Typhoon HIL

AIT HIL Controller Step by Step Guide



AUSTRIAN INSTITUTE OF TECHNOLOGY

TABLE OF CONTENTS

INTRODUCTION 3
REQUIREMENTS 3
HARDWARE REQUIREMENTS 3
SOFTWARE REQUIREMENTS 3
STEP-BY-STEP GUIDE 4
CONNECTING/WIRING THE DEVICES 4
INSTALLING PACKAGE IN TYPHOON HIL CONTROL CENTER 5
AIT HIL Controller CONFIGURATION AND SOFTWARE SETUP 6
C-HIL SIMULATION STEP-BY-STEP 7
TEST AUTOMATION STEP-BY-STEP 10
REFERENCES 11
APPENDIX I – Changing application mode of SGC 11

INTRODUCTION

The Step by Step guide describes the process of running a simple Controller Hardware-In-the-Loop example using AIT HIL Controller device. The example is based on the provided Unit example model.

This document is divided in few sections. The Requirements section lists all the Hardware and Software requirements. Step-by-Step section presents the procedure of running a C-HIL simulation and an automated test on the provided Unit example model. This includes parametrization of Typhoon HIL tools as well as the AIT HIL Controller itself. Finally various references are provided in References section.

REQUIREMENTS

HARDWARE REQUIREMENTS

- ☐ HIL Device
- ☐ AIT HIL Controller
- ☐ Cables:
  - USB B cable or Ethernet (for connecting PC with HIL device)
  - USB B cable (for connecting PC with AIT HIL Controller)
  - 2 x DIN 41612 (96 positions) cables (for connecting the HIL simulator with AIT HIL Controller)

SOFTWARE REQUIREMENTS

- ☐ Typhoon Control Center v2024.1 or higher
- ☐ Downloaded AIT HIL Controller typhoon package (.tpkg)

STEP-BY-STEP GUIDE

This chapter is divided into 5 sections. The first section describes the hardware connection and wiring. If the devices are already connected, feel free to skip this part. In second section, process of installing package in Typhoon HIL Control Center is described. In third section AIT HIL Controller configuration and basic software setup is presented. The following section explains how to open Unit example model and run simulation in HIL SCADA. Last section describes how to open and run provided automated test.

CONNECTING/WIRING THE DEVICES

Connect the following cables as shown in Figure 1:

- ☐ Connect AIT HIL Controller with Typhoon HIL simulator using the two DIN 41612 cables.
- ☐ Connect Typhoon HIL simulator to the PC using USB B cable or Ethernet cable.
- ☐ Connect AIT HIL Controller to the PC using USB B cable.



Figure 1. Properly connected AIT HIL Controller

INSTALLING PACKAGE IN TYPHOON HIL CONTROL CENTER

- ☐ Open Typhoon HIL Control Center (THCC).
- ☐ Go into Additional tools and open Package Manager.

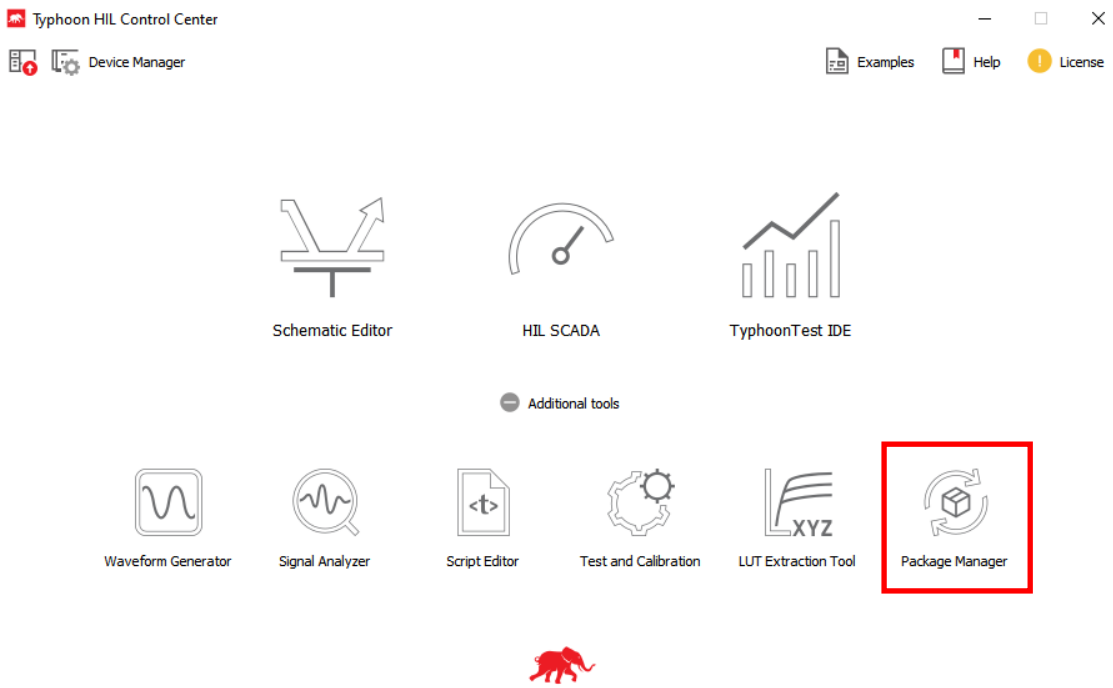


Figure 2. THCC Main Window

- ☐ Click on *Install package…* button and choose *Install package from disk*.
- ☐ Find where package is located on your PC and click on *Open*.
- ☐ Properly installed package should look like its shown in Figure 3.

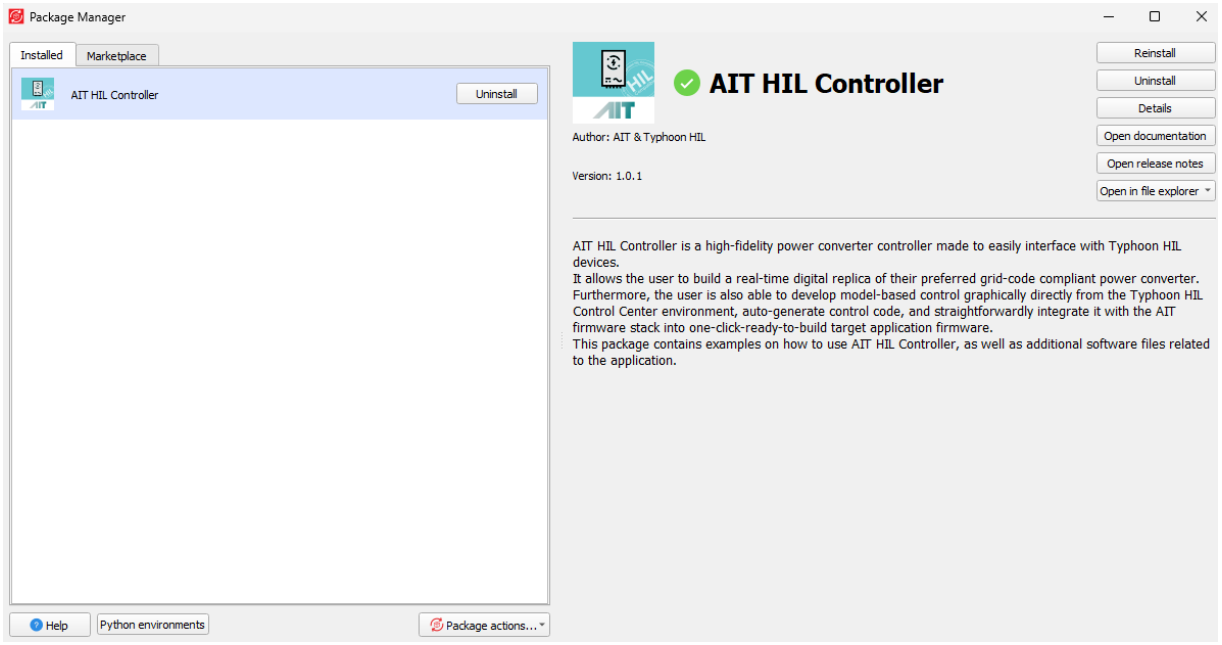


Figure 3. Properly installed package in Package Manager

- ☐ Download and install drivers for AIT HIL Controller COM port from the link. Download **CP210x Windows Driver with Serial Enumerator**. After that you need to extract this folder and install CP210xVCPInstaller_64 (or CP210xVCPInstaller_86 depending on Windows on your PC). Now, when AIT HIL Controller is connected to the PC, two new ports will appear in your Device Manager -> Ports (COM & LPT) like it's shown in Figure 4.

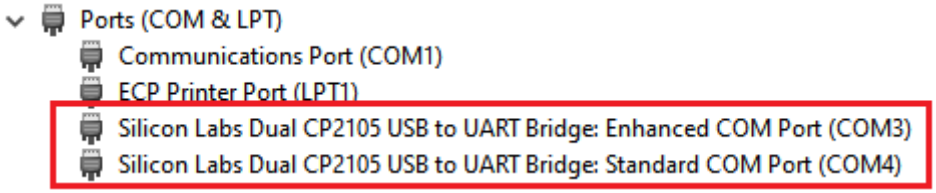


Figure 4. COM Ports

- ☐ Go to Package manager in THCC. Click on *Open in file explorer* and choose *Open additional files*. Go in additional_files\OEM_files\software folder and copy entire path from address bar.
- ☐ Open Standalone SCADA and click on *Open Panel*. Paste path you copied to address bar and select and open ASGC_GUI.cus panel.
- ☐ In communication group (top left corner of panel shown in Figure 5) select COM port of SGC SCI and click on connect. This should be done before starting HIL SCADA.

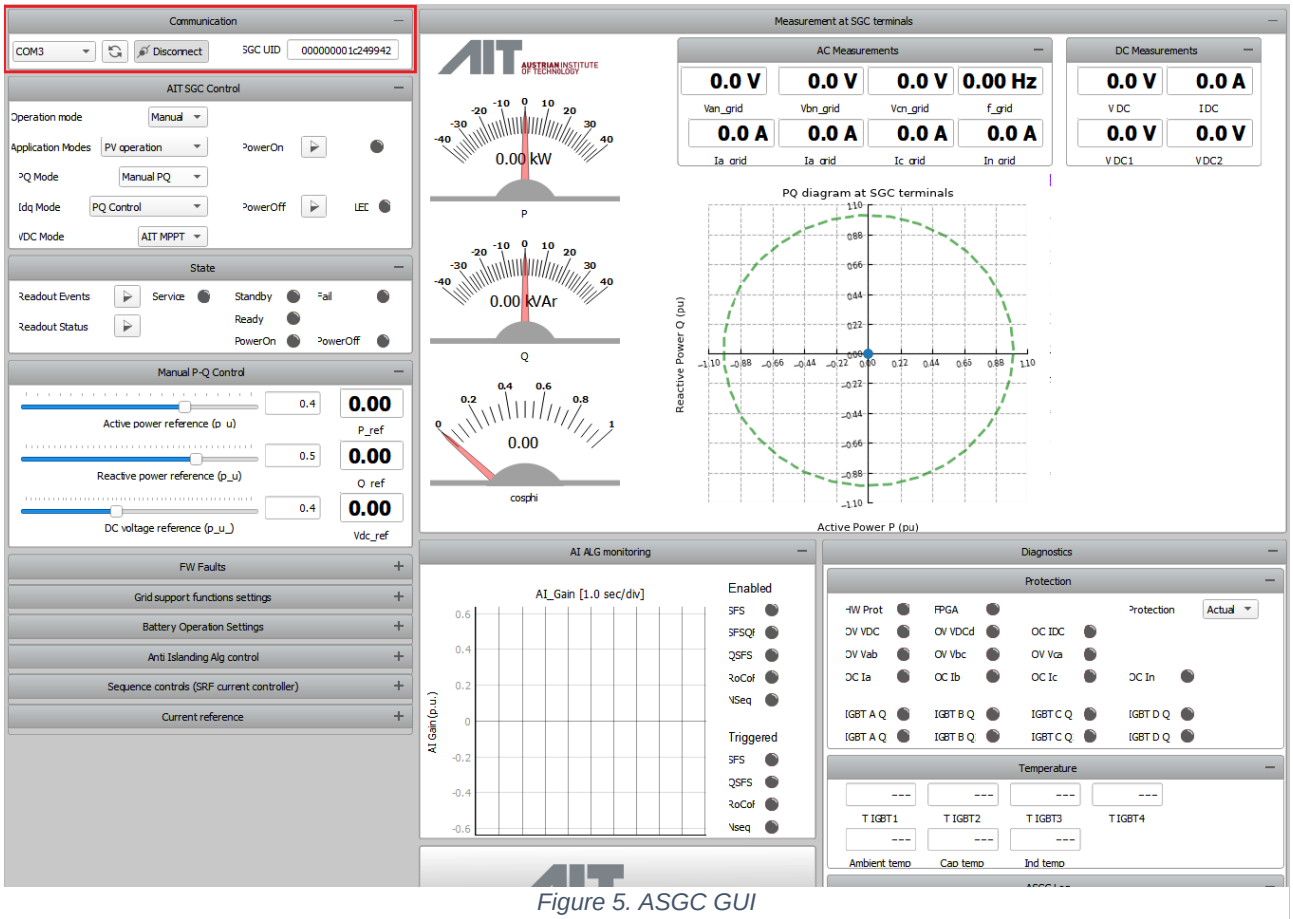


Figure 5. ASGC GUI

C-HIL SIMULATION STEP-BY-STEP

- ☐ On main window of THCC click on *Examples* button to open Example Explorer.
- ☐ On the left side, you will find all examples provided for this package. Click once on an example you want to use according to desired application. On the right side of window, you will see description of model with picture of it, as shown in Figure 6.
- ☐ Click on *Open model* button.

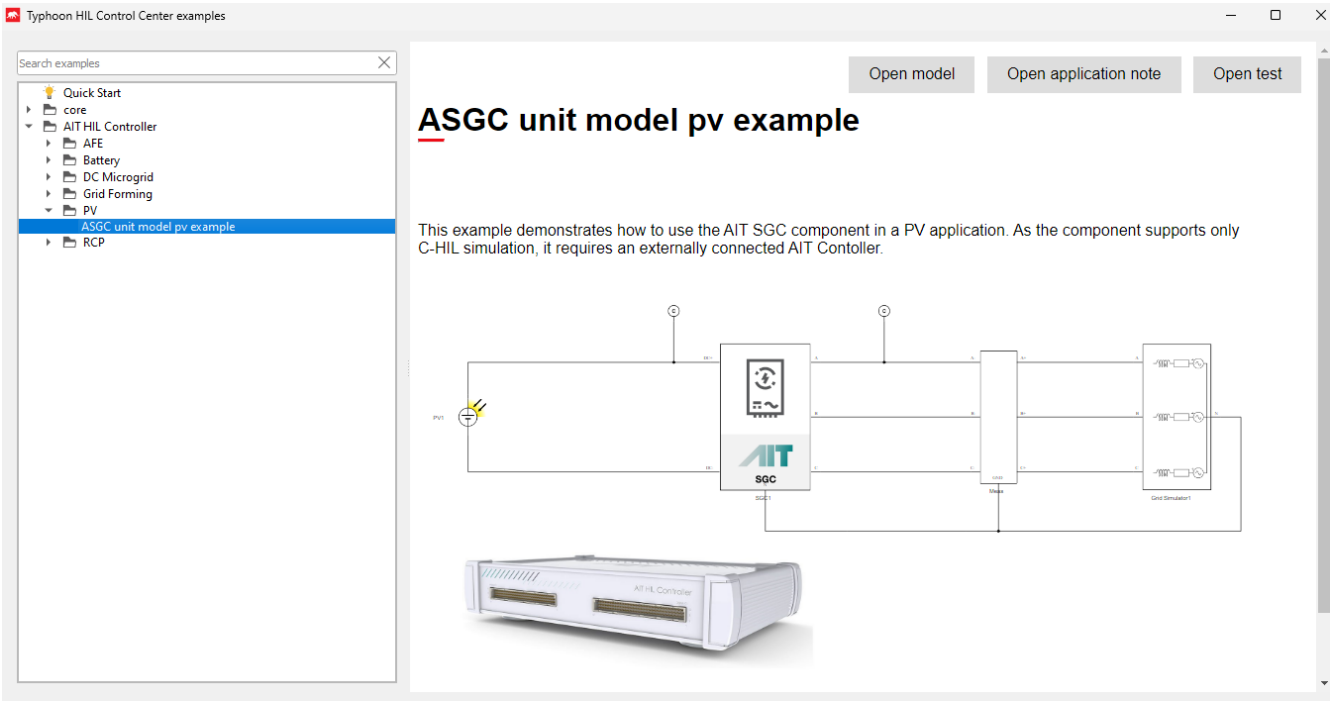


Figure 6. AIT SGC unit model in Example explorer

- ☐ If you are using HIL604 or HIL606 it is necessary to define the row on which is AIT HIL Controller connected to the Typhoon HIL Simulator. That is done on the mask of SGC component, in HIL System Parameters tab through I/O Position property.
- ☐ Compile model and load it to HIL SCADA. Open ASGC_unit_model_scada.cus panel and run it, as shown in Figure 7.
    - NOTE: PV file init.ipvx will automatically be loaded during initialization (if you have chosen PV application).

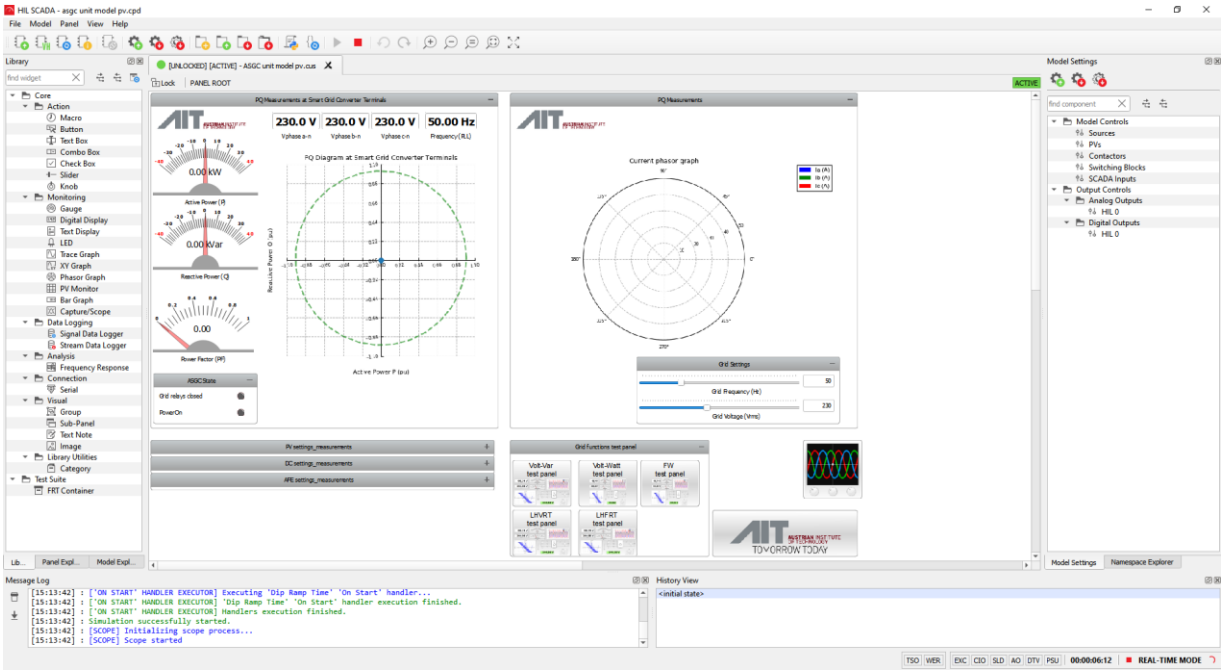


Figure 7. AIT SGC unit model in HIL SCADA

☐ Open panel that you previously opened in Standalone HIL SCADA and run it. Be sure to start this panel after one in HIL SCADA and that controller is connected. You should see readings as shown in Figure 8.

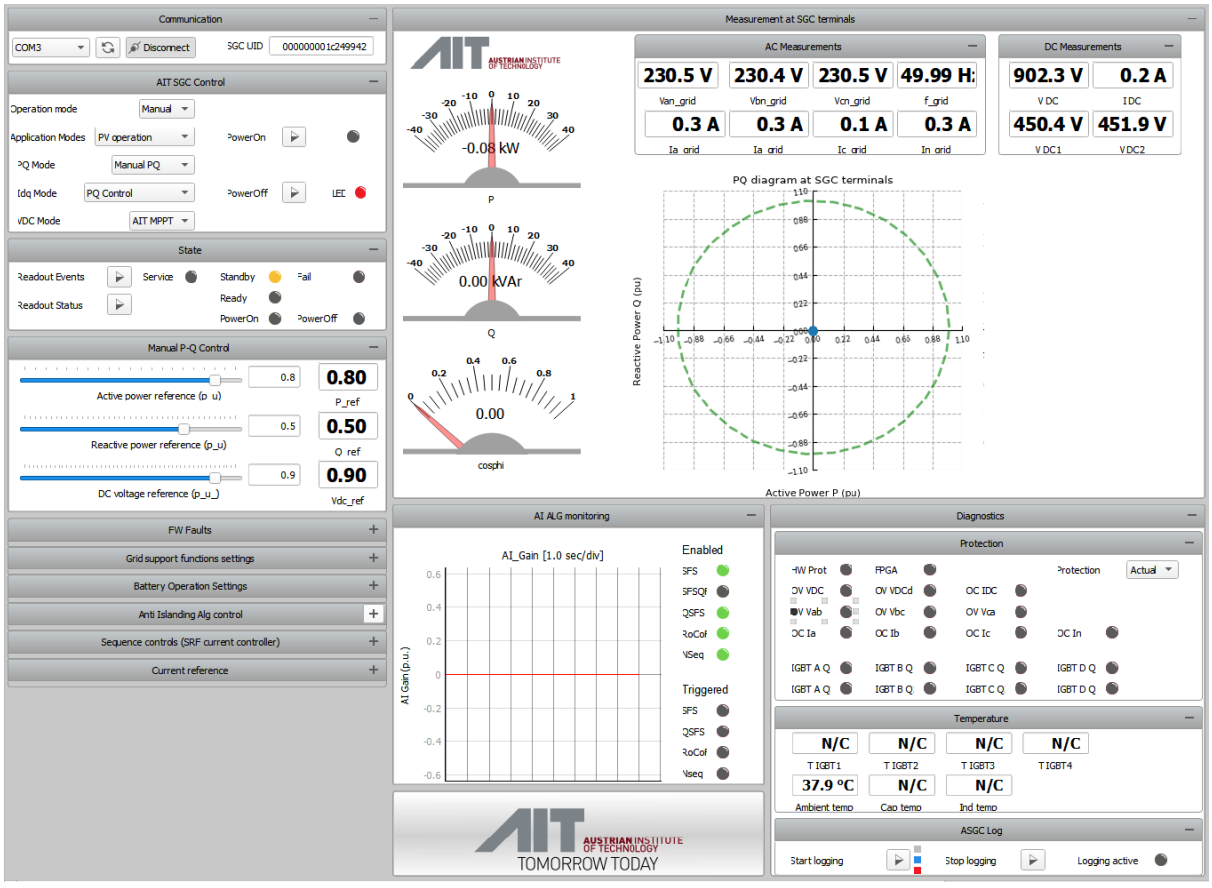


Figure 8. Successfully started simulation in Standalone SCADA

- ☐ Before powering the inverter on, you should change application mode, if it's necessary. Click on *Readout status* button in panel opened in Standalone SCADA and look at message that shows up in Message Log. If under *Execution* you see application that you wanted to use, you can move on, if not go to APPENDIX I – Changing application mode of SGC. Also, if under Operation you see *service*, in Operation mode combo box choose *Manual*.

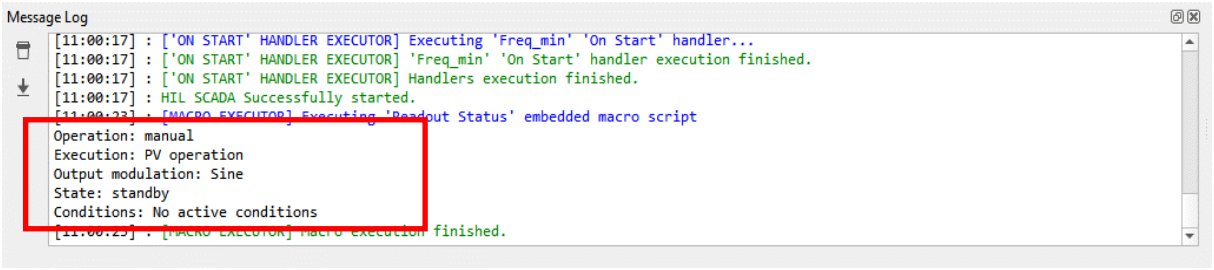


Figure 9. Message Log in Standalone SCADA

- ☐ You can Power on inverter by clicking corresponding button in AIT SGC Control group widget. When it's powered on, LED next to the button will become green and in State group widget LED labelled PowerOn will also be green.
- ☐ In Manual P-Q Control group you can change references for Active and Reactive power, if PQ Mode is set on Manual PQ. You can see change in power by looking at gauges in Measurement at SGC terminals group or opening, for example, Volt-Var test panel in HIL SCADA like it's shown in Figure 10. Also, you can change DC Voltage reference here, if VDC mode is chosen.

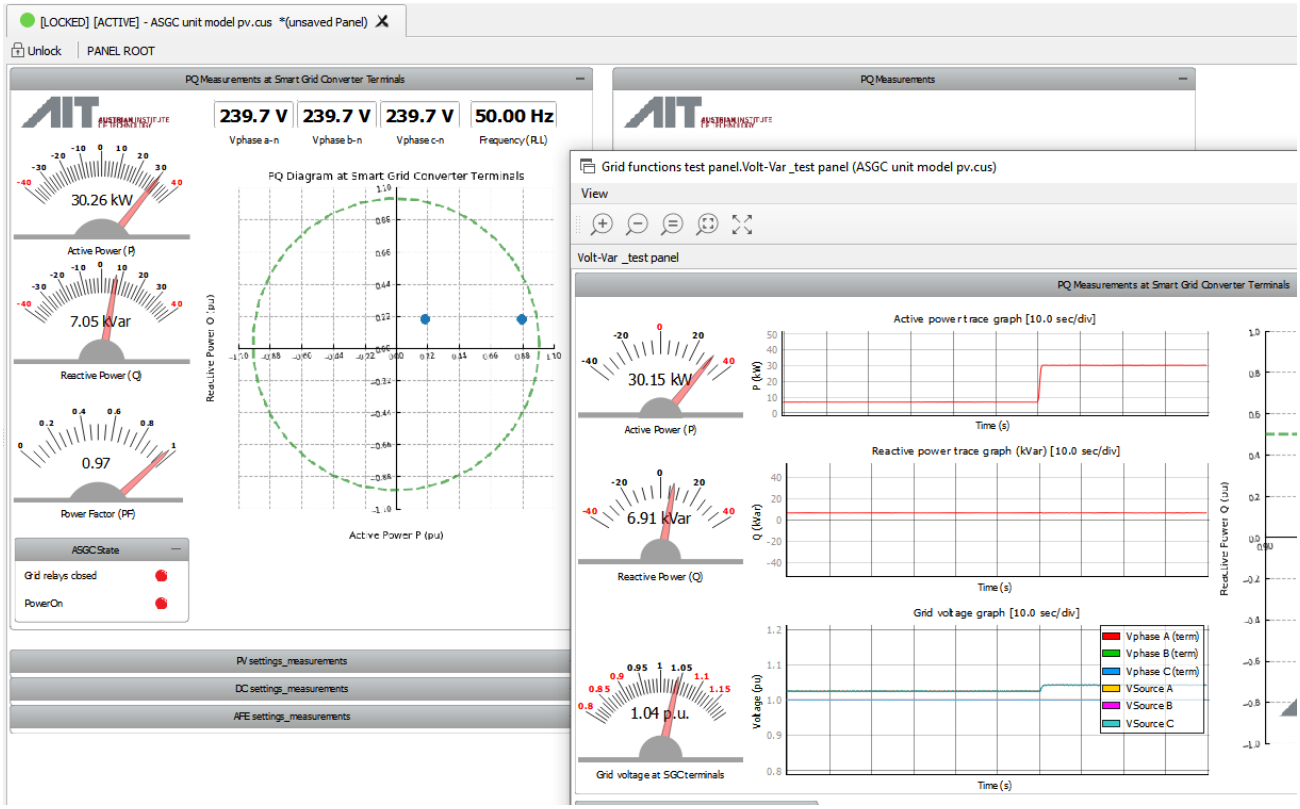


Figure 10. HIL SCADA, changed active power reference

TEST AUTOMATION STEP-BY-STEP

- ☐ Go to Example explorer and select example for which you want to run test.
- ☐ Click on *Open test* button.
- ☐ Change working directory window will appear. It is necessary to click on *yes*.
- ☐ New window will appear to select working directory. It should automatically lead to the folder where your test is located. Click on *Select Folder* in the bottom of the window and test will appear, as shown in Figure 11.

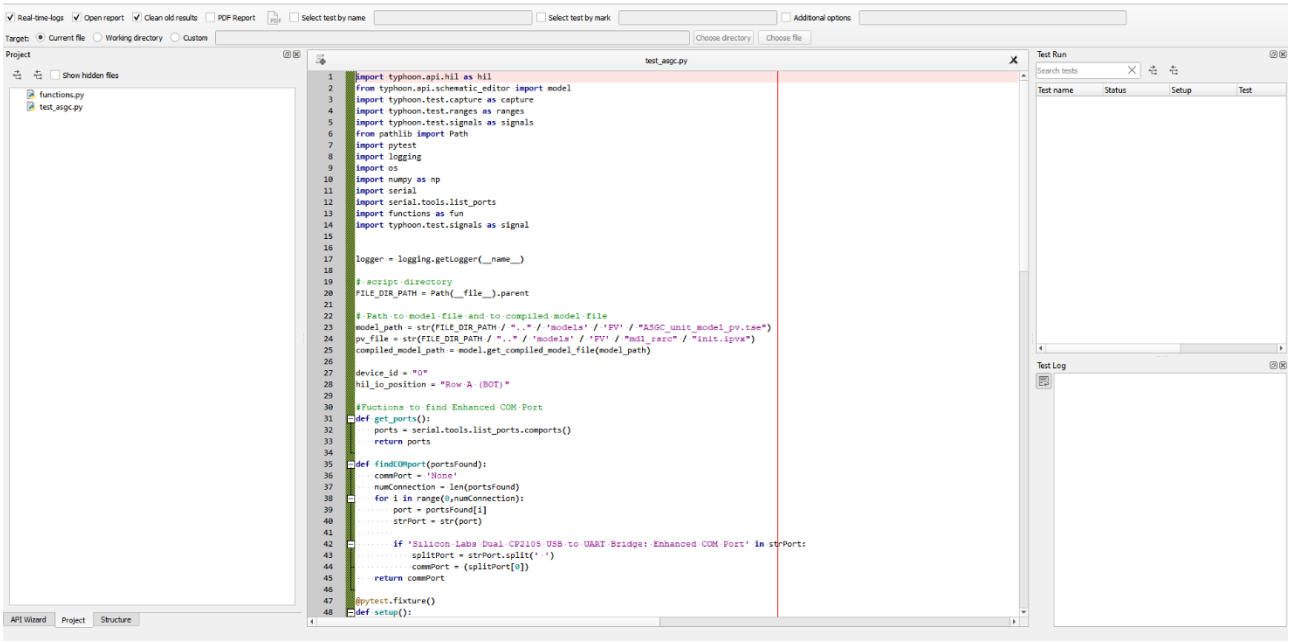


Figure 11. ASGC_test in TyphoonTest IDE

- ☐ Before running the test, it is necessary to define HIL ID with device_id parameter and I/O position of the AIT HIL controller connections to the Typhoon HIL Simulator with hil_io_position. If you are using HIL402, HIL404 or HIL602+ it is necessary to define hil_io_position as "Row A (BOT)".

```
26
27  device_id = "0"
28  hil_io_position = "Row A (BOT)"
29
```

Figure 12. Definition of HIL ID and I/O position in TyphoonTest IDE

- ☐ Run the test.
- ☐ When Test is finished Report will appear, as shown in Figure 13. On the right side you can find information about on which COM port are you connected and status of ASGC before powering inverter on.

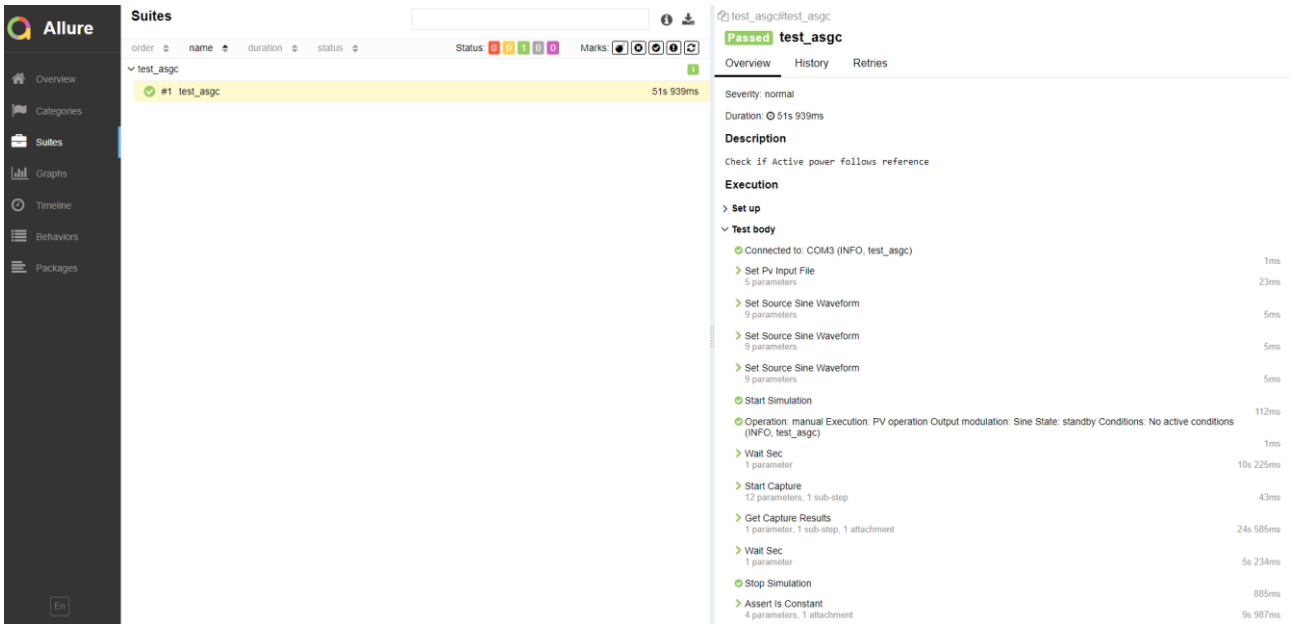


Figure 13. Report after successful test execution

REFERENCES

[1] Typhoon HIL home page, https://www.typhoon-hil.com/

APPENDIX I – CHANGING APPLICATION MODE OF SGC

- ☐ Open Standalone SCADA and open ASGC_GUI.cus panel located in additional_files\OEM_files\software. To get to additional files folder, go in Package Manager tool, click on *Open in file explorer* and choose *Open additional files.*
- ☐ In communication group select COM port of SGC SCI and click on connect. After that start simulation in Standalone SCADA.
- ☐ In *AIT SGC Control* group of widgets, find Operation mode combo box, and select *Service.* This will put SGC in Service mode. LED labeled Service will turn blue, when this is finished.

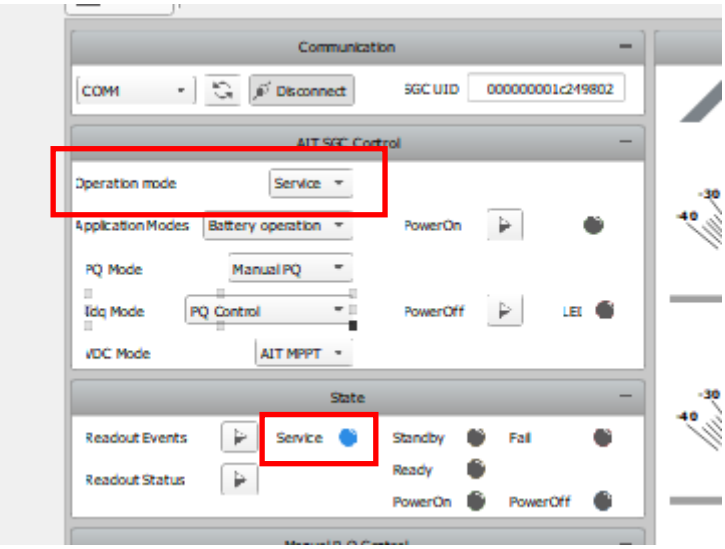


Figure 14. Putting SGC into Service Mode in Standalone SCADA

- ☐ In Application Modes combo box, choose Application you want to use.
- ☐ To check if everything is done correctly, click on Readout status button and you will see a message in Message Log like one shown in Figure 15. Check if application you have chosen is written in message under *Execution*.

```
[11:30:40] : HIL SCADA Successfully started.
[11:30:43] : [MACRO EXECUTOR] Executing 'Readout Status' embedded macro script
Operation: service
Execution: Battery operation
Output modulation: Sine
State: service
Conditions: op.service.
[11:30:43] : [MACRO EXECUTOR] Macro execution finished.
```

Figure 15. Message Log in Standalone SCADA