G5.SASControl

PC-Software for Solar Array Simulation

REGATRON G5.SASControl is an application software specially designed for simulating solar arrays to test PV inverters in range from a few kW up to 2000+ kW. It is suitable for use in R+D laboratories and as well on test benches. The G5.SASControl software offers the user the possibility to test and qualify the solar inverters according to international standards. The advantages of the G5 PV simulation solution result from the combination of the G5.SASControl software together with the G5 power supplies. While the curves can be easily generated and monitored on the graphical user interface, the power supply takes care of the entire curve calculation and guarantees real-time computational processing with advanced accuracy, sampling rate and resolution. This feature is necessary for the compliant efficiency measurement procedures for maximum power point tracking (MPPT) of solar inverters as described in EN 50530.

Core of G5.SASControl is a versatile script programming system that gives the user the possibility to easily implement own programming sequences with one or more G5 devices or systems and to measure and protocol the resulting data.

G5.SASControl is the comprehensive software for all simulations, tests and evaluations in the field of PV inverter testing.

Key Features & Functionality

- Fully integrated in REGATRONS's G5.SAS and G5.UNV devices
- Remote connection to a G5 device / system via PC interfaces, e.g. USB or LAN interface
- Easy generation and simulation of characteristic I-V curve of solar panels according to EN 50530 standard
- Parameter based operation, simple script programming for automated processes
- Consideration of the theoretical MPP value for tracking efficiency calculation
- Change of irradiance value, temperature, short circuit current (I_{sc}), or open circuit voltage (U_{oc})
- Display and logging of various actual and set values
- Upper output value limiters for voltage, current and power with dynamic change of control mode
- Indication of warnings and errors, including incident history
- Tabs can be arranged individually on the screen by the user

Application

The PC software G5.SASControl simulates the specific characteristics of user definable solar arrays and their dependence on environmental conditions.
Core of the simulation is a fast and dynamic algorithm, which computes the relationship between voltage and array current onboard the power supply device in µ-seconds. Therefore, even highly dynamic processes interacting between the PV inverter and the simulated solar array can be tested under controlled and largely real conditions.

The G5.SASControl software works with single devices or with G5 multi-device systems. Up to seven individual devices or systems can be controlled with one single instance of the software.

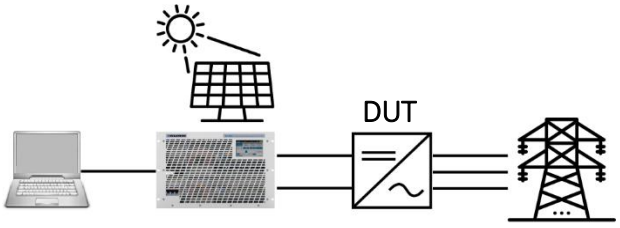

Figure 1: PV curves are created by G5.SASControl software and transferred to the G5 device. The G5 device controls the current as a function of the curve definition and the applied voltage of the device under test (DUT). The calculation of the current I = f(U) is performed onboard of the G5 power supply without any communication delay.

MPP Tracking Test

Testing the inverter's MPP tracking efficiency is possible for static testing by changing I_{SC} and U_{OC} values or for dynamic testing by changing irradiance and temperature conditions as the theoretical MPP is always known by the software. The following curves are available:

Calculated I-V curves:

The basis of the calculated curve is a mathematical 1-diode-model of solar cells according to EN 50530:2010. The relevant MPP will be calculated automatically. These curves are used for dynamic MPPT efficiency test by changing irrandiance and temperature conditions.

Custom I-V curves:

Individually defined PV curves for particular requirements by using an arbitrary set of data points. The envisaged MPP may be configured manually to get tracking efficiency values. These curves are used for static MPPT or plain I or V scaling.

Tests according to EN 50530

Preprogrammed SAS-scripts for testing inverters according EN 50530 are provided with G5.SASControl with following features:

- Script for static MPP test included:
  Determination of the conversion efficiency at 48 different operating points of the G5 PV simulator and perform the MPP tracking test
- Script for dynamic MPP tests included:
  To run the trapezoid curves (10…50%, 30…100%)
- Script for start-up / shutdown tests included
- Possibility to customize the scripts as desired

User Interface Structure

Thanks to the division into different tabs and windows and its flexible arrangement on the screen, the G5 solar array simulation system can be configured and commissioned quickly and efficiently according to customers' needs.

The software provides a number of tabs to configure the system. A status bar, permanently visible on every tab allows the user to select a connected device from which the values are displayed.

Control Tab

The control tab represents the main user interface with display of the live data, the DC-on/off button and access to information on warnings, errors, as well as to the saved incident history

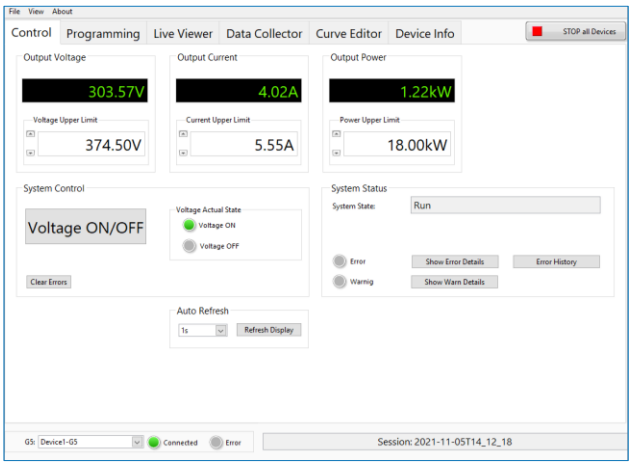

Figure 2: Information on the main operating values, like actual values and upper limits.

Programming Tab

Selection of a provided script to be used for testing, or implementing an own custom script is done within the programming tab.
It provides intelligent coding by means of content assist. The integrated parser displays available commands in a selection box on the fly.

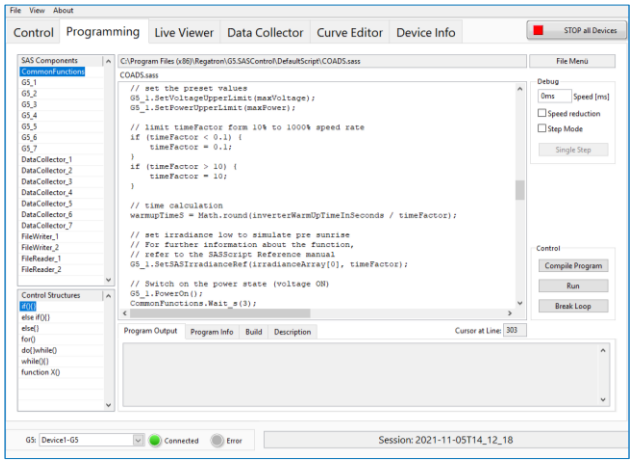

Figure 3: Programming and debugging tab with single step mode and output window.

Further features of the programming tab:

- Test sequence programming with an easy to learn (JavaScript alike) language
- Extended debugging capabilities: single step mode, slow motion, interactive loop break
- Importing data from file to be processed in a script
- Read in and simulate irradiation measurements of a complete course of the day
- Software for running tests according to EN 50530 (static / dynamic MPPT)
- Support for up to seven individual G5 connections / channels with a communication watchdog

Live Viewer Tab

Monitoring of the actual curve and the dynamically tracked MPP on this curve is one of the main tasks of the live viewer tab.
Furthermore, it provides information on the theoretical MPP and the calculation of the MPP tracking efficiency.
The programmed irradiance and temperature or U_{oc} and I_{sc} and its changes is displayed dynamically.

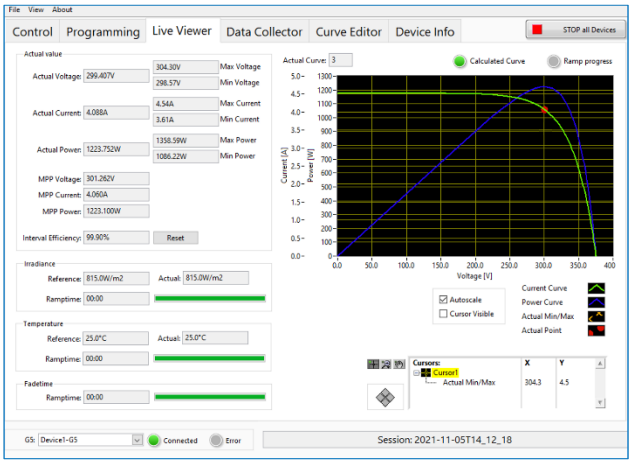

Figure 4: Visualisation of the programmed curve and the corresponding operating point.

Data Collector Tab

The data collector is an 8-channel long term data logger with virtually unrestricted data recording on a PC file. Start/Stop of the logger and the selection of commonly used signals may be done manually or from within a programming script.
The raw data can be exported to Excel or clipboard.

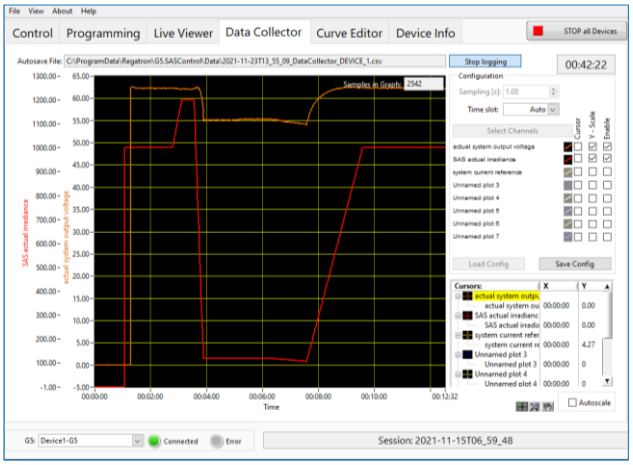

Figure 5: Easy selection of channels to be displayed.

Curve Editor Tab

Whether you want G5.SASControl to automatically calculate a curve according to EN 50530 or you want to import your own customized curve, both can be easily done in the curve editor tab.
Besides crystalline silicon (cSi) or thin film (TF) technology with its predefined parameters, also an automatic calculation with user defined cell characteristic parameters is possible.
The generated curves can be saved on, or loaded from the device's flash memory.

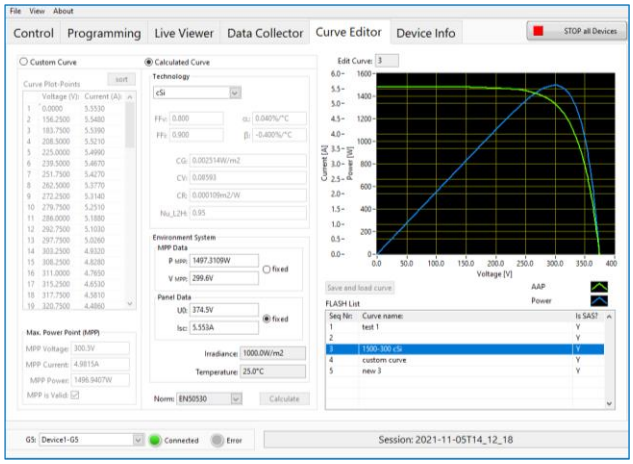

Figure 6: Curve generation and automatic MPP calculation.

Further features of the curve editor tab:

- Calculation of MPP based on parameter set according to EN 50530 model
- Curve preview
- Import of custom curves from csv file
- Editing, saving and loading of curves on G5
- Managing of the curves list saved on G5

Device Info Tab

The device info tab shows information about the connected and selected G5 system such as device identification, software versions, installed software options, overall system values and connection information.

G5.SASControl on G5 Devices

G5.SASControl software is included in G5.SAS and G5.UNV deliveries.

Connectivity

A connection is established via Ethernet or USB using the connection manager of the G5.SASControl software, which offers further functions such as multi device connection and auto connect for pre-configured connections. A communication watchdog may be activated in script programming.

System Requirements

- Windows 10 (32bit and 64bit)
- 4 GB RAM
- 5 GB disk space
- Recommended screen resolution 1280 x 720 or higher
- LabView Runtime Engine (part of the scope of delivery)

This product is developed, produced and tested according to ISO 9001 by REGATRON.

All product specifications and information herein are subject to change without notice.

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