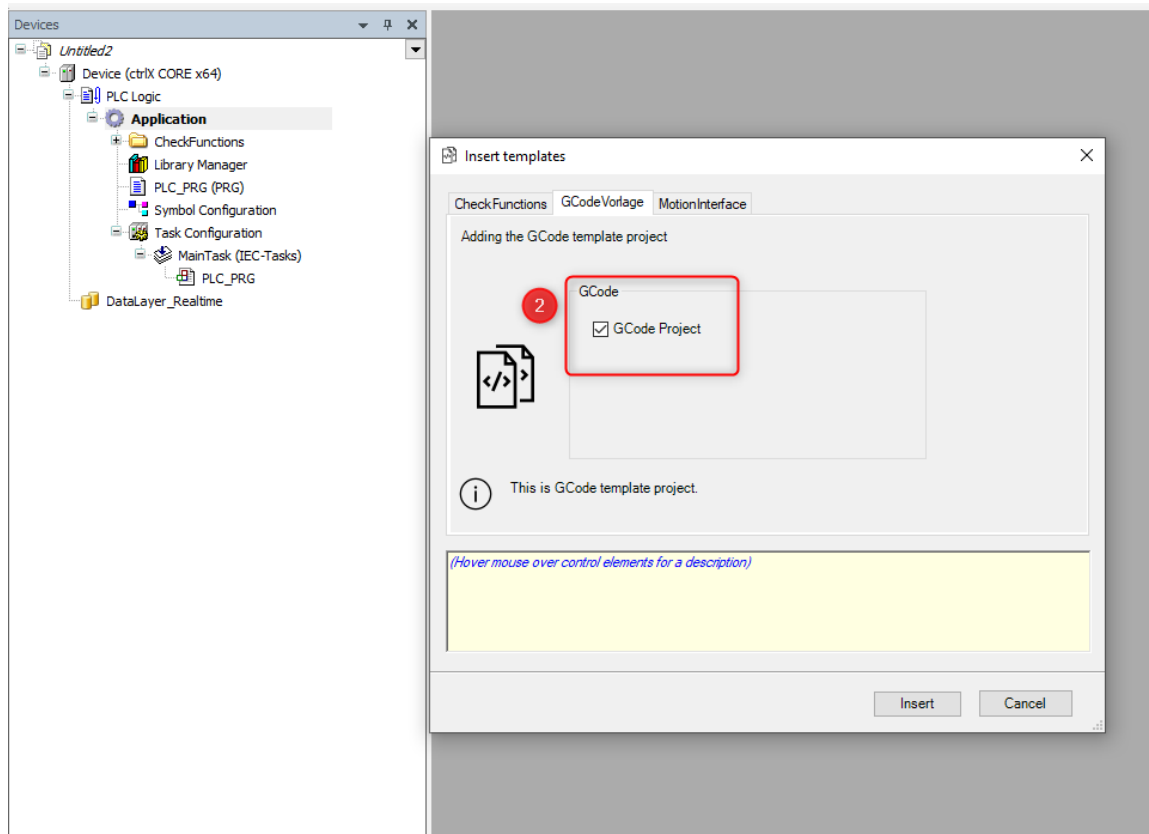


How to install PLC template package of G-Code UI

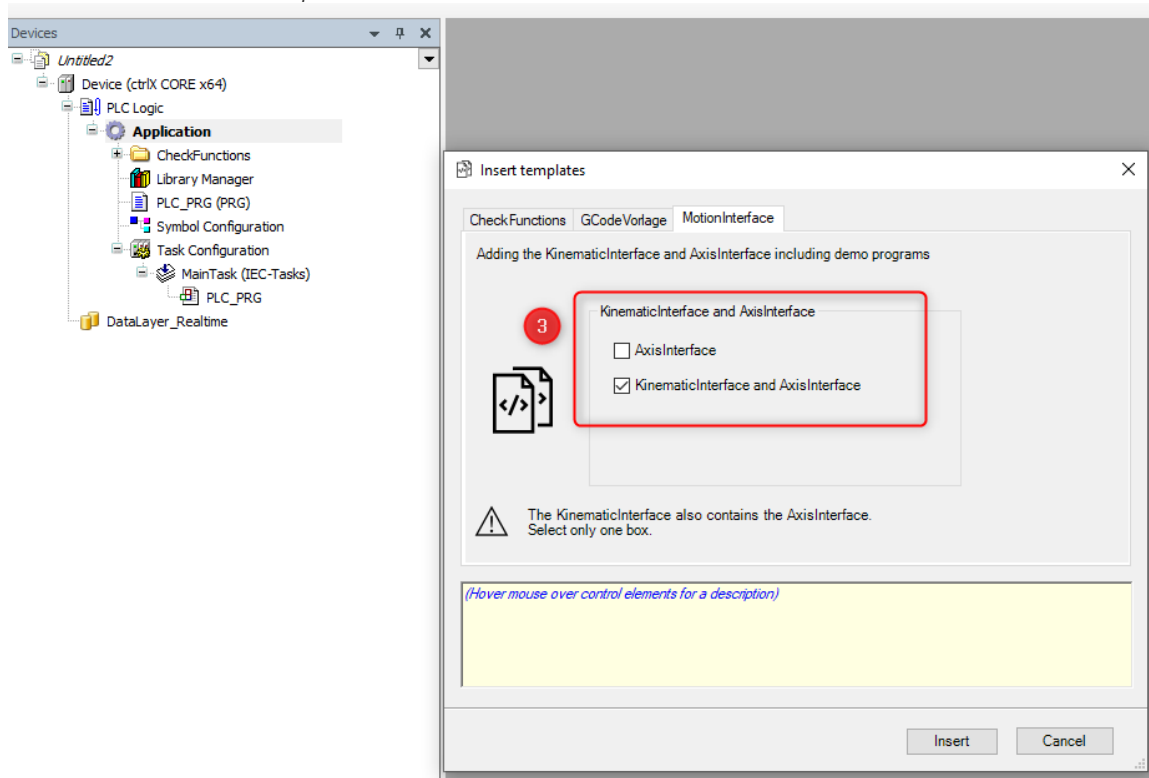
Create a new PLC project and insert PLC templates. Both the G-Code template and Motion Interface template need to be inserted:



*Insert the PLC templates in PLC project*

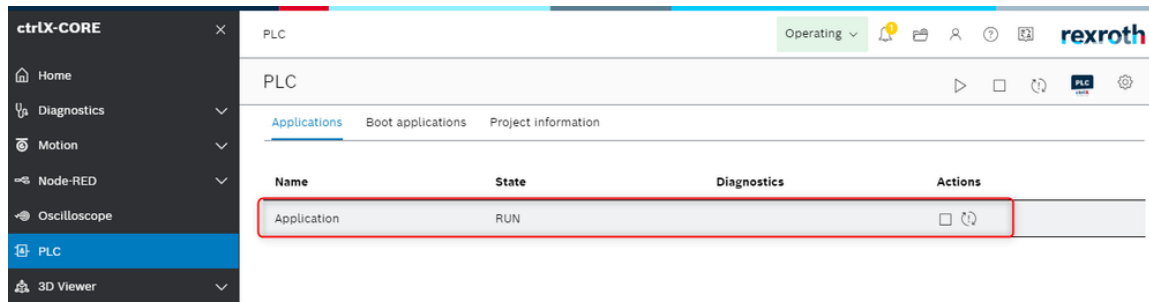


Select and insert G-Code template



Select and insert Motion Interface template

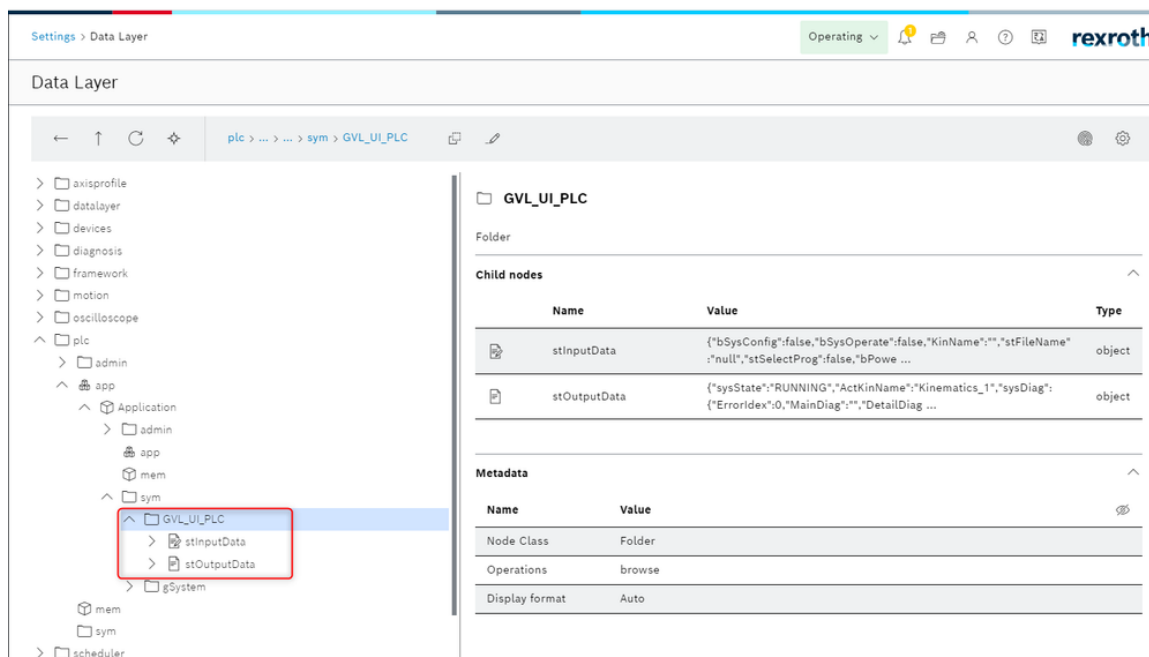
Make sure the right PLC project is loaded, and "Application" of PLC runtime in ctrlX WORKS is in state of "RUN".



Application of PLC runtime in ctrlX WORKS is in state of RUN

All of PLC interface variables can be traced in the DataLayer node, as shown in the figure below.

(Path: plc/app/Application/sym/GVL\_UI\_PLC/stInputData)



PLC interface variables in the DataLayer node

## Node-RED part

There are two methods to load and active Node-RED configuration:

- Load GCode\_UI\_\*\*\*\*.zip from the "Manage app data".
- Or import GCode\_UI\_\*\*\*\*.json in Node-RED flow editor.

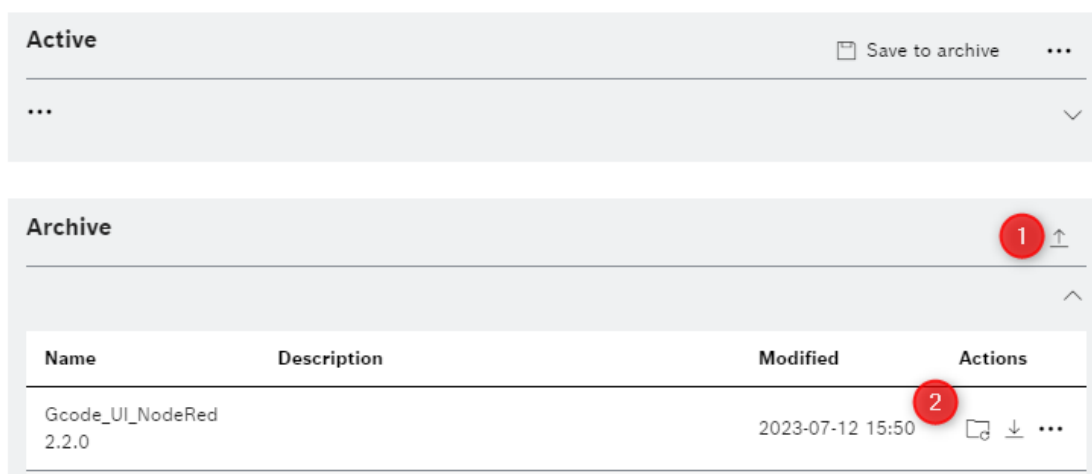
**Note:**

GCode\_UI\_\*\*\*\*.zip: It doesn't only contain the configuration of Node-RED, but also the configuration of Motion, the existing motion configuration will be overwritten. Therefore, it is recommended to load and activate the Node-RED configuration through the second way.

GCode\_UI\_\*\*\*\*.json: It only contains the configuration of Node-RED, the user needs to add axes and create at least one kinematics before implementation.

**Method 1:** Activate the configuration of Node-RED by loading the GCode\_UI\_\*\*\*\*.zip file.

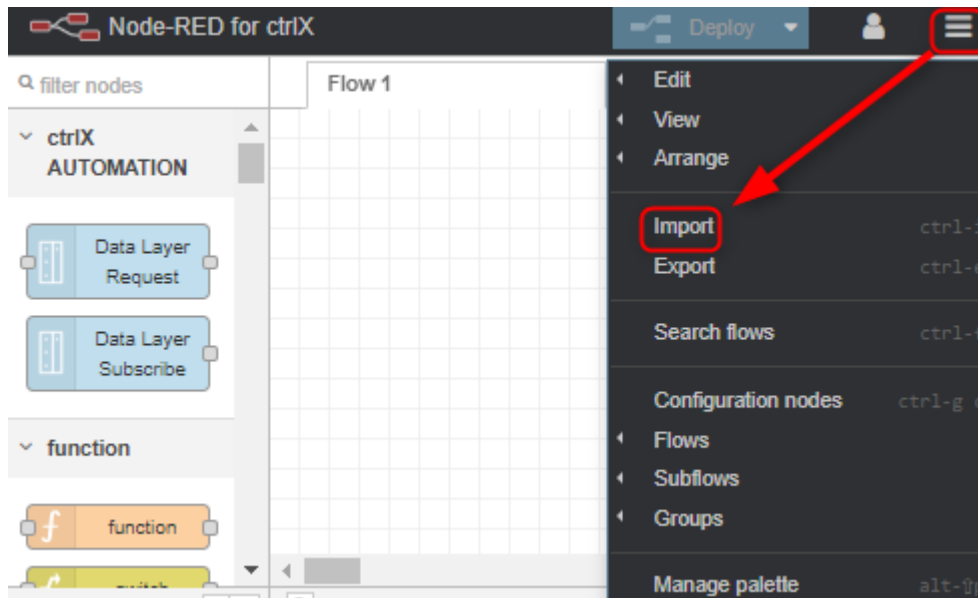
- Switch ctrlX CORE state to "Setup" mode, uploads GCode\_UI\_\*\*\*\*.zip file via "Home → Manage app data → Archive/Uploads Configuration".
- Active the configuration and switch the ctrlX CORE state to "Operating" mode.



Activate the configuration of Node-RED by loading the GCode\_UI\_\*\*\*\*.zip file

**Method 2:** Activate the configuration of Node-RED by import the GCode\_UI\_\*\*\*\*.json file.

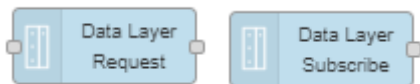
Open Flow Editor of Node-RED App, then import the Node-RED configuration flows.



Activate the configuration of Node-RED by import the GCode\_UI\_\*\*\*\*.json file

**Note:**

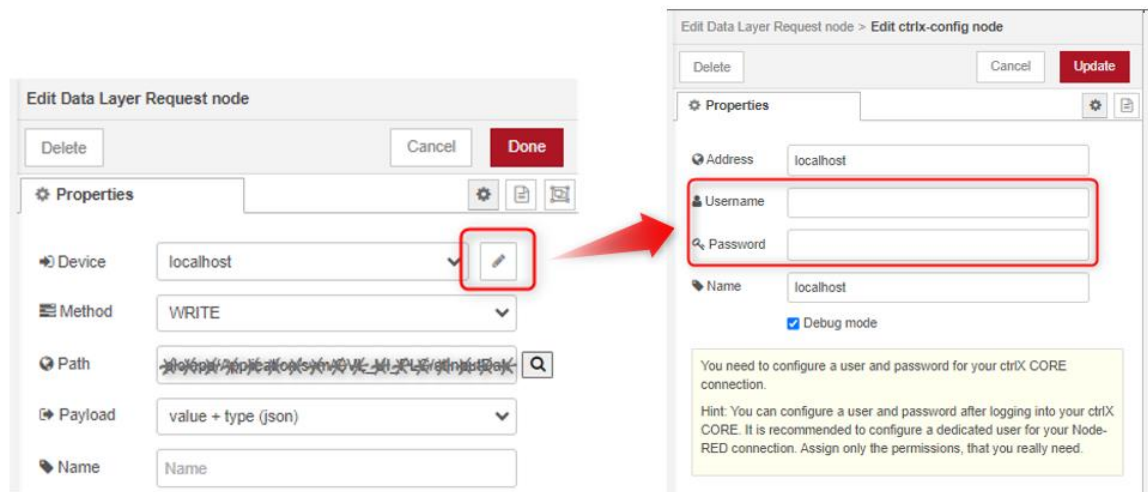
The Node-RED configuration has been uploaded, but there are two ctrlX Automation nodes that need to be logged in before flows are deployed. One is the “Data Layer Request” node and another one is “Data Layer Subscribe” node.



How to log in “Data Layer Request” node:

- Double-click any “Data Layer Request” node to open the configuration window.
- Enter the username and password to log in, as shown in the figure below.
- Deploy the flows.

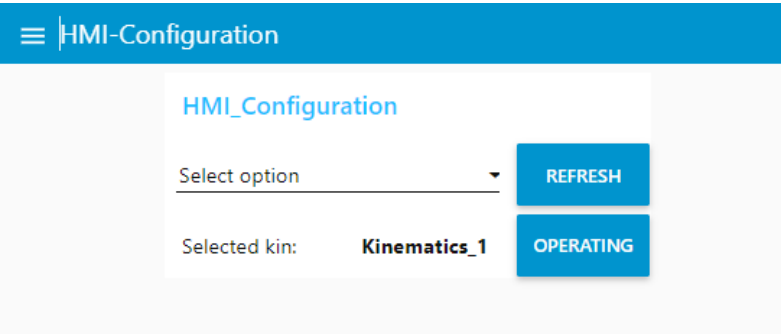
Same for the "Data Layer Subscription" node.



How to log in Data Layer request node

Description of G-Code UI

G-Code UI have two modes: HMI-Configuration and HMI-Operating.



HMI-Configuration of G-Code UI (2.6.0 and below)

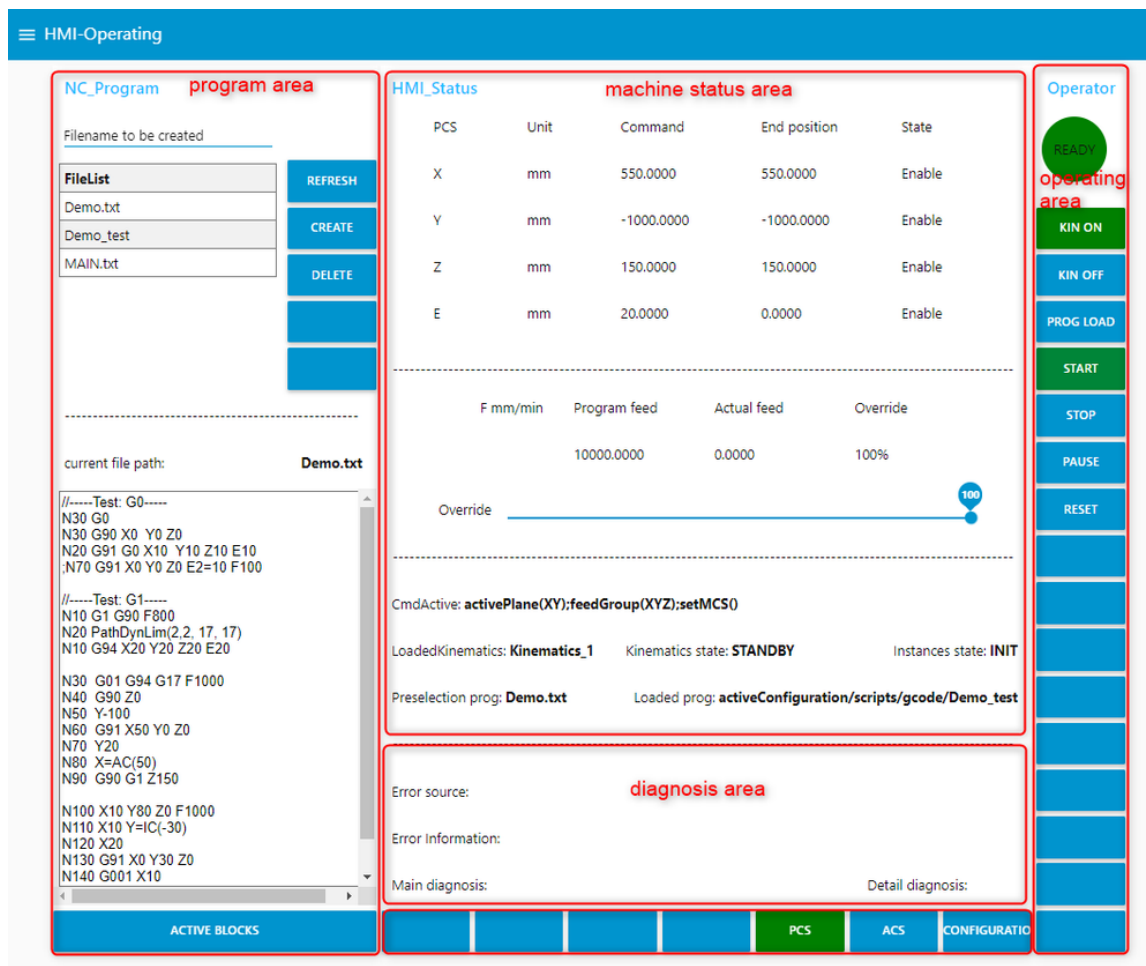
HMI-Configuration is shown as picture. Before you switch from UI to operating mode, it is needed to refresh and select the right kinematics. The below table describes the areas in configuration mode:

Optional operations of HMI-Configuration

	Name	Description
1	Select option	Select kinematics to be activated from the "Select option" drop-down menu.
2	REFRESH	Load all of kinematics which have been created in motion kernel.
3	OPERATING	Switch HMI mode from configuration to operating.
4	Selected kin	Displays the loaded kinematics.



HMI-Operating of UI includes four areas: program, machine status, operation and diagnosis.



HMI-Operating of G-Code UI

### Program area:

There are two pages in the program area. The default page "NC\_Program" displays the operable fields for of the program, which are described in the below table. The "Active\_NC\_Blocks" page displays the activated NC block. The page is switched from "NC\_Program" to "Active\_NC\_Blocks" automatically when the NC program is running.

*Optional operations of program area of HMI-Operating*

	Name	Description
1	File List	Show the list of NC programs. The default storage path is "Manage app data/Active/scripts/gcode".
2	Filename to be created	Input the name of new NC program.

3	REFRESH	Refresh the NC program list.
4	CREATE	After input the new program name via "Filename to be created", click "CREATE" to create program.
5	DELETE	Delete program.
6	ACTIVE BLOCKS	Switch page to "ACTIVE BLOCKS" manually. Only when NC program is running, the "ACTIVE_NC_BLOCKS" page can display the executing NC blocks. Switch from "Active_NC_Blocks" page to "NC_Program" page via "PROGRAM" button.
7	SAVE	Save the NC program.

#### Machine status area:

- Display axis status, position, and velocity information. Maximal four axes status can be displayed.
- Slider of override to modify the percentage of command value F.
- Observe the active command options.
- Show kinematics activated name and state.
- Displays pre-selected and loaded programs.

#### Operating area:

This area provides operation buttons to control the system.

*Optional operations of operating area of HMI-Operating*

	Name	Description
1	CONFIGURATING	Switch HMI from operating to configuring.
2	KIN ON	Axes power on and group enable.
3	KIN OFF	Axes power off and group disable.
4	PROG LOAD	Load the pre-selected program, switch UI state from "DISABLED" to "READY".
5	START	<ul style="list-style-type: none"> <li>▪ Start NC program, switch UI state from "READY" to "RUNNING".</li> <li>▪ Continue running NC program which has been interrupted by pause. UI state switch from "PAUSE" to "RUNNING".</li> <li>▪ Reset M0 and continue running NC program.</li> </ul>
6	STOP	Stop NC program, switch UI state from "RUNNING" / "PAUSE" to "READY".
7	PAUSE	Pause NC program, switch UI state from "RUNNING" to "PAUSE".
8	RESET	Reset errors, switch UI state from "ERROR" to "DISABLED".

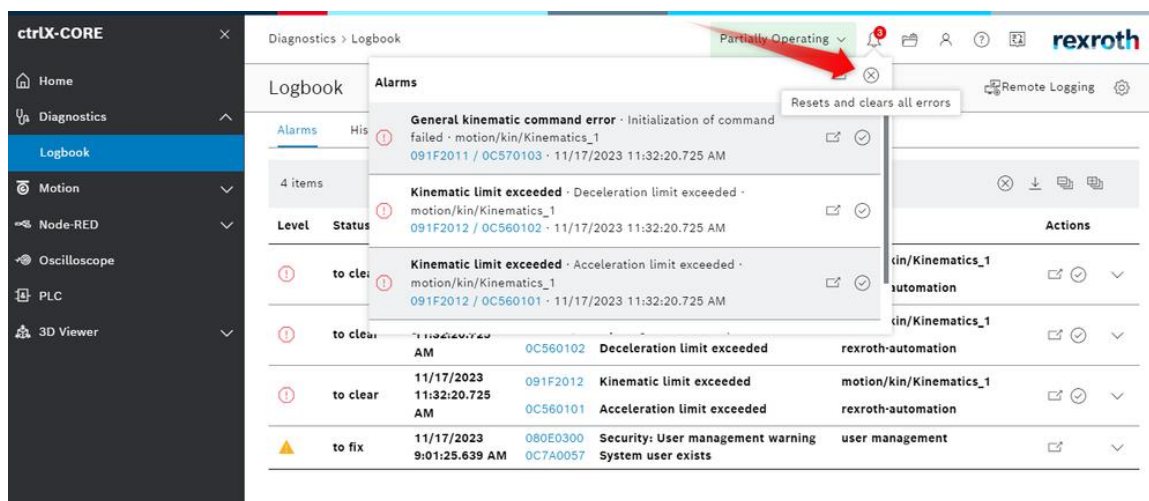
9	PCS	Show kinematics position in product coordinate system.
10	ACS	Show kinematics position in axis coordinate system.

### Diagnosis display:

When an error occurs, the user can get the following information from the UI:

- Main diagnosis: Main number of the diagnostic information.
- Detail diagnosis: Detailed number of the diagnostic information.
- Error Information: Description of error.
- Error source: Traced source of the error

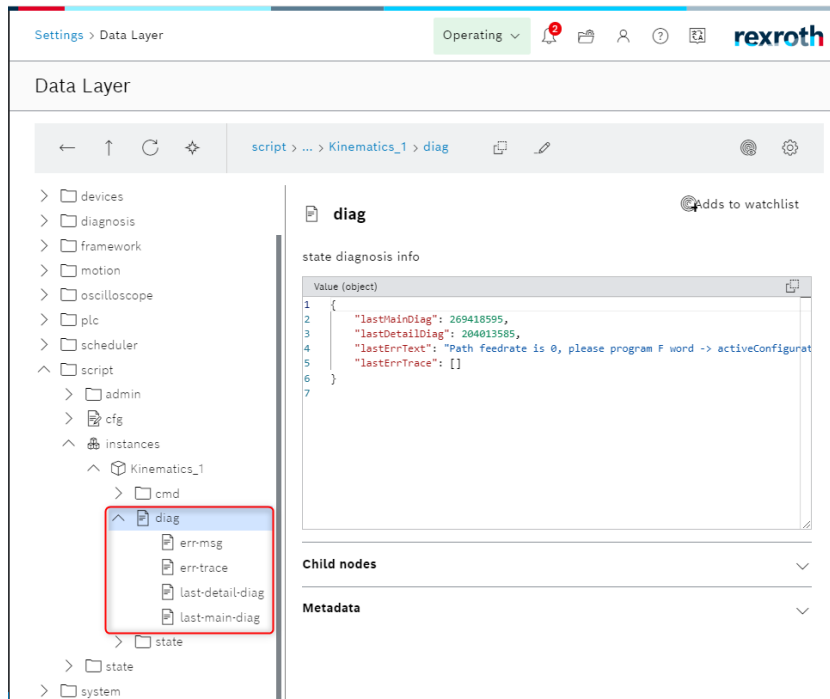
The diagnosis includes motion error, G-Code error, PLC error and error from others. If the error cannot reset from UI, users can clear pending alarm as below picture.



Clear pending alarms

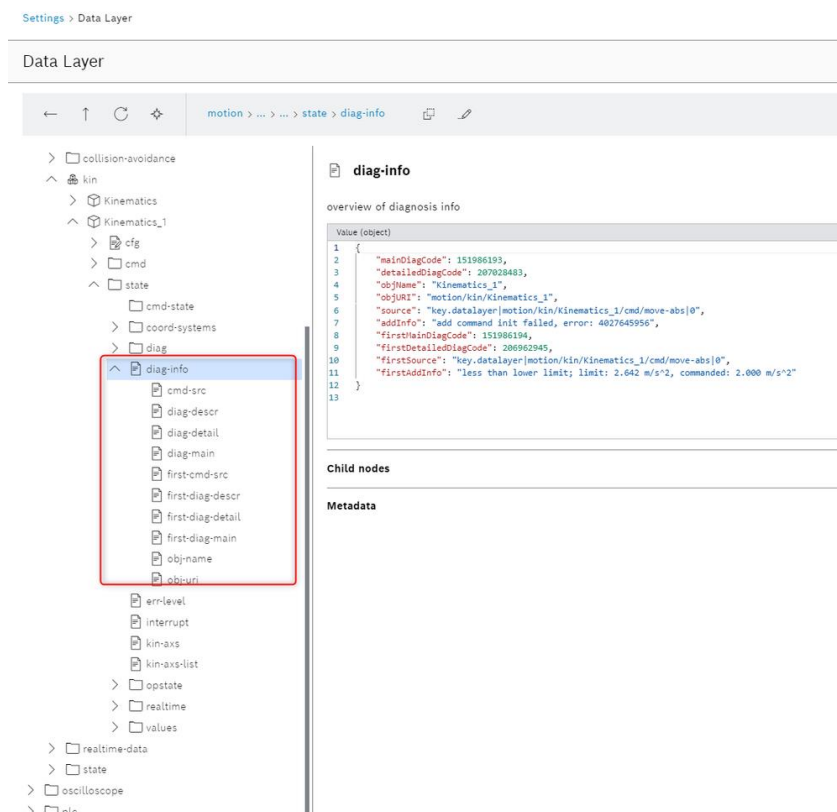
All errors also can be traced in Diagnostics/Logbook, and in addition, the errors from G-Code and motion can also be traced in data layer node.

G-Code error: `script/instances/<"kinematics name">/diag`



The DataLayer node for G-Code error

Motion error: motion/kin/Kinematics\_1/state/diag-info



The DataLayer node for Motion errors

**Note:**

Big NC file can be loaded in "Manage app data -> Active -> Scripts will be executed by script runner", it should be edited before loading.

**Operate G-Code UI**

Before you operate G-Code UI, at least one kinematics should be created, and PLC project should be in "RUN" state.

- Open G-Code UI at the Node-RED/ Dashboard.
- Refresh and select which kinematics will be activated at configuring mode.
- Click "OPERATING" button to switch HMI mode from configuring to operating.
- Axes power on and group axes of kinematics via "KINON" button.
- Input the new program name via "Filename to be created", then click the button of "CREATE" to create a new program. When create a NC program, system will automatically create the "gcode" folder, which is in "Manage app data -> Active -> Scripts will be executed by script runner" as the default NC program storage location.
- Select and open the new program, then NC program can be edited.
- Save the NC program via "SAVE" button.
- Click the "PROG LOAD" button to load the pre-selected program.
- Click the "START" button to implement the program which loaded.
- Pause NC program via "PAUSE", and then continue running program via "START".
- Stop NC program via "STOP" and reset error via "RESET".

**Related Links**

- [ctrlX AUTOMATION - G-Code Runtime App](#)
- [Documentation G-Code Runtime App](#)
- [Documentation ctrlX MOTION App \(including CXA\\_MOTION, Data Layer/REST, Python, C++\)](#)
- [Documentation ctrlX Node-RED App](#)
- [Documentation ctrlX PLC App](#)