G5.Control

PC-Software for Operating and Service of the G5 Family

G5.Control allows complete and easy control of the power supply unit or entire master-slave system and also offers a whole range of service functions. In addition to basic control, configuration and update functions, G5.Control has a powerful integrated 8-channel digital scope. The high-resolution real-time display of numerous internal system signals allows the engineer to optimize the overall system in a targeted manner. Different application specific settings of parameters for single devices or master-slave systems can be saved on the devices and either recalled by G5.Control, an API or CAN message or digital I/O signals. Firmware updates can be carried out quickly and easily for individual units as well as for master-slave systems with a single command. When handling support cases concerning the application of the power supplies, the built-in diagnostic functions help to quickly identify the problem.

Key Features & Functionality

- G5.Control softwarre included in the scope of delivery of every G5 programmable DC power supply
- Upper and lower output value limiters for voltage, current and power with dynamic change of the control mode
- Upper and lower trip and warning limit values for voltage, current and power allows the user to programm a digital fast-acting fuse and to protect electrial installation and device under test (DUT)
- Programming of optional function generator TFE and AAP
- Digital 8-channel scope functionality for data analysis and application specific system control optimization
- Activation and saving of application specific configuration settings on the device
- Free configuration of all analog and digital I/O channels
- Graphical supported multi-device system configuration
- Firmware updates of a single unit as also of multi-device systems
- Option enabling allows remote activation of additional functionalities at a later stage
- Tabs can be arranged individually on the screen by the user

User levels

To effectively protect application and DUT-specific settings, G5.Control offers three user levels with different permissions.

- "Standard User" (default configuration)
  Password not required to operate the device/system and adapt operating references
- "Advanced User"
  A password is required to configure sensitive parameters of the device
- "Power User"
  A daily changing password is required for the access to calibration data

User Interface Structure

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

In addition to the consistently displayed DC-on/off, warnings, errors, and access to the saved incident history, the software provides also a number of tabs to configure the system

Control Tab

The control tab represents the main user interface with display of the live data. Furthermore it allows for setting of control modes, reference, and upper and lower limit values.

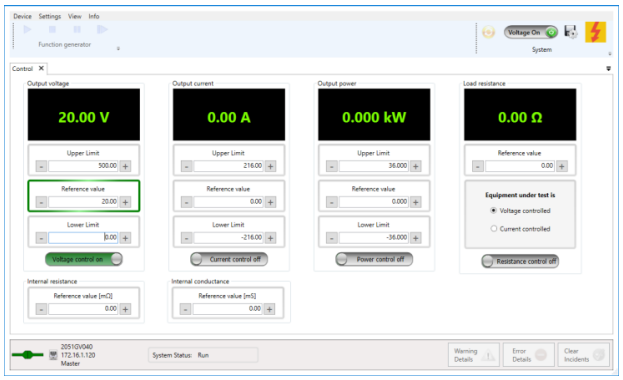

Figure 1: Comprehensive information on the main operatig values with setting of the controller mode constant voltage (CV), current (CC), power (CP), or resistance (CR) and additional setting of real-time calculated internal resistance (Ri) or conductance (Gi)

Multi Device Configuration Window

A graphical representation of the devices in a multi-device system allows an intuitive definition of the system in series, parallel or matrix connection. Even splitting up of a system in independent subsystems without the need of changing the communication bus wiring is done with a few clicks of the mouse.

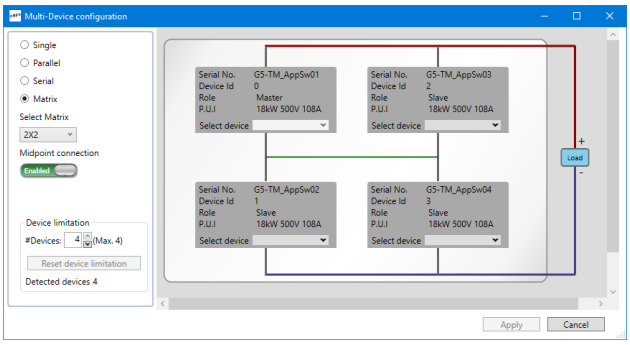

Figure 2: G5.Control provides meaningful visualisations that display the current configuration and specify the DC wiring of the multi device system as well as the most important data of the involved devices.

I/O Configuration Tab

For greater flexibility when integrating the G5 into an external control system, the analog pins of the I/O terminal X705 of the G5 unit can be freely assigned to the desired values while the digital pins may be assigned to the desired functions and also defined as input or output. In addition to standard functions such as analog set- and actual values as well as the operation status commands like DC on/off and reset of errors, there are also further functions available. These are selecting the controller mode, integration of an external insulation monitoring unit or loading an application specific parameter set.

Digital I/Os may be assigned as active-high, or active-low signal. Furthermore the configuration of each pin can be protected by selecting an appropriate user level.

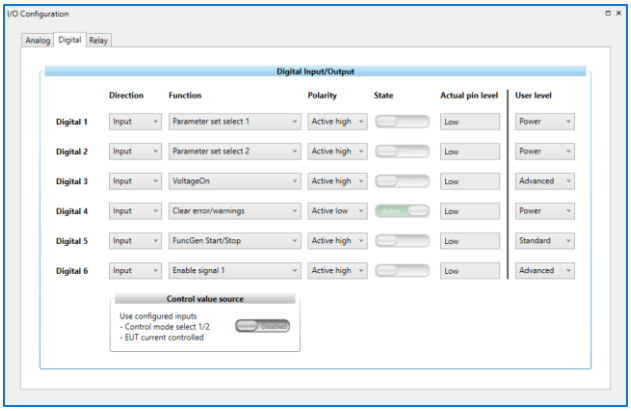

Figure 3: Flexible system integration due to free pin-function assignment

Load Protect Tab

To effectively protect the DUT, not only voltage, current and power are monitored for a violation of trip or warning limits in both quadrants, but there is also a continuous I^2t calculation available to simulate the behaviour of a thermal fuse. The installation of a real DC fuse is cost-intensive and generates a considerable amount of dissipated energy. The digital fuse of the G5 series is therefore significantly more economical and freely programmable in terms of current level and tripping characteristics.

In order to protect a battery as DUT, G5.Control provides also an undervoltage monitoring with trip and warning limit to avoid dangerous deep discharge conditions.

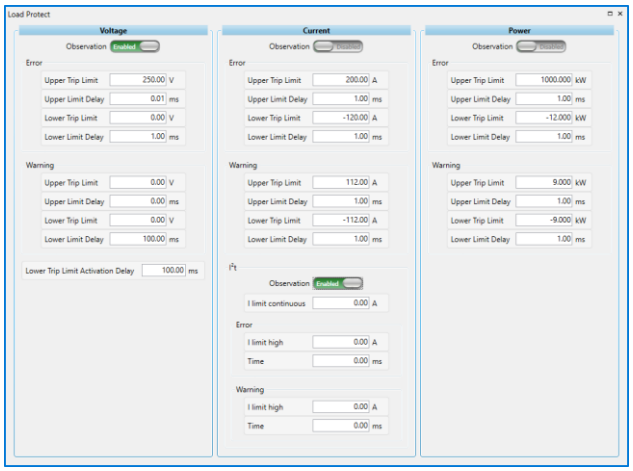

Figure 4: Individual enabling/disabling of each observation block and setting of various trip and warning limits

Use cases for I/O Configuration and Load Protect

#1: Insulation monitoring

The insulation monitoring unit can interact with G5/X705 analog and digital I/O interface. Customer's automation test system has access via CANmp interface for remote activation of the insulation measurement (D_{OUT}) and to read out the actual insulation value (A_{IN}) and the warning or error status (D_{IN}).

#2: Digital fuse

Digital fuses can be programmed to protect the wiring and the DUT with different voltage and current ratings. The parameter sets and the corresponding I/O contacts can be protected by the Power User password, so that the user cannot manipulate the system incorrectly. The setting of the various programmed DC fuse values can be easily changed by means of an external selector switch.

#3: Application switch

An external mounted application selector switch allows the user to switch between different applications related configuration settings. The table below lists some important application specific settings of battery testing and battery simulation mode.

Application specific setting	Battery testing	Battery simulation
Low output filter capacity for increased current stability	X	
High output filter capacity for increased voltage stability		X
Activated RPP feature for reverse polarity protection, softstart and to avoid deep discharge at DC off state	X	
High impedance to avoid even small measurement currents during DC off state	X	
Active discharge at DC off		X
Optional DC Discharge Unit (DDU)		X

Function Generator Tab (TFE)

The optional time-based function generator (TFE) offers nearly unlimited time-dependent functions on voltage, current or power. The execution of the function is on board of the power supply, therefore a real-time capability with high resolution of approx. 20 µs is given for single devices or multi-unit systems. Selectable predefined waveforms like square wave, triangle and more, an arbitrary function definition by a value table and an envelope modulation capability round off the functionality of the TFE. The fast preset handling and large selection of waveforms allow the use of the TFE for high speed ripple modulation up to 10 kHz or load profile simulation. The saving and recall of various functions like f = U(t), f = I(t), and f = P(t) on the device or through csv-file handling is available.

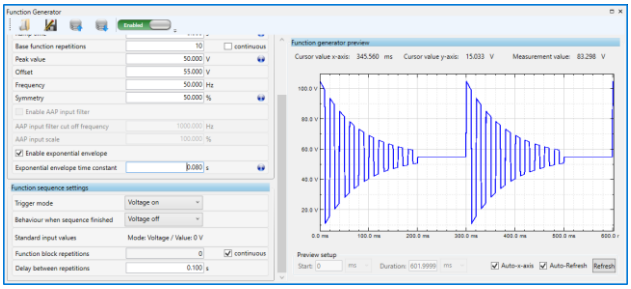

Figure 5: Easy programming of time dependent functions with TFE

Function Generator Tab (AAP)

The optional application area programming feature (AAP) allows to set the DC output voltage or current or power as a function of any of the input values I_{DC}, U_{DC}, or P_{DC}. The functional relationship is given by a user-defined curve whose values are managed by CSV import/export. In this way, a wide variety of nonlinear electrical two-pole networks can be defined, e.g., photovoltaic arrays or fuel cell curves. As an example, the following figure shows the typical PV array characteristics with a current/voltage dependence. Embedded calculation on board the G5 power supply assures real-time simulation.

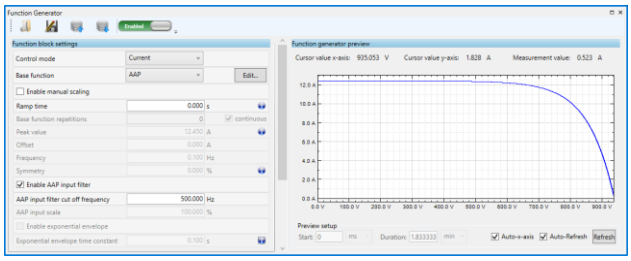

Figure 6: AAP curve with a characteristic of a PV array I = f(U)

Scope Tab

G5.Control has a powerful integrated 8-channel digital scope. The high-resolution real-time display of numerous internal system signals allows the engineer to optimize the overall system in a targeted manner. Besides the variables available outside the unit like U_{DC} and I_{DC}, it can also record internal signals, such as reference values or controller output variables of the G5 unit. With the convenient trigger/pretrigger menu and the comparison function by which actual tracks can be directly superimposed on reference tracks, the user has a comprehensive analysis tool at hand.

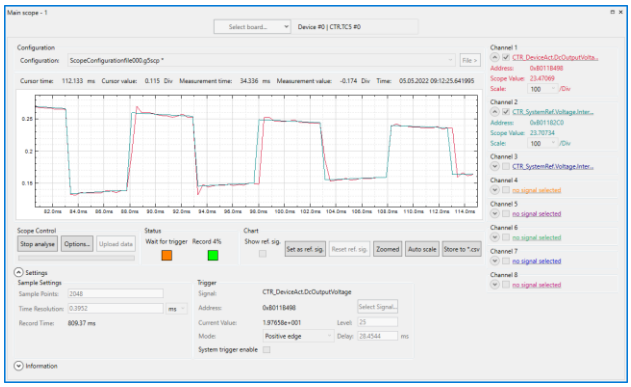

Figure 7: G5 Scope for external and internal analysis

Configuration Tab

Several fields for editing of general device or system operational parameters are accessible on the configuration tab. Among others, these are:

- PI controller parameters for manual optimization of the control behaviour, independently adjustable for voltage, current and power controllers with separate settings for high- and low capacity output filters
- Quadrant limitation, source only, sink only or both quadrants (bidirectional)
- Adjustable slopes for voltage/current/power reference value steps
- Behaviour of the system at 'Voltage Off': Active discharge for drive train applications or high impedance mode for battery applications to avoid even small measurement currents during DC off state
- Voltage sensing for voltage drop compensation, settings for allowed sensing error level and tripping delay
- High- / low output filter capacitance switch for optimized control behaviour for different aplications
- 50/60 Hz AC grid frequency settings

Figure 8: Extensive setting options on the configuration tab

Use case for Configuration and Scope Tab

Various excellent features such as switchable filter time constants and adjustable controller settings as well as the integrated powerful 8-channel digital scope assist the user to quickly and easily achieve optimal system behavior for a special customer specific application.

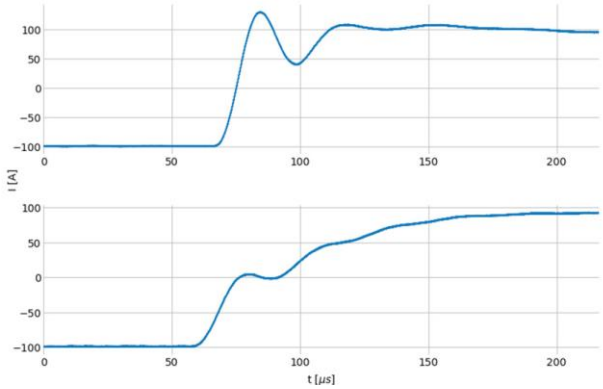

Figure 9: Parameterization example: set-value step currents. -97…97 A@333VDC in <50 µs with overshoot (top), in <200 µs w/o overshoot (bottom).

Status Tab

The status tab provides live data and system state values, as well as information about configuration, control and AC grid data.
In the case of a multi-device system, direct readout of individual device data as also system data is provided.

Calibration and adjustment

Calibration and adjustment of the power supplies is performed by means of the G5.Control software. Provided the necessary precision equipment is available, calibration and adjustment can be carried out in the field by the user or a third-party service provider. REGATRON will provide the required one-day password and operating instructions free of charge. REGATRON will of course also perform calibration and adjustment of power supplies at the factory for a flat service fee.

Device Info Window

The device info tab shows information about the G5 device such as device identification with key values, software versions, installed software options, multi-device configuration, overall system values and much more.

Connectivity

G5.Control may be installed on a PC with Windows 10 operating system and any device of the G5 family can be connected to the software.
A connection is established via Ethernet or USB using the connection manager of the G5.Control software, which offers further functions such as auto connect for pre-configured connections and a communication watchdog.
Furthermore a comprehensive .NET API is supplied with G5.Control.

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

For detailed technical information, contact REGATRON or your local sales partner.

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