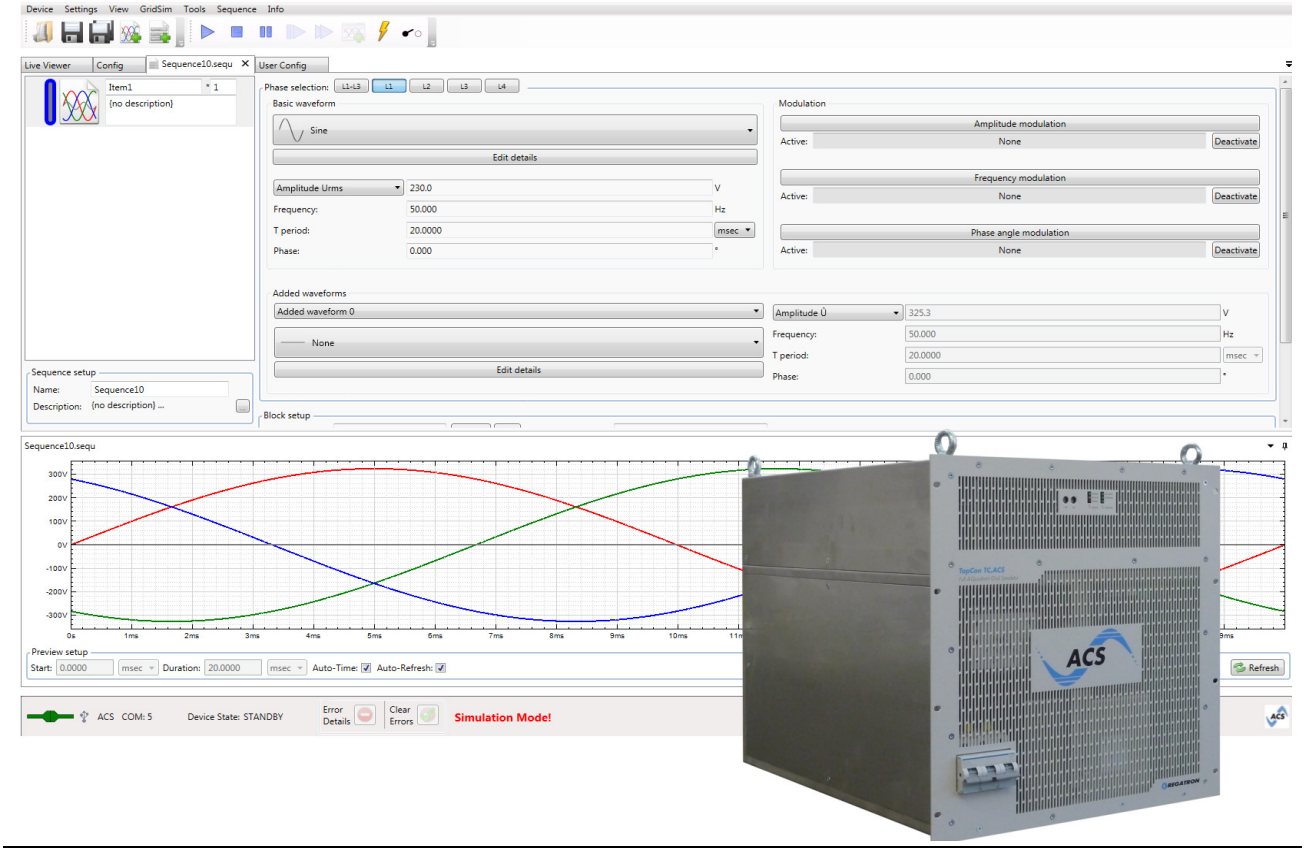
ACSControl

Software for operating the TC.ACS full 4-Quadrant Grid Simulator



Software Manual

Version V2.00

Regatron AG
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General Information

Usage of the Document

This document serves as a guide and also as a reference work. Familiarize yourself with the contents of the document to operate the device efficiently. The document must be available at all times to the personnel who are operating the device.

Copyright Information

The information in this documentation corresponds to the development situation at the time of going to print and is therefore not of a binding nature. Regatron AG reserves the right to make changes at any time for the purpose of technical progress or product improvement, without stating the reasons. In general we refer to the applicable issue of our “Terms of delivery”.

Customer Support

If you have any questions, your Regatron AG sales partner will be pleased to be of assistance. However, you can also reach Regatron Customer Support at tc.support@regatron.ch.

*For more information on the Regatron Customer Support see section **10 Support**.*

1 General Safety Information

1.1 Warning Symbols

Throughout this document the following symbols are used, wherever necessary, to indicate and specify hazardous or potentially hazardous situations:

Symbol	Indication
 **DANGER**	Hazardous situation which, if not avoided, will result in death or serious injury
 **WARNING**	Hazardous situation which, if not avoided, could result in death or serious injury
 **CAUTION**	Hazardous situation which, if not avoided, could result in minor or moderate injury
CAUTION	Hazardous situation which, if not avoided, could result in damage to the product or other items in its surroundings
	Hazard due to high voltage
	Hazard due to suspended load
	Hazard due to hot surface
	Hazard due to a substance or mixture of substances (H361, H373)
	Hazard due to a substance or mixture of substances (H302)

1.2 Ordinances and Regulations

Follow the mounting and installation instructions during electrical installation!

In particular, in the countries of the European Union the following standard applies:

EN 50178 Electronic equipment for use in power installations

If you want to use the electrical power supply in special applications, you must comply with the related standards and health and safety regulations.

Due to the high operating voltage and the high output voltages, an industrial electrical power supply represents a mortal hazard.

To avoid serious injuries or significant damage, only appropriately qualified personnel who are familiar with industrial electrical power supplies are allowed to work on the devices. These individuals must carefully read these operating instructions prior to installation and commissioning and follow the safety instructions.

Electronic devices are in principle not fail-safe. The user is responsible for ensuring that the electrical power supply, mains supplies and loads connected to it are placed in a safe state in the event of a failure of the device.

1.3 Categorization of the hazard Areas

The assessment of the effects of hazards from low-voltage systems with a flow of energy for supply and possibly regeneration is divided into the following areas:

- Personnel Area (1.3.1)
- Systems and Material Area (1.3.2)
- Mains Connection Area (1.3.3)
- Surrounding Area (1.3.4)
- Area related to Interaction with the Device (1.3.5)

1.3.1 Personnel Area

The utmost attention is to be paid to the hazards for individuals. There are various risks and hazards, the most important of which are mentioned here.

1.3.1.1 Electric shock

The system can produce electrical potentials that can be dangerous or even fatal for individuals. During work on the system the following guidelines are to be observed:

- Work in electrically isolated state

  This is the recommended way of working, it should be rigorously applied during all connection and wiring work. Follow the rules:

  - Electrically isolate.
  - Secure against switching back on.
  - Discharge and short-circuit capacitors, disconnect and isolate batteries.
  - Verify the voltage free status by measurement.
  - Connect to earth.
  - Report and instruct.

- Work in the vicinity of live parts

  In these circumstances an increased hazard potential is to be expected. Minimize the risks by means of:

  - Guards
  - Covers
  - Insulating, encapsulation, cladding
  - Imposed separation by means of mechanical features, protective grilles
  - Supervision, reporting

- Work on live equipment

  It is imperative that this form of working is avoided. If it cannot be avoided, careful work preparation is essential. Pay attention to the following:

  - The personnel must be specially trained.
  - Work in accordance with recognized specialist methods.
  - Controlled personal protective equipment must be available (passive protection).
  - Organization of the working areas.
  - Supervision and preparatory measures (active protection).
  - Use appropriate protection against physical contact throughout.
  - Set up a suitable emergency stop chain and test it at regular intervals.
  - Mark all wires and cables to prevent mistakes.

1.3.1.2 Electrical heating

TopCon power supply systems operate with significant amounts of energy. High currents can cause heating of cables and wires. In particular, during unmonitored endurance tests insulation fires and short-circuits may be caused.

- At particular risk are connectors, switchgear and cable terminals. Check these parts particularly carefully and at regular intervals.
- Use wiring material suitable and stipulated for your application with the related insulation class.
- Monitor your system actively or passively using appropriate sensors or by monitoring parameters.

1.3.1.3 Arcing and sparking on opening Contacts

In relation to AC systems, note that on opening a circuit through which a current is flowing, arcing with very high energies can be produced depending on the inductance!

In some circumstances this arcing can result in burns, damage to the eyes as well as damage, destruction or fire on parts of the system. The usage of normal mains contactors as isolating devices in AC circuits is recommended! In case of doubt contact the related manufacturer. Take into consideration that the protective devices on the TopCon system cannot detect an arc as a fault condition, as this situation may be a required function.

1.3.1.4 Mechanical Injury

As on all electrical installations, mechanical injuries to the head and hands may be caused on removing and fitting covers, wire and cable connections. Always use the correct tool. If necessary protect the head and hands against injuries due to cuts and impacts.

1.3.1.5 Chemical Injury

While handling with cooling liquid, open doors and windows and ensure the room is well ventilated also on the ground level. Avoid work which leads to the formation of aerosols. Use, if necessary the personal safety equipment:

- Use the respiratory protection at short time and existing low concentrations of vapor and aerosols. Use breathing apparatus with independent air supply at long time and high concentrations of vapor and aerosols.
- Use protective gloves which are resistant against acids and solvents and safety gloves to avoid direct skin contact.

1.3.2 Systems and Material Area

1.3.2.1 Fire

TopCon power supply systems are build from noncombustible materials exclusively.

In case of fire, electrically isolate the system immediately, on the one hand to interrupt the supply of energy and on the other hand to shut down the fans.

Fight the fire from bottom to top in accordance with the rules in your organization using suitable firefighting equipment (CO_2 fire extinguisher). If possible use fire extinguishers with asphyxiation action to keep the secondary damage low.

1.3.2.2 Electromagnetic Fields

Like any electrical system, TopCon systems produce electrical and magnetic fields. However, these fields comply fully with the usual standards.

Note, however, that particularly the EM fields from your wires and equipment connected could nevertheless produce interference on objects in the immediate area.

- Keep data carriers and PC-based measuring environments at an adequate distance from live wires to prevent interference and data loss.
- Protect highly-sensitive sensors and instruments.
- Test effects on communication networks, in particular radio networks.
- Make individuals with electronic implants aware that implants may be affected.

1.3.2.3 Noise and Noise Level

The inductive elements as well as the fans on the TopCon low voltage system produce a lower or higher noise level dependent on the operating mode. However, in the immediate vicinity of the cabinet this noise is under the tolerance limit that would make acoustic protection equipment necessary.

The usage of acoustic protection equipment or acoustic insulation measures can be necessary in specific circumstances.

1.3.2.4 Mechanical Damage

Incorrect operation of the systems can result in mechanical damage to the downstream equipment and systems. In particular, on the supply of power to drives it is to be ensured, that excessively high speeds cannot result in load shedding. The monitoring of the maximum speed with intervention in the safety chain is recommended above all if the system runs unmonitored.

1.3.2.5 Handling Storage Systems containing large Amounts of Energy

Modern energy storage systems are able to absorb very large amounts of energy. This situation has the following consequences:

- The cabling should not just comply with the maximum charging and discharging currents to be expected, to some extent significantly higher peak currents are to be expected during switching processes.
- A short circuit or failure can be very serious in the case of stores containing large amounts of energy. Due to the high currents serious injuries and serious damage can be caused. The following, incomplete list indicates some of this damage:
  - Burning of wires and connectors
  - Sparking
  - Fires, insulation fires
  - Arcing, welding
  - Electric shocks
- Never short-circuit energy storage systems to discharge them! Always use a suitable discharge resistor of appropriate power rating!
- Visibly secure a discharged energy store using a short-circuit bridge.
- Always monitor the maximum storage voltage, also during practical test operation.
- Use a device that clearly indicates the charge state of the energy store, e.g. by monitoring the voltage.

1.3.3 Mains Connection Area

When a TopCon power supply device is switched on, there may be an uneven load on the three phases; this uneven load may cause older residual current circuit breakers to trip. Here a modern make of residual current circuit breaker is to be used that will tolerate such asymmetries during the switch-on process.

1.3.4 Surrounding Area

TopCon power supply devices are generally forced-air cooled (some are water-cooled in addition). Despite the very high efficiency, a power loss occurs in the components that must be dissipated in the form of heat to the surroundings. The energy is dissipated with the aid of forced ventilation to the rear of the TopCon device. It is to be ensured that the rooms in which TopCon power supply devices operate are cool so that the heat produced can actually be removed.

It is to be ensured that there are no undesirable effects (e.g. stirring up of dust or sand, deformation due to the action of heat etc.) due to the flow of air and the heat, which at high load may be powerful.

1.3.5 Area related to Interaction with the Device

Compliance with the design data for the specific device is a prerequisite for malfunction-free operation. Load systems can have significant effects on the power source. The following points are to be noted:

- The maximum voltage specified must not be exceeded.
- Protective measures must be provided against voltage spikes on the load side and their function must be monitored (voltage spikes could damage the filter capacitors and semi-conductors in the device).
- Periodic over currents are to be avoided.
- The ripple currents produced on the load side are to be monitored to avoid overloading filter capacitors; in case of doubt ask the manufacturer.

The device is always to be operated within the permissible temperature range. High temperatures will significantly reduce the service life of various components.

2 Introduction

This section includes the following subsections:

2.1 Range of Application

The software ACSControl is designed to operate the TC.ACS device. Here the device can be operated in three different modes, i.e. Amplifier Mode, Load Simulation Mode (optional) and waveform generator mode. The waveform generator mode can be used in either a basic or a full version (optional).

For detailed information on the different operation modes see the introductory parts of the respective chapters or the TC.ACS device manual.

Accordingly, the range of application includes the following tasks:

- General Tasks when working with the TC.ACS Device (see section 5)
- Working with the TC.ACS Device in Basic Waveform Generator Mode (see section 6)
- Working with the TC.ACS Device in Full Waveform Generator Mode (see section 7)
- Working with the TC.ACS Device in Amplifier Mode (see section 8)
- Working with the TC.ACS Device in Load Simulation Mode (see section 9)

*For the **User Interface** see section **3**.*
*For **Installing and Commissioning** see section **4**.*
*For **Support** see section **10**.*

2.2 Product Options

The following features of the software TC.ACS Control are optional:

- Full Waveform Generator Mode
- Load Simulation Mode
- Amplifier Mode with current control

*For **Enabling Product Options** see section **5.5.5**.*

2.3 User Levels

The software ACSControl offers three different user levels, each of which provides a specific range of access to the User Interface and thus different possibilities of working with the software.

There are the following user levels:

- Standard User (2.3.1)
- Advanced User (2.3.2)
- Power User (2.3.3)

*For **Changing the User Level** see **5.5.4**.*

2.3.1 Standard User

The user level ‘Standard User‘ is granted by default, i.e. there is no password required.

2.3.2 Advanced User

The user level ‘Advanced User‘ requires a password. This password is **kilowatt** and it remains valid without limitation.

As compared with a Standard User, an ‘Advanced User‘ has the additional possibility of Updating the Firmware.

2.3.3 Power User

The user level ‘Power User‘ requires a single-day password. This password can be requested from Support (see section 10).

As compared with an Advanced User, a ‘Power User‘ has the additional possibility of Executing Factory Tools.

3 User Interface

3.1 Overview

The user interface of the software ACSControl is divided into four main sections.

These are the following:

- Menu Bar (3.2)
- Tool Bar (3.3)
- Tab Section (3.4)
- Status Bar (3.5)

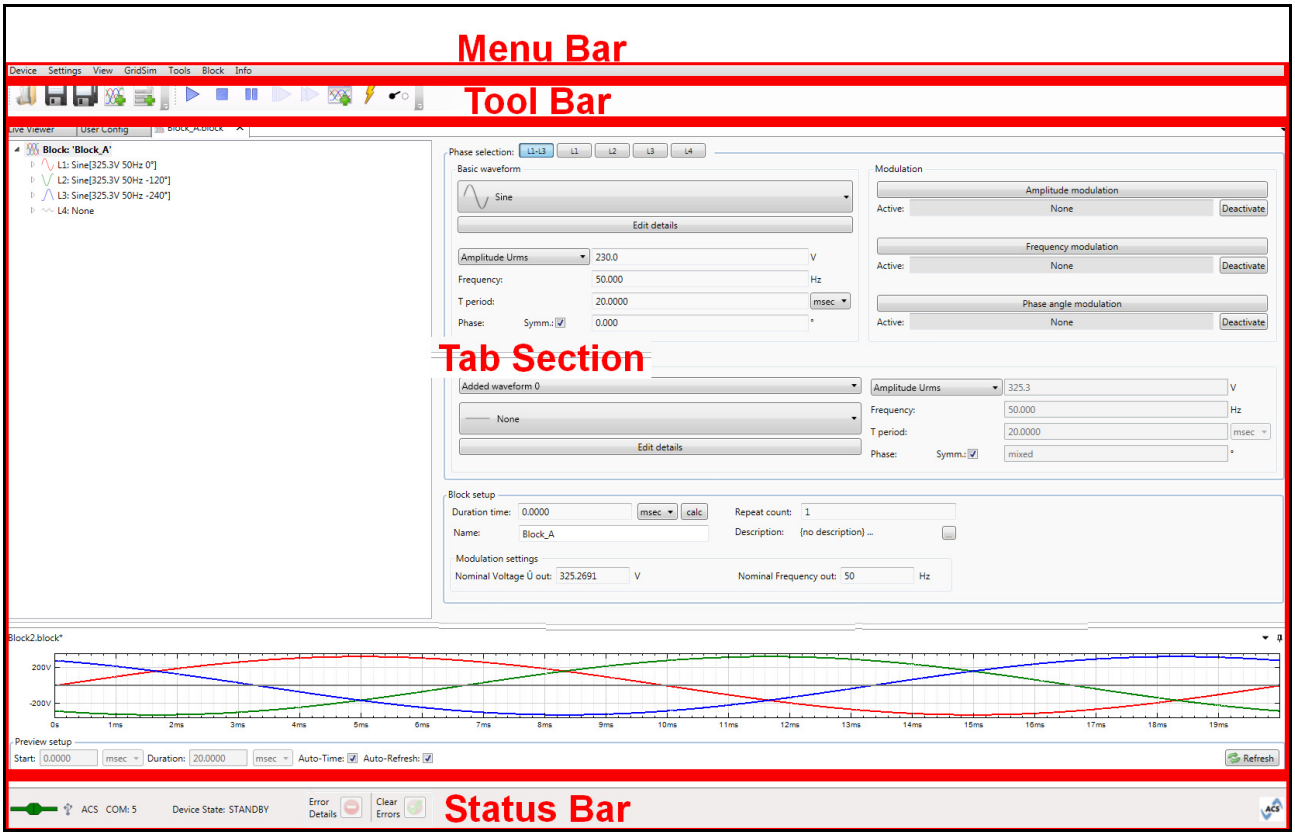


Fig. 1: *Main sections of the user interface*

*The **Tool Bar** as well as the **Tab Section** can be arranged individually (see section **5.8**).*
*Furthermore a number of dialogs are provided. Some of these are described in section **3.6**.*

3.2 Menu Bar

3.2.1 Overview

The menu bar of the ACSControl user interface provides the following menus:

- Menu ‘Device’ (3.2.2)
- Menu ‘Settings’ (3.2.3)
- Menu ‘View’ (3.2.4)
- Menu ‘Waveform Generator’ (3.2.5)
- Menu ‘Tools’ (3.2.6)
- Menu ‘Info’ (3.2.7)

*Furthermore, the **Menu ‘Block’** is provided, whenever the **Tab ‘Block’** is active, and the **Menu ‘Sequence’** is provided, whenever the **Tab ‘Sequence’** is active.*

3.2.2 Menu ‘Device’

The menu ‘Device’ is used for Installing and Commissioning (4). It provides the following menu items with the following functions:

Menu item	Function
Connect	Reestablishing the first Connection available (5.2.3.1)
Reconnect	Reestablishing the Connection used last (5.2.3.2)
Disconnect	Disconnecting a connected Device (5.4)
Connection Manager	Opening the Dialog ‘Connection Manager‘ (3.6.2)
Update Firmware	Updating the Firmware (5.6)
Options Enabling	Enabling Product Options (5.5.5)
Error History	Showing Errors (5.12.2)
Factory Tools	Executing Factory Tools (5.7)

3.2.3 Menu ‘Settings’

The menu ‘Settings’ is used for Configuring your ACSControl Application (5.5). It provides the following menu items with the following functions:

Menu item	Function
Save/Save Copy As	Saving a Configuration File (5.5.3.2)
Application Settings	Editing Application Settings (5.5.2)
Edit config files	Managing Configuration Files (5.5.3)
User Level	Changing the User Level (5.5.4)
Offline System Settings	Managing Offline System Settings (5.5.6)
Device Name	Naming the connected Device (5.5.7)
Reset Layout	Restoring the default Setting of the Tab Section (5.8.3.7)

3.2.4 Menu ‘View’

The menu ‘View’ is used for Showing a Tab (5.8.3.1). It provides the following menu items with the following functions:

Menu item	Function
Live Viewer	Showing the Tab ‘Live Viewer’ (3.4.2)
Config	Showing the Tab ‘Config’ (3.4.3)
User Config	Showing the Tab ‘User Config’ (3.4.4)
RLC Load Mode	Showing the Tab ‘RLC Load Mode’ (3.4.5)
Amplifier Mode	Showing the Tab ‘Amplifier Mode’ (3.4.6)
Basic Waveform Generator	Showing the Tab ‘Basic Waveform Generator’ (3.4.7)
Scope	Showing the Tab ‘Scope’ (3.4.8)
Parameter	Showing the Tab ‘Parameter’ (3.4.9)
Sequence Tracer	Showing the Tab ‘Sequence Tracer’ (3.4.10)

3.2.5 Menu ‘Waveform Generator’

The menu ‘Waveform Generator’ is used for Managing Blocks and Sequences (7.6). It provides the following menu items with the following functions:

Menu item	Function
New	Creating a new Block or Sequence (7.6.2)
Open	Opening a saved Block or Sequence (7.6.3)
Close	Closing an open Block or Sequence (7.6.4)
Save/Save as	Saving a Block or Sequence (7.6.5)
Save all	Saving all open Blocks and Sequences (7.6.6)

3.2.6 Menu ‘Tools’

The menu ‘Tools’ provides the menu item **Fourier** for Creating a user-defined Curve (7.3.2).

3.2.7 Menu ‘Info’

The menu ‘Info’ is used for showing detailed information on ACS as well as for Configuring the Logging.

Menu item	Function
Manual	Showing this manual
About	Showing information on the software
Device Info	Showing information on the device
Support	Sending a Support Info File (10.3.2.1)
Logging Config	Configuring the Logging (5.5.8)

3.2.8 Menu ‘Block’

*The menu ‘Block’ is provided, only if the **Tab ‘Block’** is active.*

The menu ‘Block’ is used for Operating the TC.ACS Device (7.7) with a focus on Blocks. It provides the following menu items with the following functions:

Menu item	Function
Run	Running a Block (7.7.2)
Stop	Stopping a running Block (7.7.3)
Pause	Pausing a running Block (7.7.4)
Resume	Resuming a paused Block (7.7.5)
Preview	Showing a phase-specific Preview of a Block (7.7.7)
Trigger	Setting the Trigger Output (7.7.8)
Discharge	Discharging the TC.ACS Device (5.13)

3.2.9 Menu ‘Sequence’

*The menu ‘Sequence’ is provided, only if the **Tab ‘Sequence’** is active.*

The menu ‘Sequence’ is used for Operating the TC.ACS Device (7.7) with a focus on Sequences. It provides the following menu items with the following functions:

Menu item	Function
Run	Running a Sequence (7.7.2)
Stop	Stopping a running Sequence (7.7.3)
Pause	Pausing a running Sequence (7.7.4)
Resume	Resuming a paused Sequence (7.7.5)
Go to next Block	Jumping to the next Block in a Sequence (7.7.6)
Discharge	Discharging the TC.ACS Device (5.13)

3.3 Tool Bar

The tool bar of the ACSControl user interface is divided into the following parts:

- Managing Part (3.3.1)

- Sequence Part (3.3.2)

- Operating Part (3.3.3)

*While the **Managing Part** and the **Operating Part** are always given, the **Sequence Part** is given only when the **Tab 'Sequence'** is shown.*
*You can arrange the tool bar according to your needs (see **5.8**).*

3.3.1 Managing Part

The managing part of the Tool Bar is used for Managing Blocks and Sequences (7.6). It provides the following buttons and functions:

Button	Function
	Opening a saved Block or Sequence (7.6.3)
	Saving a Block or Sequence (7.6.5)
	Saving all open Blocks and Sequences (7.6.6)
	Creating a new Block (7.6.2)
	Creating a new Sequence (7.6.2)

3.3.2 Sequence Part

The sequence part of the Tool Bar is used for Editing a Sequence (7.5). It provides the following buttons and functions:

Buttons	Function
	Moving a Block within a Sequence (7.5.2)
	Adding a Block to a Sequence (7.5.3)
	Removing a Block from a Sequence (7.5.4)

3.3.3 Operating Part

The operating part of the Tool Bar is used for operating the TC.ACS device in waveform generator mode.

It provides the following buttons and functions:

Button	Function	
	Full Waveform Generator Mode	**Basic Waveform Generator Mode**
	Running a Block or a Sequence (7.7.2)	Starting the Output of the Signal (6.3.2)
	Stopping a Block or Sequence (7.7.3)	Stopping the Output of the Signal (6.3.4)
	Pausing a running Block or Sequence (7.7.4)	n.a.
	Resuming a paused Block or Sequence (7.7.5)	n.a.
	Jumping to the next Block in a Sequence (7.7.6)	n.a.
	Showing a phase-specific Preview of a Block (7.7.7)	n.a.
	Setting the Trigger Output (7.7.8)	n.a.
	Discharging the TC.ACS Device (5.13)	

3.4 Tab Section

3.4.1 Overview

The tab section of the ACSControl user interface provides the following tabs:

- Tab ‘Live Viewer’ (3.4.2)
- Tab ‘Config’ (3.4.3)
- Tab ‘User Config’ (3.4.4)
- Tab ‘RLC Load Mode’ (3.4.5)
- Tab ‘Amplifier Mode’ (3.4.6)
- Tab ‘Basic Waveform Generator’ (3.4.7)
- Tab ‘Scope’ (3.4.8)
- Tab ‘Parameter’ (3.4.9)
- Tab ‘Sequence Tracer’ (3.4.10)
- Tab ‘Block’ (3.4.11)
- Tab ‘Sequence’ (3.4.12)
- Tab ‘Preview’ (3.4.13)

*The default setting of the tab section solely shows the **Tab ‘Live Viewer’** and the **Tab ‘User Config’**. For **Showing a Tab** see **5.8.3.1**.*

3.4.2 Tab ‘Live Viewer’

*The tab ‘LiveViewer’ is shown by default. It can be closed, though, if necessary. For **Showing a Tab** see **5.8.3.1**. Furthermore, it can be displayed in a minimized version (see **5.5.2**).*

Fig. 2: *Tab ‘Live Viewer’ (shown separate)*

The tab ‘Live Viewer’ is used for monitoring the operation of the TC.ACS device. It displays the current values of several parameters while the TC.ACS device is operated.

The tab is divided into the following sections:

- Section ‘Load’ (3.4.2.1)
- Section ‘Grid’ (3.4.2.2)

3.4.2.1 Section ‘Load’

The section ‘Load’ of the Tab ‘Live Viewer’ displays the values of the following parameters on the load side of the TC.ACS device:

- **Voltage**
- **Sense Voltage** (i.e. the voltage at the input of the sense board)
- **Current**
- **Apparent Power**
- **Active Power**
- **Reactive Power**

The sense board is an optional interface of the TC.ACS device. The sense voltage is measured only if a sense board is installed. Otherwise, the field **Sense Voltage** *is grayed out.*

Here the values are given with respect to each single phase as well as for either the neutral phase or for the total of phases.

3.4.2.2 Section ‘Grid’

The section ‘Grid’ of the Tab ‘Live Viewer’ displays the current values of the following parameters on the grid side of the TC.ACS device:

- **I**: Input current
- **Q**: Reactive power
- **P**: Active power
- **Cos φ**: Cosine of the angle between apparent power and active power

3.4.3 Tab ‘Config’

*For **Showing a Tab** see **5.8.3.1**.*

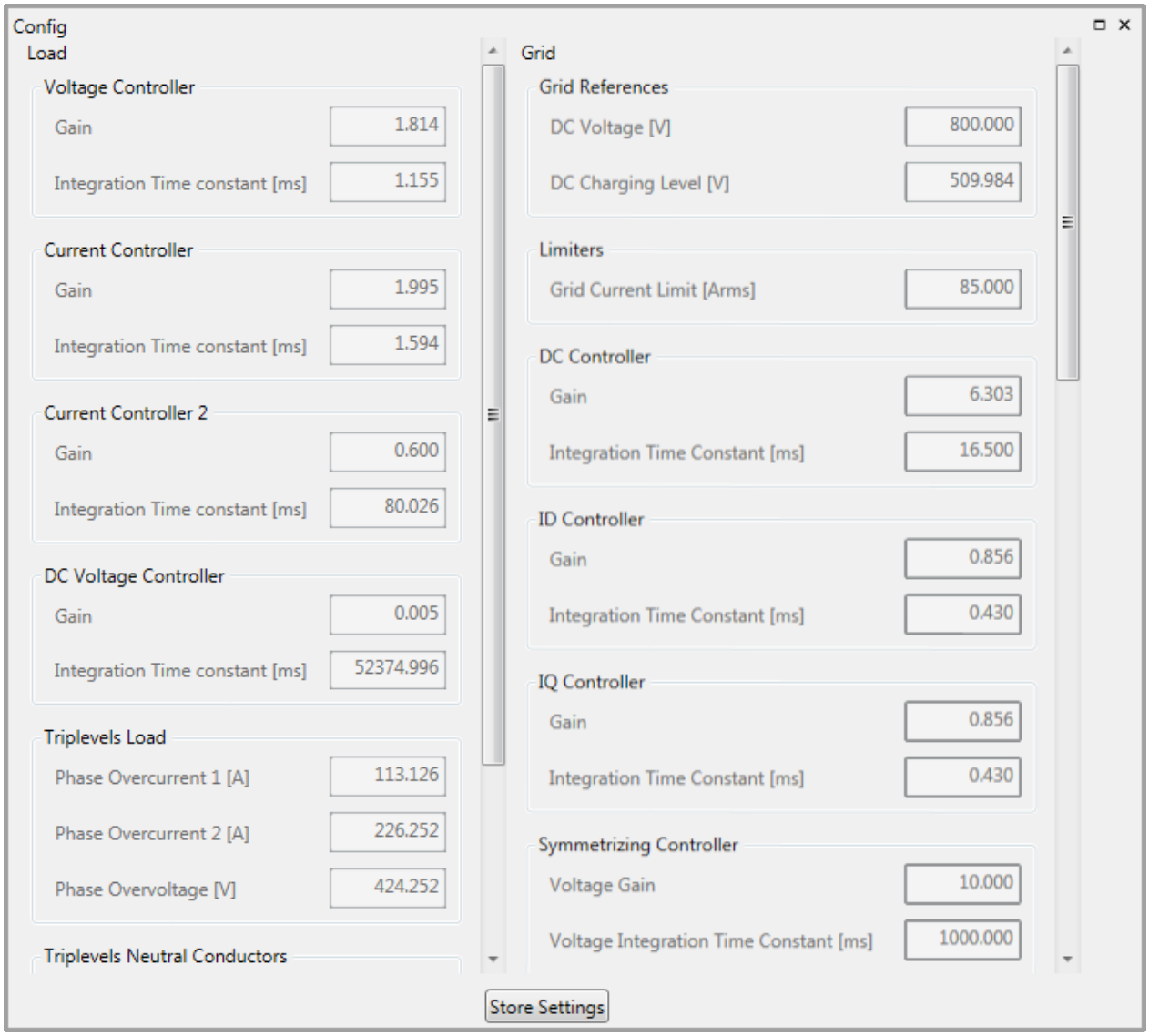


Fig. 3: *Tab ‘Config’ (shown separate)*

The tab ‘Config’ holds controller settings and safety limits. It is divided into the following sections:

- Section ‘Load’ (3.4.3.1)
- Section ‘Grid’ (3.4.3.2)

Only a power user can edit the values on the tab ‘Config’.
*A standard user as well as an advanced user has the possibility of **Setting Safety Limits with Respect to the Load** via the **Tab ‘User Config’** (see **5.9.2.1**).*

3.4.3.1 Section ‘Load’

The section ‘Load’ of the Tab ‘Config’ holds controller settings and safety limits with respect to the load side of the device:

Voltage Controller	
Gain	Gain constant parameter of the voltage PI controller
Integration Time constant [ms]	Reset time of the integral term in the voltage PI controller
Current Controller	
Gain	Gain constant parameter of the current PI controller
Integration Time constant [ms]	Reset time of the integral term in the current PI controller
Current Controller 2	
Gain	Gain constant parameter of the current PI controller 2
Integration Time constant [ms]	Reset time of the integral term in the current PI controller 2
DC Voltage Controller	
Gain	Gain constant parameter of the DC link voltage PI controller
Integration Time constant [ms]	Reset time of the integral term in the DC link voltage PI controller
Triplevels Load	
Phase Overcurrent 1 [A]	Error limit to protect the device internal current against too high current
Phase Overcurrent 2 [A]	Error limit to protect the load current against too high current
Phase Overvoltage [V]	Error limit to protect the load voltage against too high voltage
Triplevels Neutral Conductors	
N-PE Overcurrent [A]	Error limit for safety protection against too high leak current between neutral phase and protected earth
Triplevels Temperature	
PCB Overtemperature [°C]	Error limit to protect the ACSO board against too high temperature
IGBT Overtemperature [°C]	Error limit to protect the insulated-gate bipolar transistors IGBT against too high temperature

3.4.3.2 Section ‘Grid’

The section ‘Grid’ of the Tab ‘Config’ holds controller settings and safety limits with respect to the device:

Grid References	
DC Voltage [V]	Reference value of the DC link voltage
DC Charging Level [V]	Threshold of the DC link soft start voltage (on exceeding the contactor on the line side will be closed)
Limiters	
Grid Current Limit [Arms]	Threshold, where the device begins to limit the flowing on the line side
DC Controller	
Gain	Gain constant parameter of the PI DC-controller
Integration Time constant [ms]	Reset time of the integral term in the PI DC-controller
ID Controller	
Gain	Gain constant of a PI controller
Integration Time constant [ms]	Reset time of the integral term in the PI controller
IQ Controller	
Gain	Gain constant of a PI controller
Integration Time constant [ms]	Reset time of the integral term in the PI controller
Symmetrizing Controller	
Voltage gain	Gain constant of the voltage PI controller
Voltage Integration Time constant [ms]	Reset time of the integral term of the voltage PI controller
Current Gain	Gain constant of the current PI controller
Current Integration Time constant [ms]	Reset time of the integral term of the current PI controller
Zero Current Controller	
I0 Gain	Gain constant of the Zero current PI controller
I0 Integration Time constant [ms]	Reset time of the integral term of zero current PI controller

PLL Controller	
Gain	Gain constant of the PLL PI controller
Integration Time constant [ms]	Reset time of the integral term in the PLL PI controller
Triplevels Grid	
Grid Overvoltage (rms) [V]	Error limit to protect the device against too high voltage on the line side
Grid Undervoltage (rms) [V]	Error limit to protect the device against too low voltage on the line side
Grid Frequency Deviation [Hz]	Error limit to protect the device against too low or too high frequencies on the line side
Grid Overcurrent [A]	Error limit to protect the device against too high current on the line side
Triplevels DC Link	
DC Overvoltage [V]	Error limit to protect the DC link circuit against too high voltage
DC Undervoltage [V]	Error limit to protect the DC link circuit against too low voltage
NP Voltage [V]	Error limit to protect the DC link circuit against too high voltage shifting of the neutral point
NP – PE [V]	Error limit to protect the DC link circuit against too high voltage between Neutral Point and Protected Earth when the DC link circuit is charged and the load is connected
NP – PE Charging [V]	Error limit to protect the DC link circuit against too high voltage between Neutral Point and Protective Earth while the DC link circuit is charging and the load is still disconnected
Triplevels Earth Current	
Sum of Phase Current [A]	Error limit to protect on the line side against too high current. The limit value is valid for the sum of all Phase currents
FAN – Temperature	
Activation Temperature FanTop [^{o}C]	Controller board fan starts at this temperature

Max Speed Temperature FanTop [°C]	Controller board max. rpm temperature, with this the fan reaches the maximum speed (rpm)
Activation Temperature FanBottom [°C]	Power board fan starts at this temperature
Max Speed Temperature FanBottom [°C]	Power board max. rpm temperature, with this the fan reaches the maximum speed (rpm)
Triplevels Temperature	
PCB Overtemperature [°C]	Error limit to protect the ACSI board against too high temperature
IGBT Overtemperature [°C]	Error limit to protect the insulated-gate bipolar transistors IGBT against too high temperature
CASE Overtemperature [°C]	Error limit to protect the complete device against too high temperature

3.4.4 Tab ‘User Config’

*The Tab ‘User Config’ is shown by default. It can be closed, though. For **Showing a Tab** see **5.8.3.1**.*

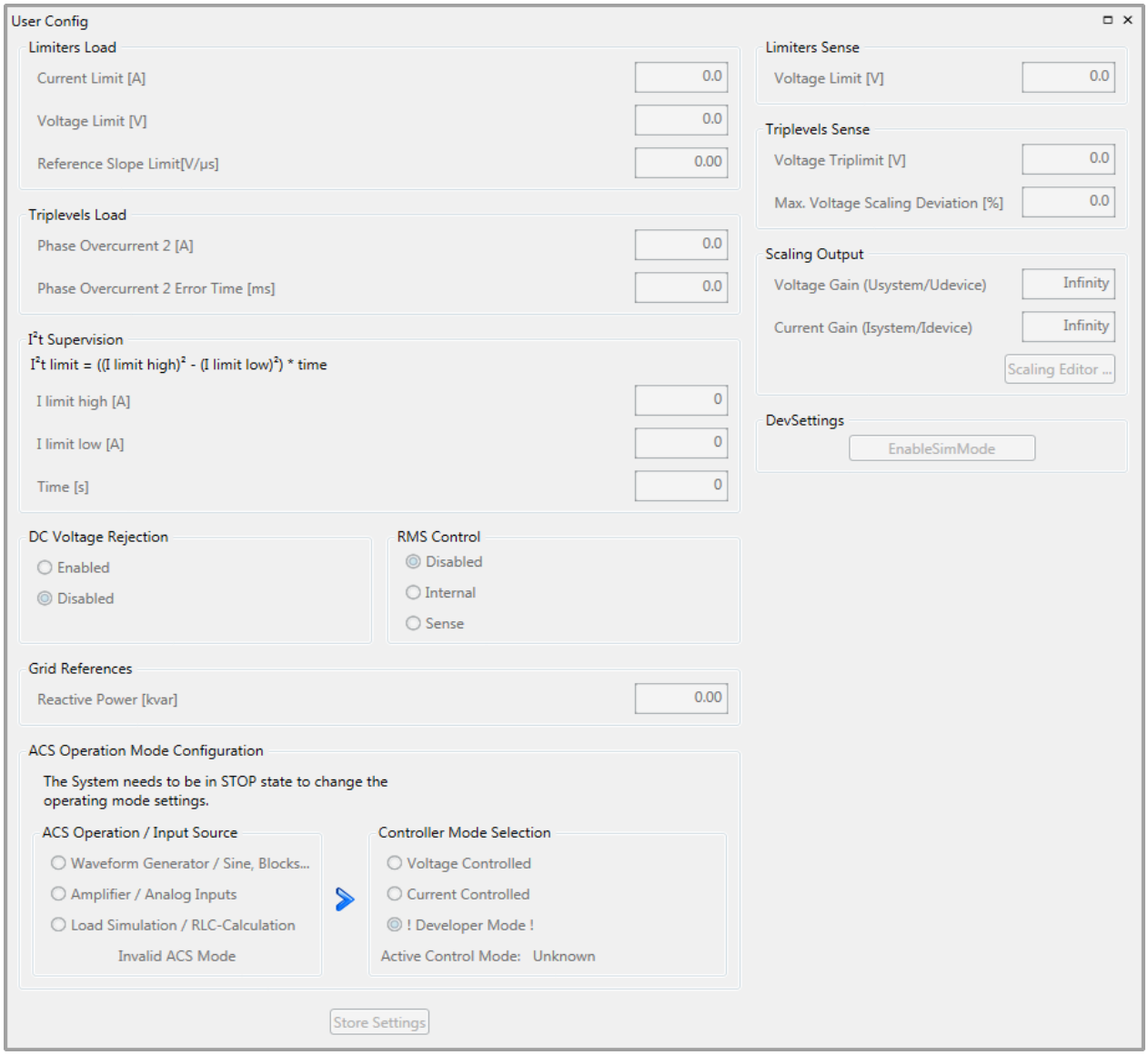


Fig. 4: *Tab ‘User Config’ (shown separate)*

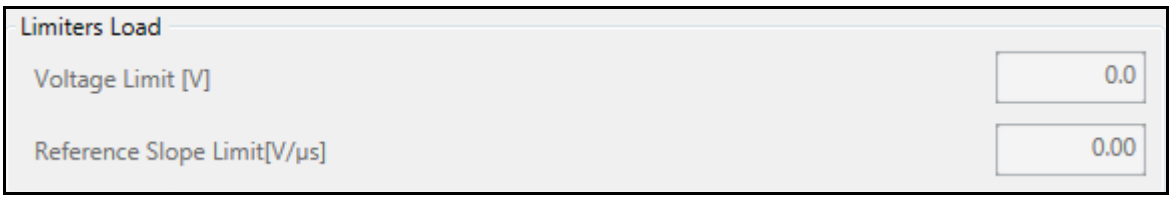
The tab ‘User Config’ is used for Configuring the TC.ACS Device (5.9).

It is divided into the following sections:

- Section ‘Limiters Load’ (3.4.4.1)
- Section ‘Triplevels Load’ (3.4.4.2)
- Section ‘I2t Supervision’ (3.4.4.3)
- Section ’DC Voltage Rejection’ (3.4.4.4)
- Section ’RMS Control’ (3.4.4.5)
- Section ’Grid References’ (3.4.4.6)
- Section ’ACS Operation Mode Configuration’ (3.4.4.7)
- Section ‘Limiters Sense’ (3.4.4.8)
- Section ‘Triplevels Sense’ (3.4.4.9)
- Section ‘Scaling Output’ (3.4.4.10)

*For a **Power User** the **Section ’Dev Settings’ (3.4.4.11)** is given in addition.*

3.4.4.1 Section ‘Limiters Load’



The section ‘Limiters Load’ of the Tab ‘User Config’ holds limiters, which will not be exceeded on the load side of the TC.ACS device. These limiters are the following:

- **Voltage Limit [V]**

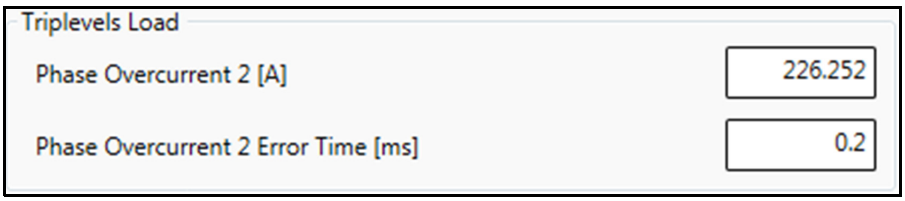
  maximum voltage L - N

- **Reference Slope Limit [V/µs]**

  maximum voltage change over one micro-second

Each limit applies to the absolute value of the respective parameter, i.e. no matter whether it is positive or negative.

3.4.4.2 Section ‘Triplevels Load’



The section ‘Triplevels Load’ of the Tab ‘User Config’ holds the following triplevels:

- **Phase Overcurrent 2 [A]**

  maximum current over a specified time period

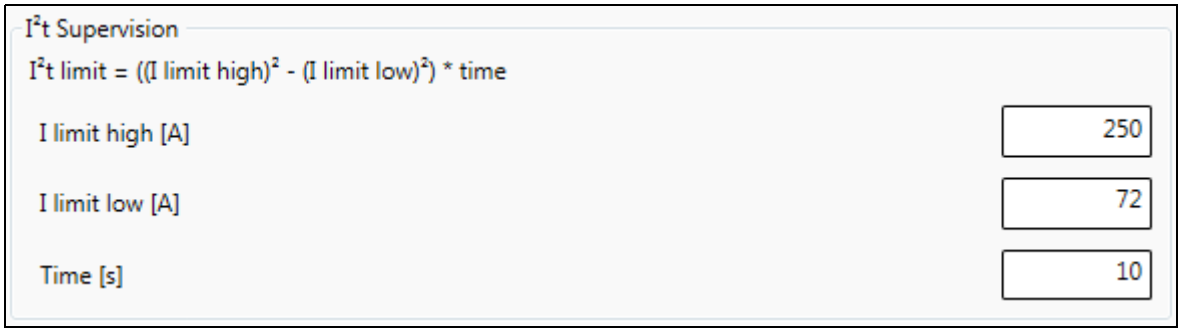
The limit applies to the absolute value of the current, i.e. no matter whether it is positive or negative.

- **Phase Overcurrent 2 Error Time [ms]**

  time period for maximum current

If on the load side of the TC.ACS device, the current exceeds the maximum value for the specified time period, then the TC.ACS will be shut off.

3.4.4.3 Section ‘I^2t Supervision’



The section ‘I^2t Supervision’ of the Tab ‘User Config’ holds the following parameters:

- **I limit high [A]**

  maximum current [rms] over a specified time period

- **I limit low [A]**

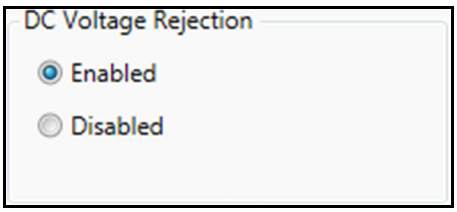
  maximum current [rms] over an infinite time

- **Time [s]**

  time period for maximum current

It on the load side of the TC.ACS device, the value **$((I\ act)^2 - (I\ limit\ low)^2) * time$** exceeds the value **$I^2t = ((I\ limit\ high)^2 - (I\ limit\ low)^2) * time$**, then the TC.ACS will be shut off.

3.4.4.4 Section 'DC Voltage Rejection'



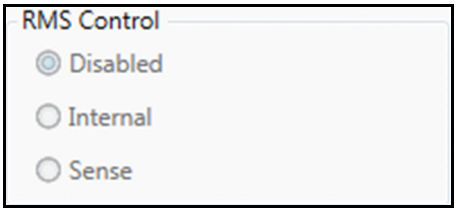
The section 'DC Voltage Rejection' of the Tab 'User Config' allows for Enabling/disabling DC Voltage Rejection (5.9.3). One of the following options can be selected:

- **Enabled**

  Residual DC voltage will be rejected, recommended with output transformers
- **Disabled**

  DC voltage will not be rejected, setting for waveforms with DC components

3.4.4.5 Section 'RMS Control'



The section 'RMS Control' of the Tab 'User Config' allows for Enabling/disabling RMS Control (5.9.4). One of the following options can be selected:

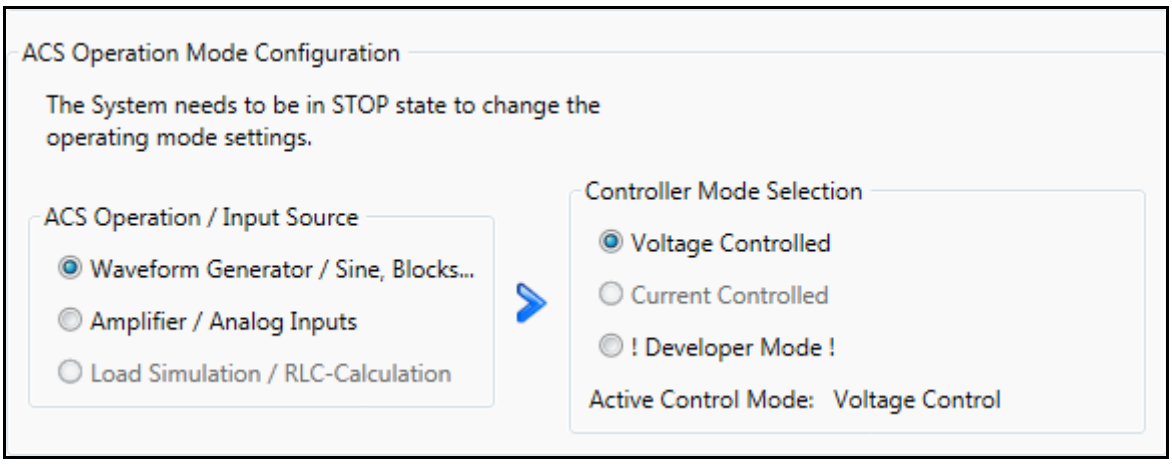
- **Disabled**: RMS Control is disabled, i.e. the accuracy is not improved.
- **Internal**: RMS Control is enabled, the accuracy is improved with respect to the device output.
- **Sense**: RMS Control is enabled, the accuracy is improved with respect to the sense board.

Generally, RMS Control is effective for frequencies (basic waveform) of 50 – 60 Hz only. If there is no sense board, the option **Sense** *is unavailable.*

3.4.4.6 Section 'Grid References'

The section 'Grid References' of the Tab 'User Config' is used for Setting a Reactive Power (5.9.5).

3.4.4.7 Section 'ACS Operation Mode Configuration'



The section 'ACS Operation Mode Configuration' of the Tab 'User Config' allows for Selecting an Operation Mode (5.9.6). It is divided into the following sections:

- **Subsection 'ACS Operation / Input Source'**

  Here an operation mode for the TC.ACS device (together with the related input source) can be selected, i.e. one of the following:

  - **Waveform Generator / Sine, Blocks...**

    (see section 7 Working with the TC.ACS Device in Full Waveform Generator Mode)

  - **Amplifier / Analog Inputs**

    (see section 8 Working with the TC.ACS Device in Amplifier Mode)

  - **Load Simulation / RLC-Calculation**

    (see section 9 Working with the TC.ACS Device in Load Simulation Mode)

Danger	*The operation mode must not be changed in operation. The TC.ACS device must be switched off.*

- **Subsection 'Controller Mode Selection'**

  Here one of the following controller modes can be selected:

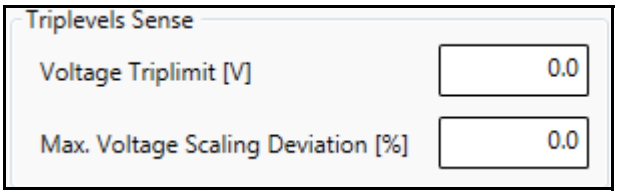
  - **Voltage Controlled**
  - **Current Controlled**

The developer mode is intended to be used by developers exclusively.

3.4.4.8 Section ‘Limiters Sense’

The section ‘Limiters Sense’ of the Tab ‘User Config’ holds the maximum voltage, i.e. the voltage, which will not be exceeded on the sense input of the TC.ACS device (if a sense board is installed).

3.4.4.9 Section ‘Triplevels Sense’



The section ‘Triplevels Sense’ of the Tab ‘User Config’ holds the following limits for the sense board of the TC.ACS device (if a sense board is installed):

- **Voltage Triplimit [V]**

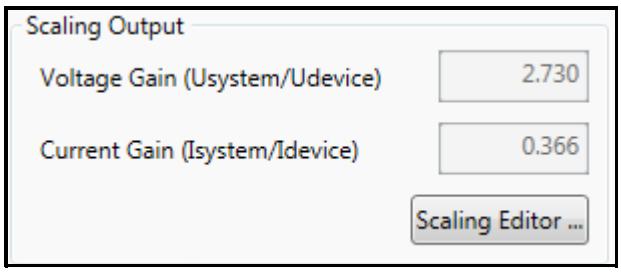
  maximum voltage

- **Max. Voltage Scaling Deviation [%]**

  maximum percentage deviation of the voltage at the device output from the voltage at the sense input (here the scaling factor **Voltage Gain** given in the Section ‘Scaling Output’ is automatically taken into account).

If on the sense input of the TC.ACS device one of these limits is exceeded, then the TC.ACS will be shut off.

3.4.4.10 Section ‘Scaling Output’



The section ‘Scaling Output’ of the Tab ‘User Config’ holds two scaling factors, i.e. the following (reciprocal) ratio values:

- **Voltage Gain (Usystem/Udevice)**

  voltage at the system input / voltage at the device output

- **Current Gain (Isystem/Idevice)**

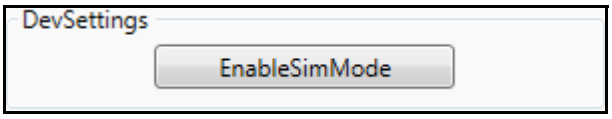
  current at the system input / current at the device output

The relevant output values will automatically be adjusted according to that factor, such that the effective input values at your DUT are as wanted.

Furthermore the button **Scaling Editor** is provided. It is used for Setting Scaling Factors.

	The scaling factors are set by the user.

3.4.4.11 Section ’Dev Settings’



The section ‘Dev Settings’ of the Tab ‘User Config’ is used to manage developer settings.

	*The section ‘Dev Settings’ is given for a **Power User** exclusively.*

3.4.5 Tab ‘RLC Load Mode’

*For **Showing a Tab** see **5.8.3.1**.*

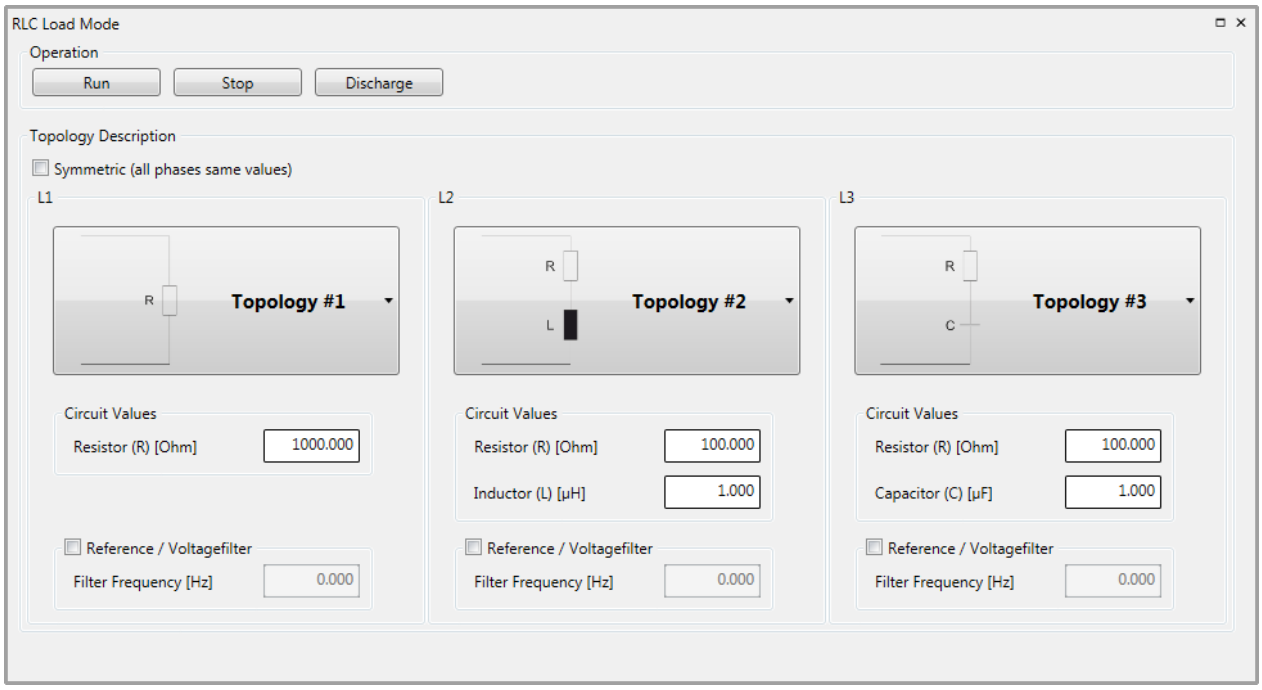


Fig. 5: *Tab ‘RLC Load Mode’ (shown separate)*

The tab ‘RLC Load Mode’ is used for Working with the TC.ACS Device in Load Simulation Mode (9). It is divided into the following sections:

- Section ‘Operation’ (3.4.5.1)
- Section ‘Topology Description’ (3.4.5.2)

3.4.5.1 Section ‘Operation’

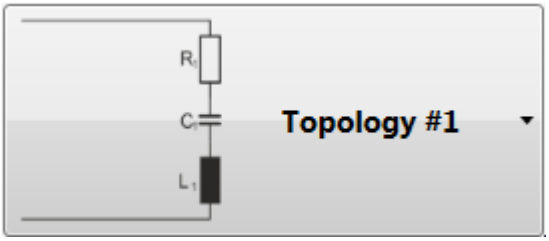
The section ‘Operation’ of the Tab ‘RLC Load Mode’ provides the following buttons:

Button	Function
Run	Starting the operation in Load Simulation Mode (9.3)
Stop	Stopping the operation in Load Simulation Mode (9.4)
Discharge	Discharging the TC.ACS Device (5.13)

3.4.5.2 Section ‘Topology Description’

The section ‘Topology Description’ of the Tab ‘RLC Load Mode’ holds the topologies and values for each of the phases L1, L2, and L3. With respect to each individual phase it offers the following:

- A selection of topologies to choose from:



- **Subsection ‘Circuit Values’**

  The section ‘Circuit Values’ of the Tab ‘RLC Load Mode’ holds the electrical data of the relevant circuit. It provides the following fields (depending on the topology selected in the Section ‘Topology Description’):

Field	Meaning	Value range
Resistor (R1) [Ohm]	Resistance of R_1	0.001…100000.000
Inductor (L1) [µH]	Inductance of L_1	0.001…100000.000
Capacitor (C1) [µF]	Capacity of C_1	0.001…100000.000

- **Subsection ‘Reference/Voltagefilter’**

  The section ‘Reference/Voltagefilter’ of the Tab ‘RLC Load Mode’ holds a filter frequency, which is used for the calculation of a reference value:

Field	Meaning	Value range
Filter Frequency [Hz]	Filter frequency	0.001…100000.000

Furthermore the section ‘Topology Description’ provides the check box **Symmetric (all phases same values)**. If activated, the topology and values given for phase L1 are automatically taken for phases L2 and L 3 as well.

3.4.6 Tab ‘Amplifier Mode’

*For **Showing a Tab** see **5.8.3.1**.*

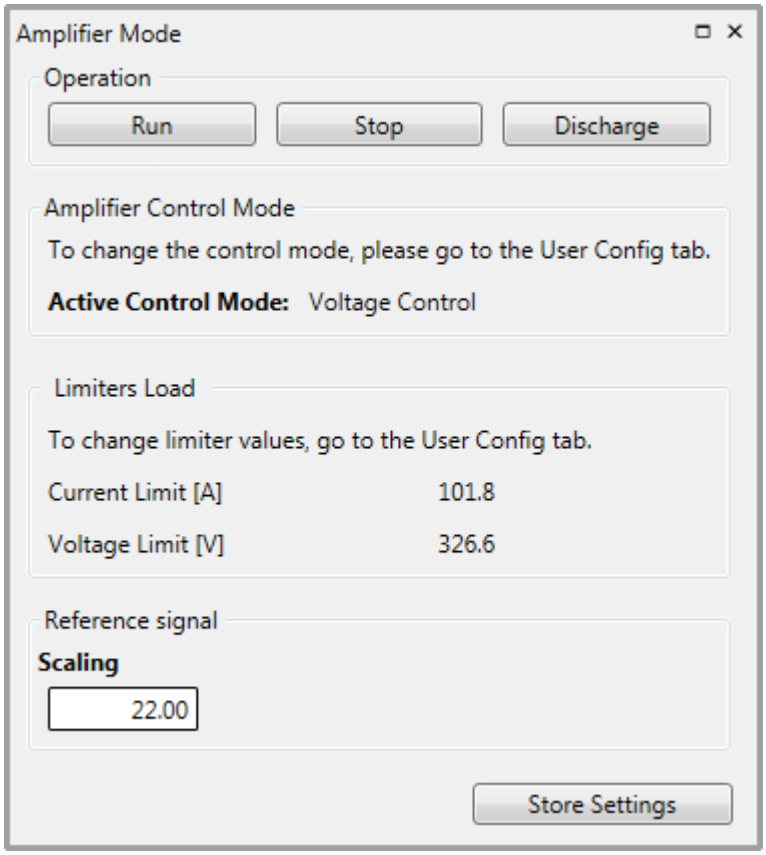


Fig. 6: *Tab ‘Amplifier Mode’ (shown separate)*

The tab ‘Amplifier Mode’ is used for Working with the TC.ACS Device in Amplifier Mode (8).

It is divided into the following sections:

- Section ‘Operation’ (3.4.6.1)
- Section ‘Amplifier Control Mode’ (3.4.6.2)
- Section ‘Limiters Load’ (3.4.6.3)
- Section ‘Reference Signal’ (3.4.6.4)

3.4.6.1 Section ‘Operation’

The section ‘Operation’ of the Tab ‘Amplifier Mode’ offers the following buttons with the following functions:

Button	Function
Run	Starting the Operation in Amplifier Mode (8.3)
Stop	Stopping the Operation in Amplifier Mode (8.4)
Discharge	Discharging the TC.ACS Device (5.13)

3.4.6.2 Section ‘Amplifier Control Mode’

The section ‘Amplifier Control Mode’ of the Tab ‘Amplifier Mode’ gives the control mode, which is currently active.

3.4.6.3 Section ‘Limiters Load’

The section ‘Limiters Load’ of the Tab ‘Amplifier Mode’ gives the limit values **Current Limit** and **Voltage Limit** as they are specified in the Section ‘Limiters Load’ of the Tab ‘User Config’.

3.4.6.4 Section ‘Reference Signal’

The section ‘Reference Signal’ allows for Setting a Scaling Factor for the Reference Signal. The reference signal is either amplified (scaling factor > 1) or diminished (scaling factor < 1) by the multiplication with that factor. Default value is 1, i.e. no scaling.

Without scaling (i.e. scaling factor 1) an input voltage of 10 V equals:

	widerange type device	***standard type device***
voltage control	*432 V output voltage*	*396 V output voltage*
current control	*134 A maximum current*	*124 A maximum current*

3.4.7 Tab ‘Basic Waveform Generator’

*For **Showing a Tab** see **5.8.3.1**.*

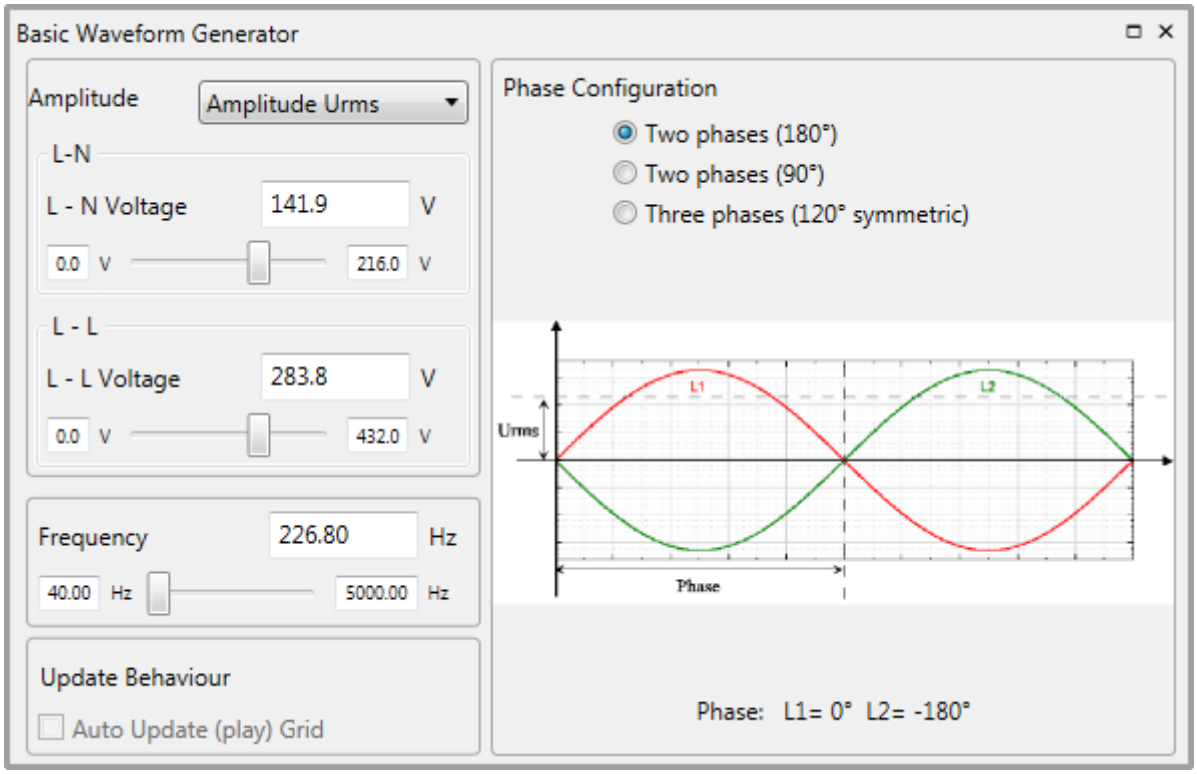


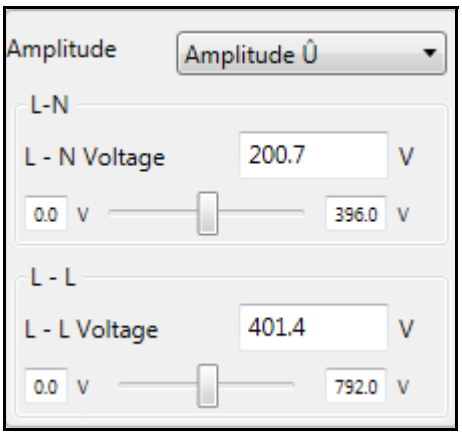
Fig. 7: *Tab ‘Basic Waveform Generator’ (shown separate)*

The tab ‘Basic Waveform Generator’ is used for Configuring the Signal (6.2) when Working with the TC.ACS Device in Basic Waveform Generator Mode.

It is divided into the following sections:

- Section ‘Amplitude’ (3.4.7.1)
- Section ‘Frequency’ (3.4.7.2)
- Section ‘Update Behaviour’ (3.4.7.3)
- Section ‘Phase Configuration’ (3.4.7.4)

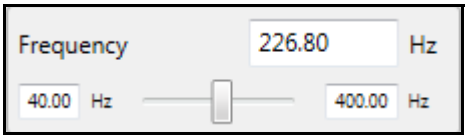
3.4.7.1 Section ‘Amplitude’



The section ‘Amplitude’ holds the values of the following parameters:

- Kind of amplitude, i.e. one of the following:
  - **Û**, i.e. the peak voltage
  - **Urms**, i.e. the root mean square voltage
- **L – N**: voltage between phase and neutral
- **L – L**: voltage between two phases

3.4.7.2 Section ‘Frequency’



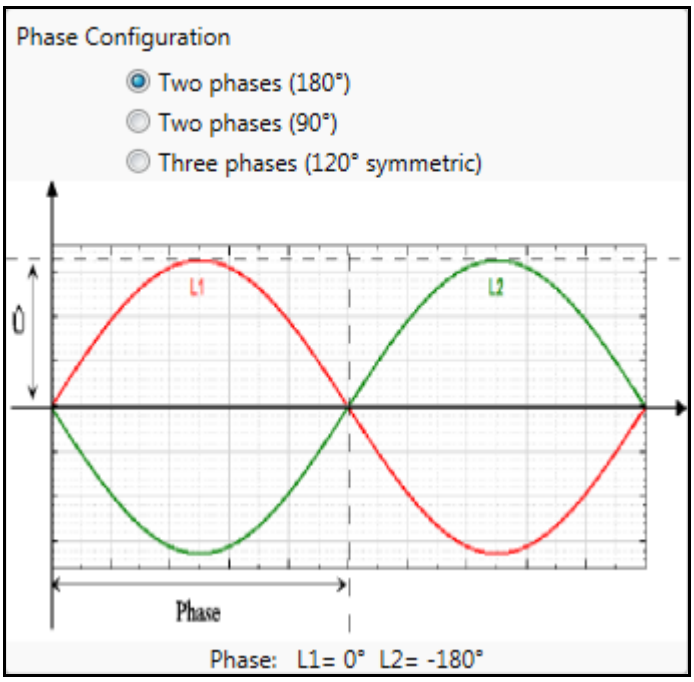
The section ‘Frequency’ holds the frequency of the signal.

3.4.7.3 Section ‘Update Behaviour’

If the check box in the section ‘Update Behaviour’ is activated, then changes in the configuration of the signal are instantaneously transmitted.

*The check box can only be activated after **Starting the Output of the Signal** (**6.3.2**).*

3.4.7.4 Section ‘Phase Configuration’



The section ‘Phase Configuration’ holds the phase configuration of the signal.

3.4.8 Tab ‘Scope’

*For **Showing a Tab** see **5.8.3.1**.*

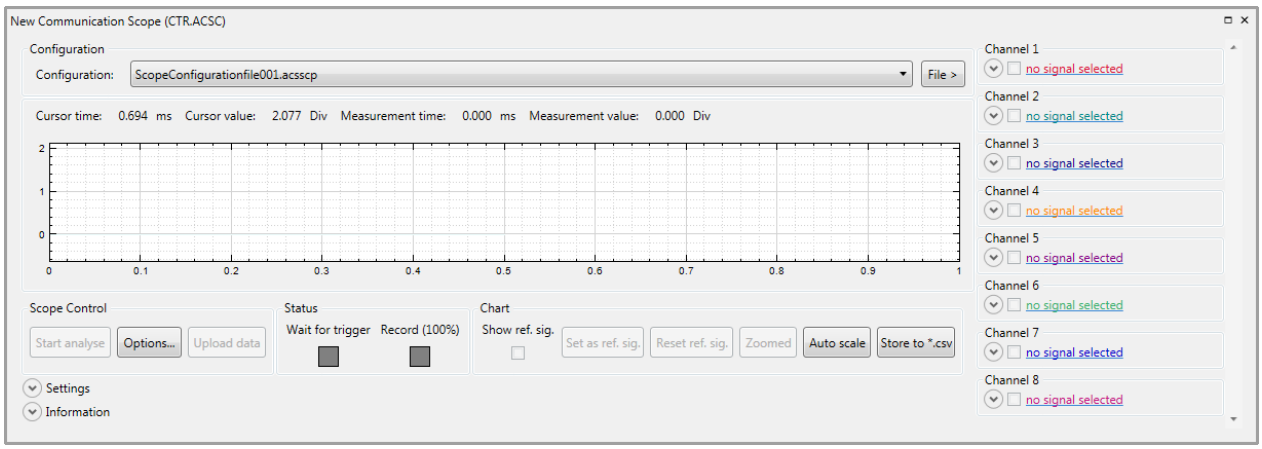


Fig. 8: *Tab ‘Scope’*

The Tab ‘Scope’ is used for Working with the internal Oscilloscope (5.11).

3.4.9 Tab ‘Parameter’

*For **Showing a Tab** see **5.8.3.1**.*

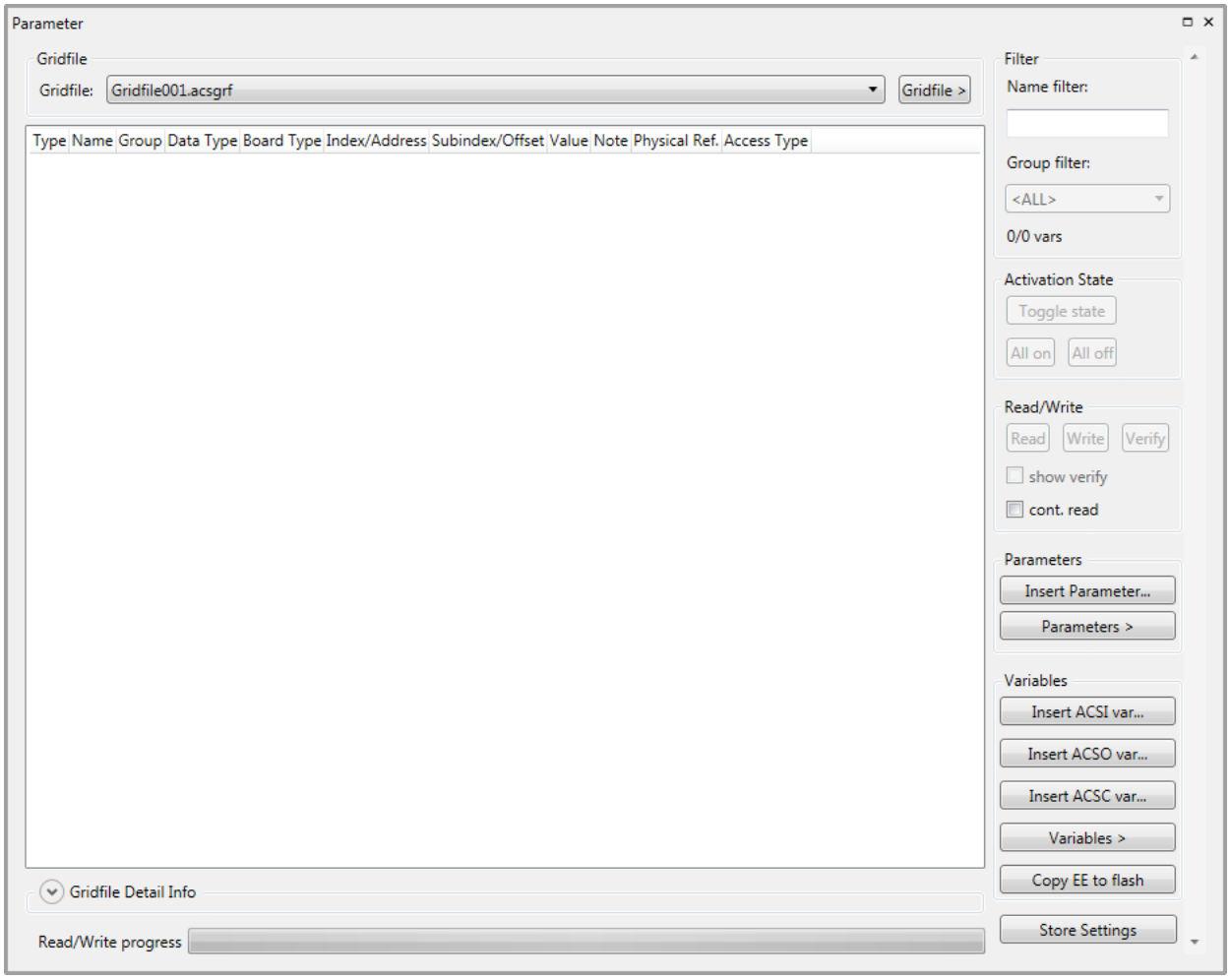


Fig. 9: *Tab ‘Parameter’*

The Tab ‘Parameter’ is used for Working with Grid Files (5.10).

3.4.10 Tab ‘Sequence Tracer’

*For **Showing a Tab** see **5.8.3.1**.*

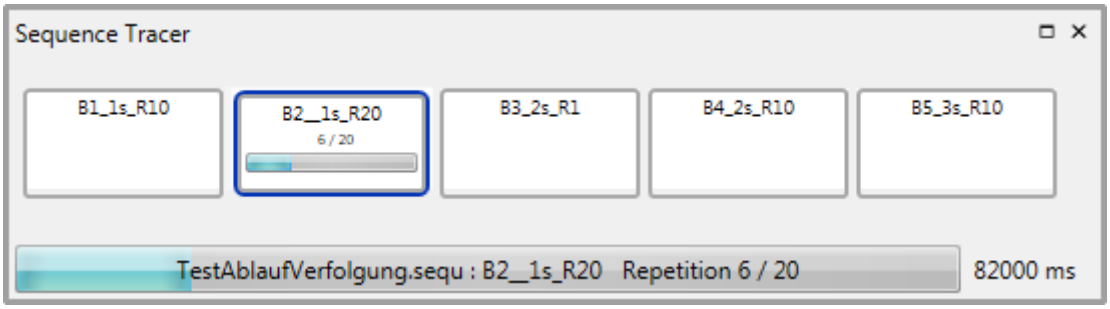
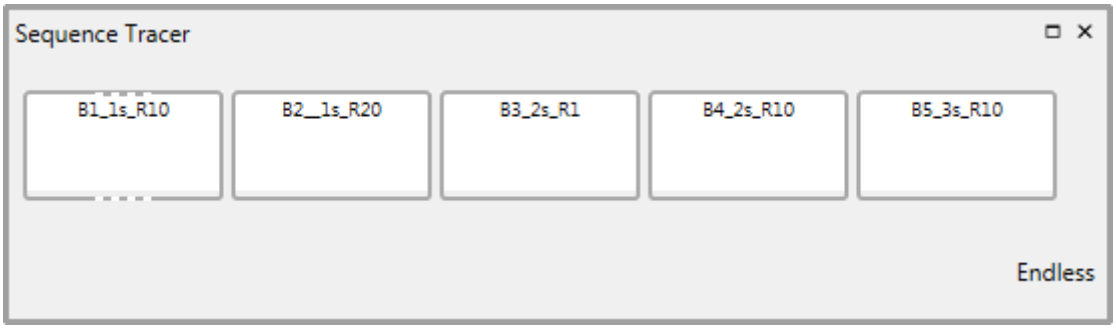


Fig. 10: *Tab ‘Sequence Tracer’ (shown separate)*

The tab ‘Sequence Tracer’ visualizes the progress when Running a Block or a Sequence (7.7.2). Here the Blocks included in a Sequence are given in chronological order, each represented by its name. The Block that is currently being run is marked with a blue frame. A progress bar indicates the current status of the Block.

Another current bar that runs across the Blocks indicates the current status of the complete Sequence. Also the overall time for the Sequence is given.

If a block is configured such that it will be run endlessly, this is indicated by dotted lines in the relevant frame. An example is the first Block in the following queue:



*To proceed within a **Sequence** after an endless **Block** it is necessary to jump to the next **Block** manually (see **7.7.6**).*

3.4.11 Tab ‘Block’

*The tab ‘Block’ is automatically shown, when creating a new **Block**. For an existing **Block** it is shown when double-clicking on the respective **Block File** in the file system.*

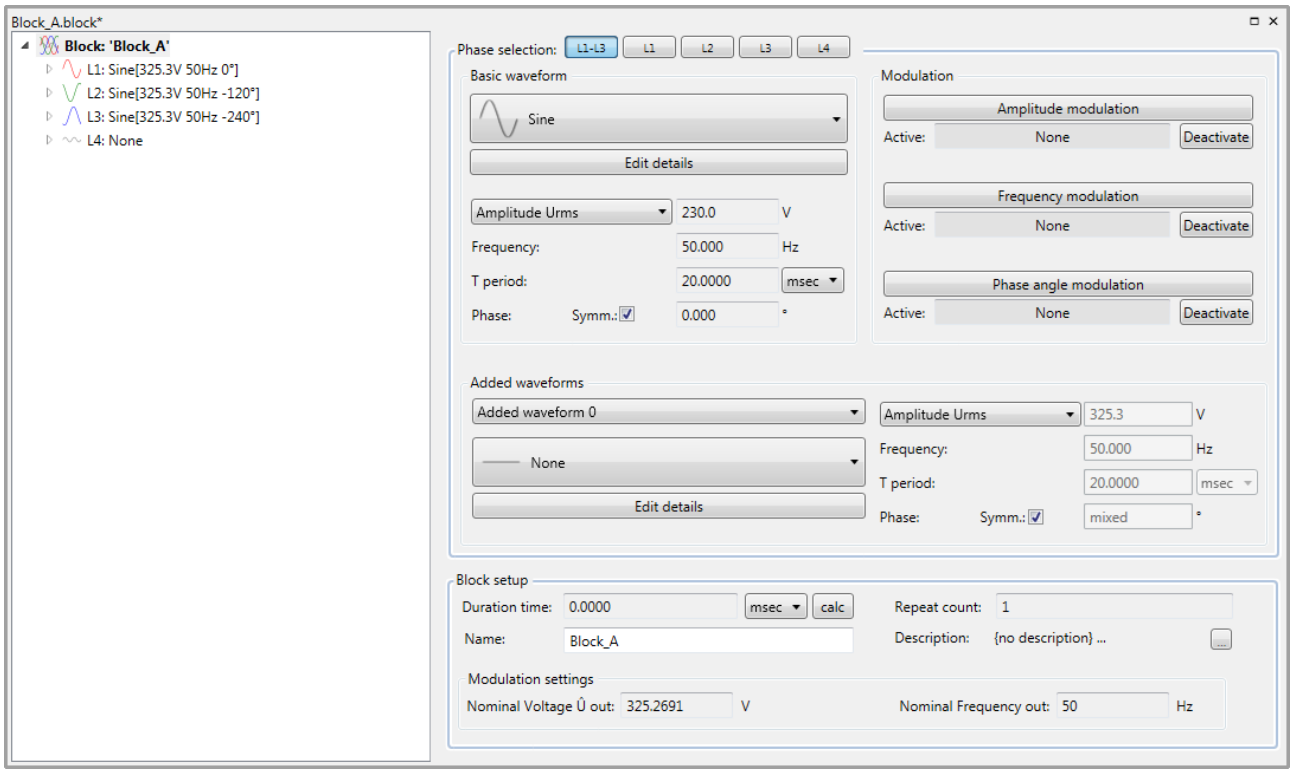


Fig. 11: *Tab ‘Block’*

The tab ‘Block’ is used for Editing a Block (7.4). It can be present manifold, each time with respect to a specific Block. The name of the respective Block is given in the header followed by the file extension **.block**.

*The name of a **Block** can be edited (see section **7.4**).*
An asterisk attached to the file extension (.block) indicates that there are unsaved changes in the **Block File**.*

It is divided into the following sections:

- Overview Section (3.4.11.1)
- Section ‘Block setup’ (3.4.11.2)
- Phase-specific Section (3.4.11.3)

3.4.11.1 Overview Section

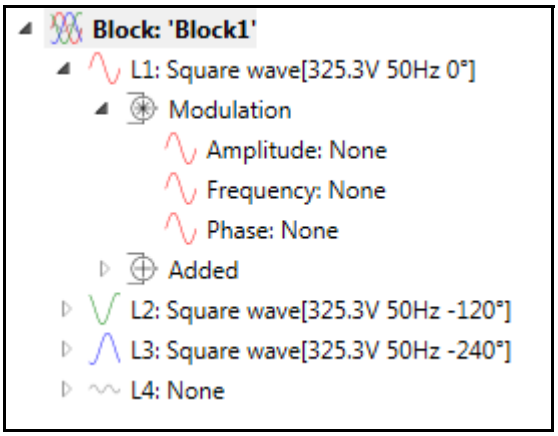


Fig. 12: *Overview section of the tab 'Block'*

The overview section of the Tab 'Block' shows an expandable tree of the Curves included in the relevant Block as well as the related details (i.e. Modulation and Added Waveforms, if so). When selecting an element, detailed information on that element is shown (instead of the Phase-specific Section).

3.4.11.2 Section 'Block setup'

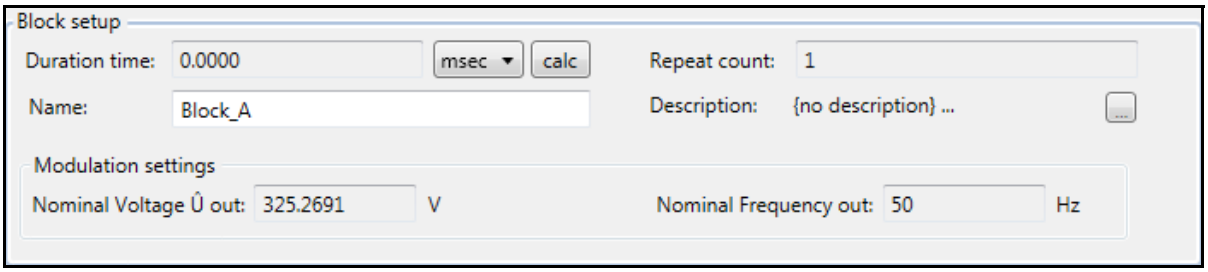


Fig. 13: *Section 'Block setup' of the tab 'Block'*

The section 'Block setup' of the Tab 'Block' is used for Specifying the Setup of a Block (7.4.3). It holds the values of the following parameters:

- **Duration time**, i.e. how long one run of the Block lasts
- **Repeat Count**, i.e. how often the Block will be repeated

A duration time of 0 (zero) means an infinite period of time.
A repeat count of 0 (zero) means an infinite number of repetitions.

- **Name**, i.e. the name of the Block
- **Description**, i.e. the description of the Block
- **Modulation settings**, i.e. the following values to be used when Specifying a Modulation, if the option **Additive amplitude/frequency, per unit of nominal value** is used:
  - **Nominal Voltage Û out**, i.e. a reference value to be used in amplitude Modulation
  - **Nominal Frequency out**, i.e. a reference value to be used in frequency Modulation

3.4.11.3 Phase-specific Section

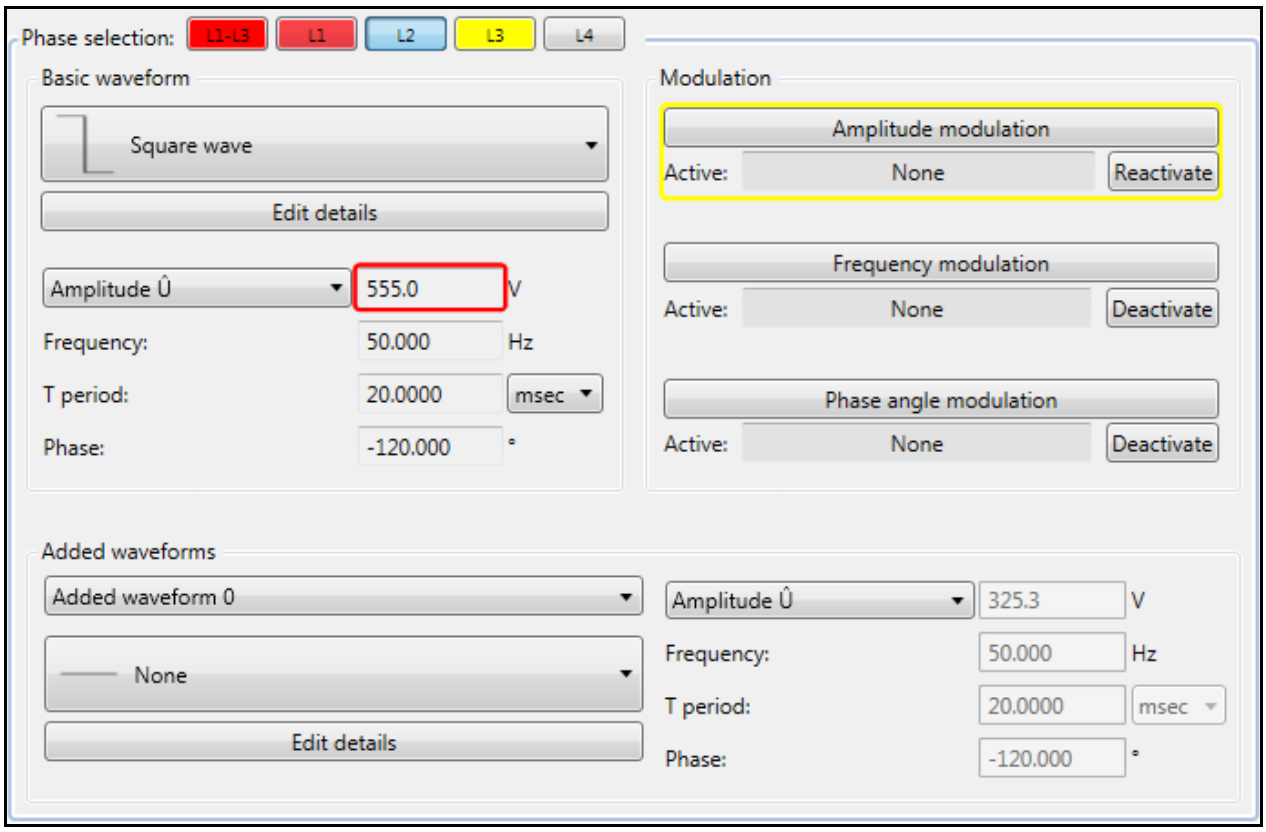


Fig. 14: *Phase-specific section of the tab 'Block'*

*The phase-specific section is hidden, when in the **Overview Section** an element is selected. In this case, detailed information on that element is shown instead.*

The phase-specific section of the Tab 'Block' is used for Editing the Curves of a Block (7.4.2). It is divided into the following sub-sections:

- Sub-section 'Phase selection'
- Sub-section 'Basic waveform'
- Sub-section 'Modulation'
- Sub-section 'Added waveforms'

With respect to the specifications currently given in the tab, the following situations may be indicated by the following colors (frame or background), if so:

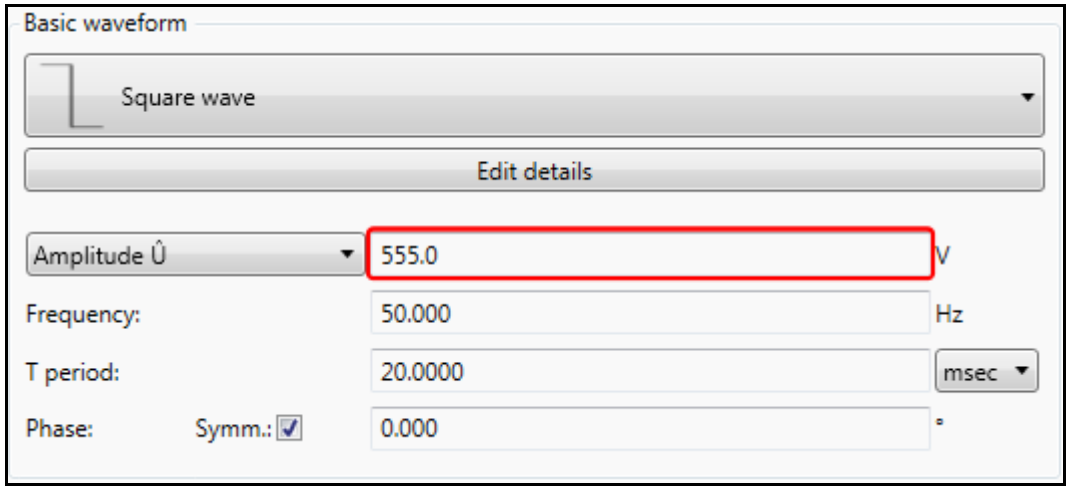
Color	Situation
red	there are invalid values
yellow	there are unsaved changes

- **Sub-section ‘Phase selection’**

The sub-section ‘Phase selection’ is used for Selecting the Phase (7.4.2.2). One of the four possible phases or the sum of the first three of these can be selected. Here the selection is shown blue.

	At any time the specifications given in the phase-specific section refer to the currently selected phase(s). *L4 does not represent neutral. It represents a control signal, which can be put out at an analog output. Contact Regatron Support if needed.*

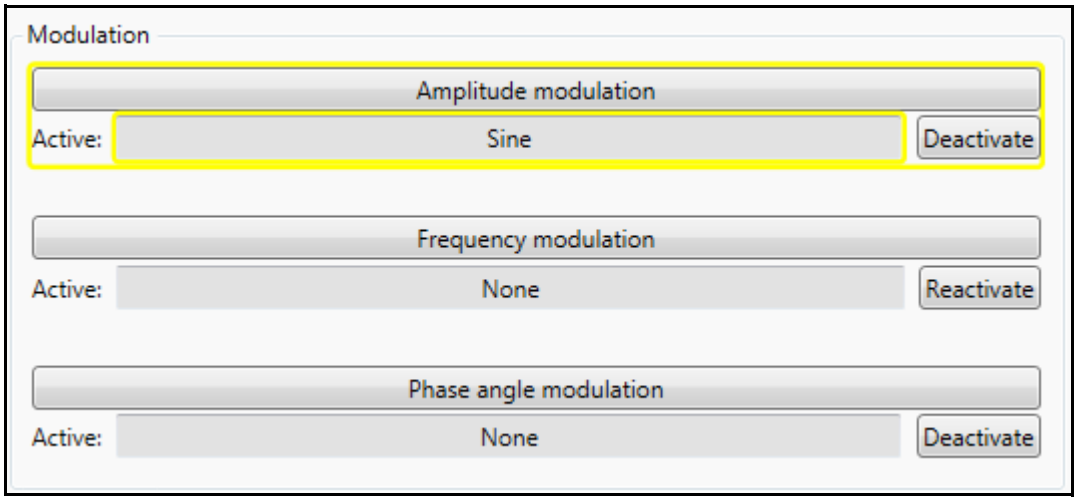
- **Sub-section ‘Basic waveform’**



The sub-section ‘Basic waveform’ is used for Specifying the basic Waveform 7.4.2.3. It offers all waveforms to choose from. For each of these it provides the related selection of specifying parameters.

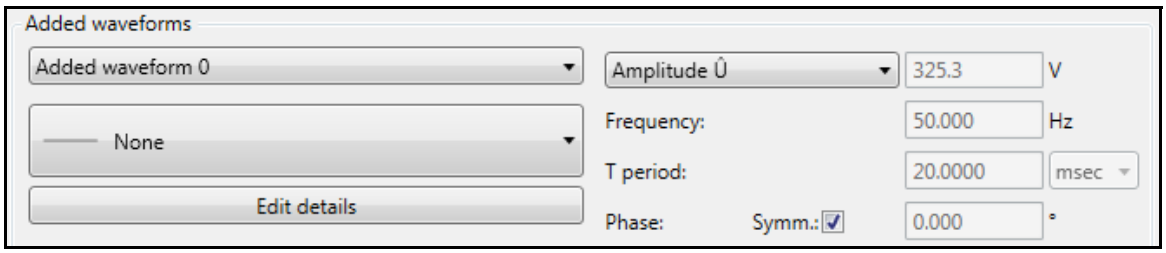
	*The check box **Symm.** is given only if **L1-L3** is selected in the **Sub-section ‘Phase selection’**.*

- **Sub-section ‘Modulation’**



The sub-section ‘Modulation’ is used for Specifying a Modulation (7.4.2.4). It offers all kinds of Modulation to choose from.

- **Sub-section ‘Added waveforms’**



The sub-section ‘Added waveforms’ is used for Specifying Added Waveforms (7.4.2.5). It offers all waveforms to choose from. For each of these it provides the related selection of specifying parameters.

3.4.12 Tab ‘Sequence’

*The tab ‘Sequence’ is automatically shown, when creating a new **Sequence** (see **7.6.2**). For an existing **Sequence** it is shown when double-clicking on the respective **Sequence File** in the file system.*

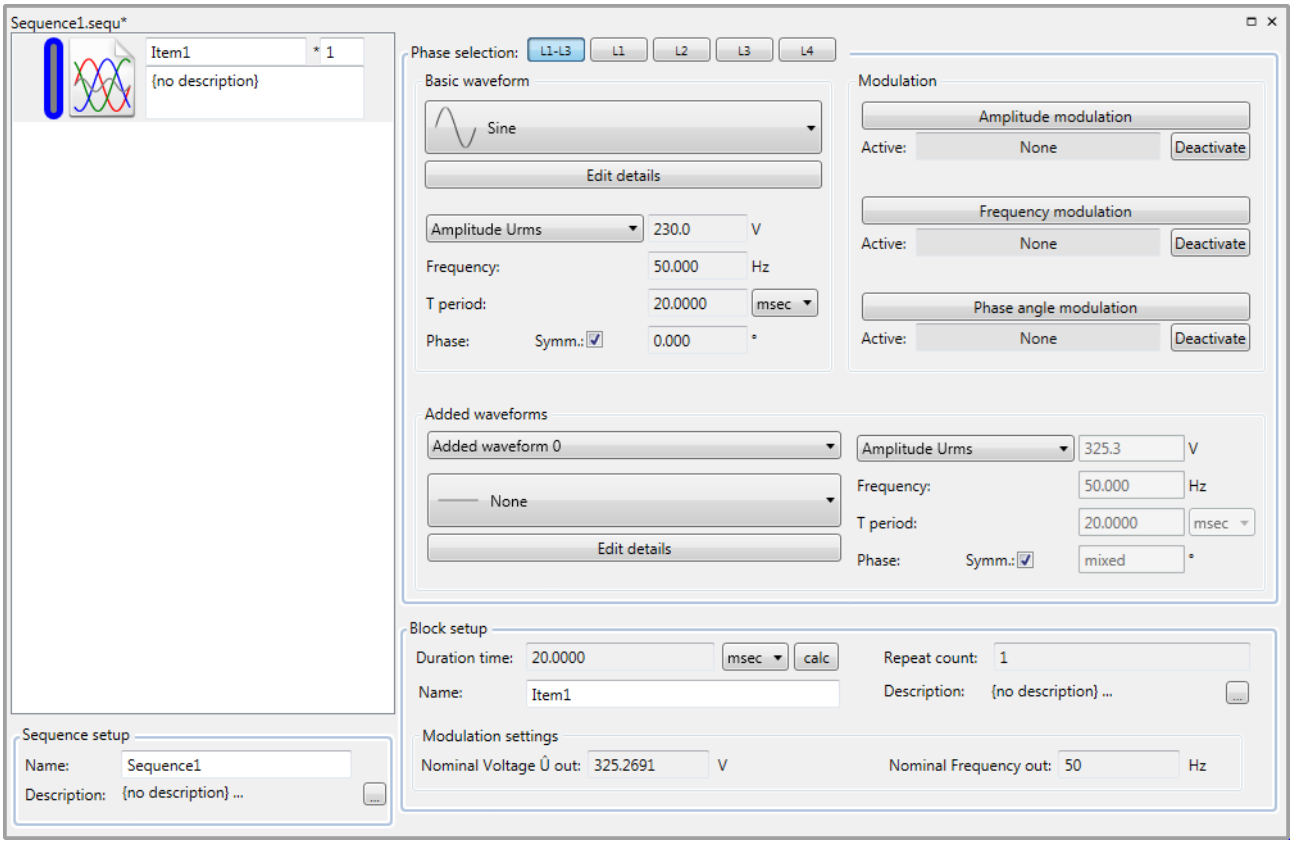


Fig. 15: *Tab ‘Sequence’*

The tab ‘Sequence’ is used for Editing a Sequence (7.5) or Editing a Block (7.4) within a Sequence. It can be present manifold, each time with respect to a specific Sequence. The name of the respective Sequence is given in the header followed by the file extension **.sequ**.

It is divided into the following sections:

- Overview Section (3.4.12.1)
- Section ‘Sequence setup’ (3.4.12.2)
- Phase-specific Section (3.4.12.3)
- Section ‘Block setup’ (3.4.12.4)

*The name of a **Sequence** can be edited in the Section ‘Sequence setup’. An asterisk attached to the file extension (.sequ*) indicates that there are unsaved changes in the **Sequence File**.*

3.4.12.1 Overview Section

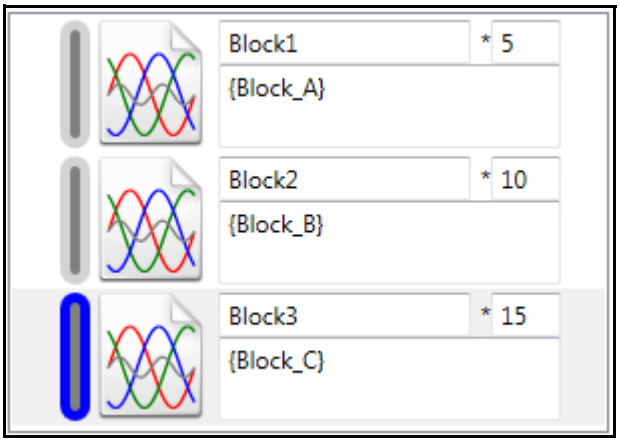


Fig. 16: *Overview section of the tab 'Sequence'*

The overview section of the Tab 'Sequence' shows an overview of the Blocks included in a Sequence. For each individual Block the name, description and repeat count are given.

*When selecting a **Block** in the overview section, the **Phase-specific Section** as well as the **Section 'Block setup'** display the data for that **Block**.*
*When double-clicking on a **Block** in the overview section, the **Tab 'Block'** opens for that **Block**.*

3.4.12.2 Section 'Sequence setup'

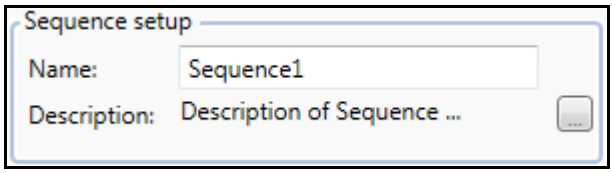


Fig. 17: *Section 'Sequence setup' of the tab 'Sequence'*

The section 'Sequence setup' holds the name and description of a Sequence. Both can be edited here.

3.4.12.3 Phase-specific Section

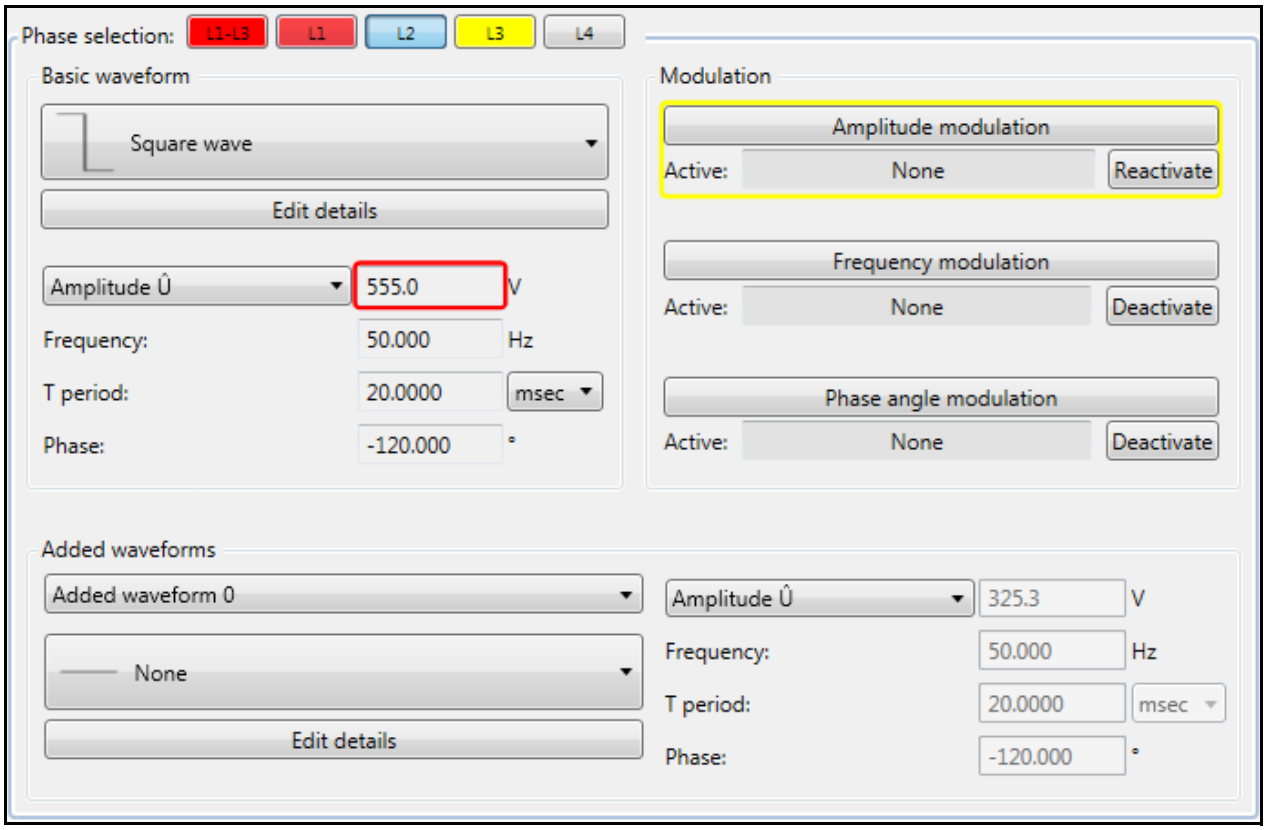


Fig. 18: *Phase-specific section of the tab 'Sequence'*

The phase-specific section of the Tab 'Sequence' is the same as the Phase-specific Section of the Tab 'Block'. It refers to the Block currently selected in the Overview Section of the Tab 'Sequence'.

3.4.12.4 Section 'Block setup'

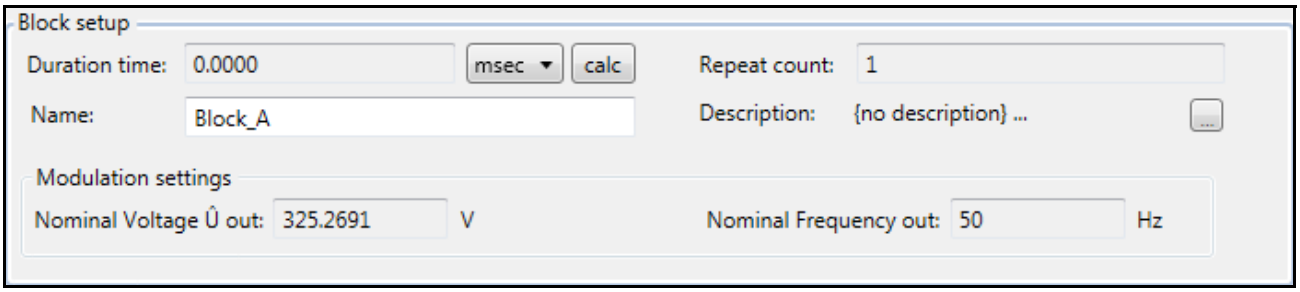


Fig. 19: *Section 'Block setup' of the tab 'Sequence'*

The section 'Block setup' of the Tab 'Sequence' is the same as the Section 'Block setup' of the Tab 'Block'. It refers to the Block currently selected in the Overview Section of the Tab 'Sequence'.

3.4.13 Tab ‘Preview’

*The tab ‘Preview’ is automatically shown with the **Tab ‘Block’** and with the **Tab ‘Sequence’**. It is initially arranged below these, but it can be arranged just as any other tab (see **5.8.3**).*

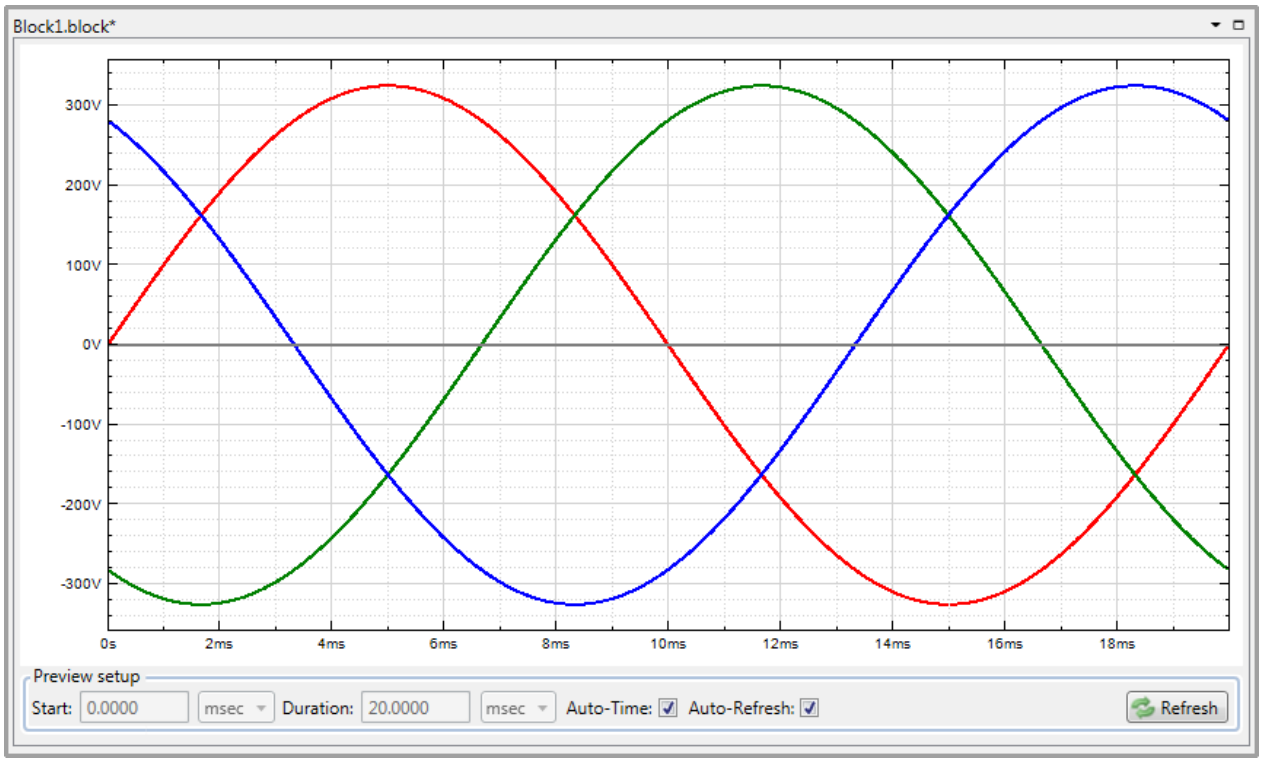


Fig. 20: *Tab ‘Preview’*

The tab ‘Preview’ displays a preview of the respective Block (or Blocks of a Sequence), i.e. a graphical representation of the included Curves for the individual phases of the signal.

*For **Specifying the Preview Setup** see **7.6.7**.*
*Clicking on **Refresh** refreshes the preview.*
*You have the possibility of **Showing a phase-specific Preview of a Block** (see **7.7.7**).*

3.5 Status Bar

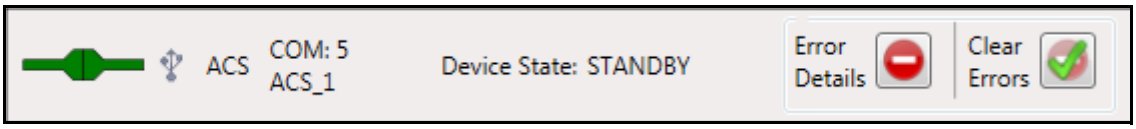


Fig. 21: *Status bar of the ACSControl user interface*

The status bar is permanently shown. It cannot be hidden or closed.

First of all, the status bar indicates connection status by one of the following symbols:

- : a device is connected to the PC
- : no device is connected to the PC

If a device is connected, then the following additional information is given:

- Kind of connection, i.e. one of the following:
  - : Ethernet
  - : RS232
  - : USB
- Connected device, e.g. ACS (and device name, if given)
- Communication port, e.g. COM:5
- Device State, i.e. one of the following:
  - STANDBY
  - READY
  - SWITCHED ON

  Where these have the following meanings:

State	Device is in operation	Device is charged
STANDBY	×	×
READY	×	✓
SWITCHED ON	✓	✓

Furthermore, the status bar provides the following buttons:

for Showing Errors (5.12.2)

for Clearing Error Messages (5.12.4)

3.6 Dialogs

3.6.1 Overview

Amongst others, the ACSControl user interface provides the following dialogs:

- Dialog ‘Connection Manager‘ (3.6.2)
- Dialog ‘Edit Config Files‘ (3.6.3)
- Dialog ‘Fourier Tool‘ (3.6.4)

3.6.2 Dialog ‘Connection Manager‘

*The dialog ‘Connection Manager‘ opens when selecting **Device > Connection Manager** in the **Menu Bar**.*

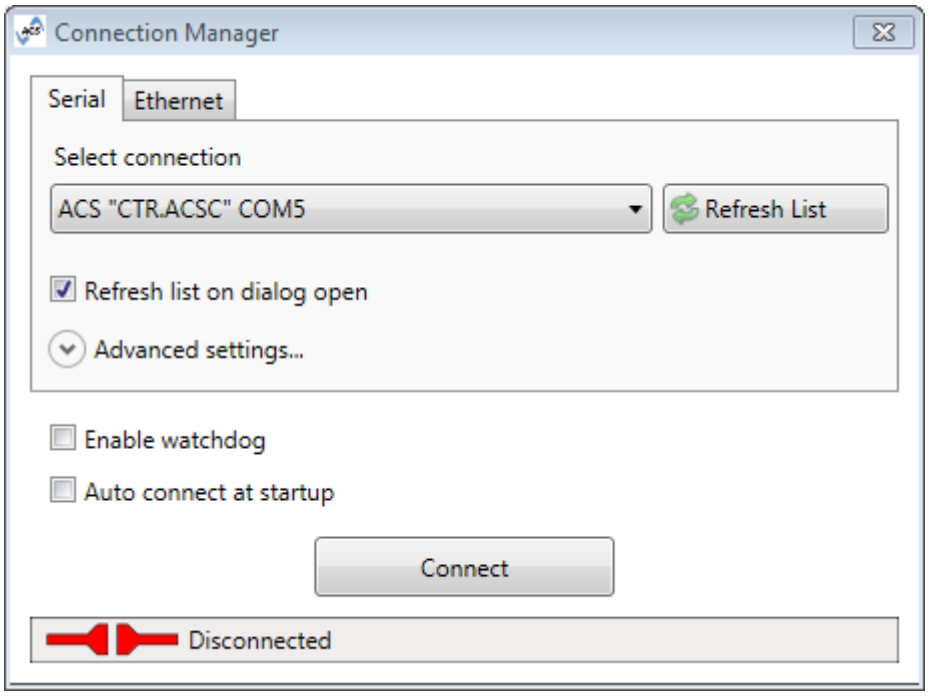


Fig. 22: *Dialog ‘Connection Manager‘*

The dialog ‘Connection Manager‘ is used for the following tasks:

- Connecting a TC.ACS Device (5.2)
- Setting general Configurations of the Connection (5.3)
- Disconnecting a connected Device (5.4)

3.6.3 Dialog ‘Edit Config Files‘

*The dialog ‘Edit Config Files‘ opens when selecting **Settings > Edit config files** in the **Menu Bar**.*

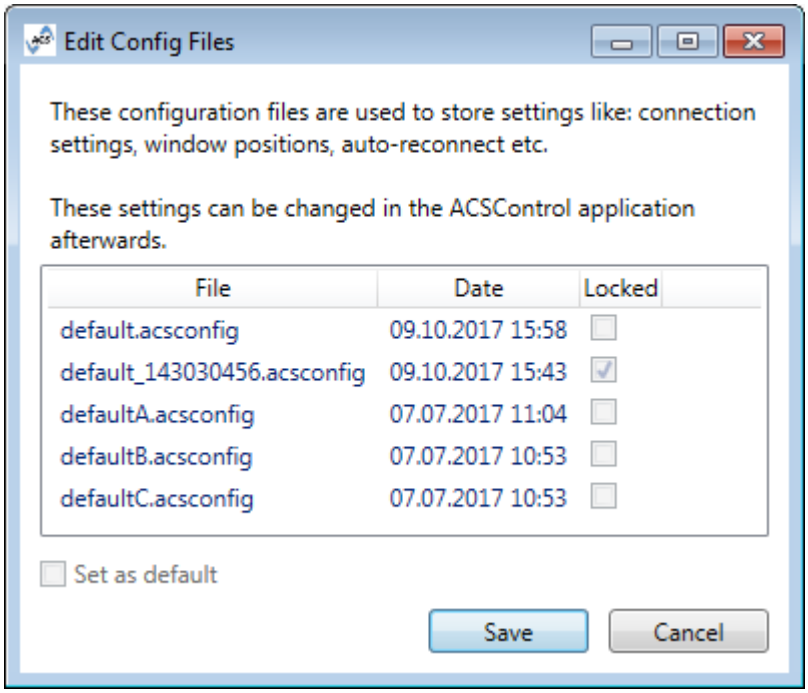


Fig. 23: *Dialog ‘Edit Config Files‘*

The dialog ‘Edit Config Files‘ offers the available configuration files. It is used when Managing Configuration Files (5.5.3).

In particular, it is used for the following tasks:

- Unlocking a Configuration File (5.5.3.3)
- Deleting a Configuration File (5.5.3.4)
- Changing the Setting of a Configuration File as Default (5.5.3.5)

3.6.4 Dialog ‘Fourier Tool‘

*The dialog ‘Fourier Tool‘ opens when selecting **Tools > Fourier** in the **Menu Bar**.*

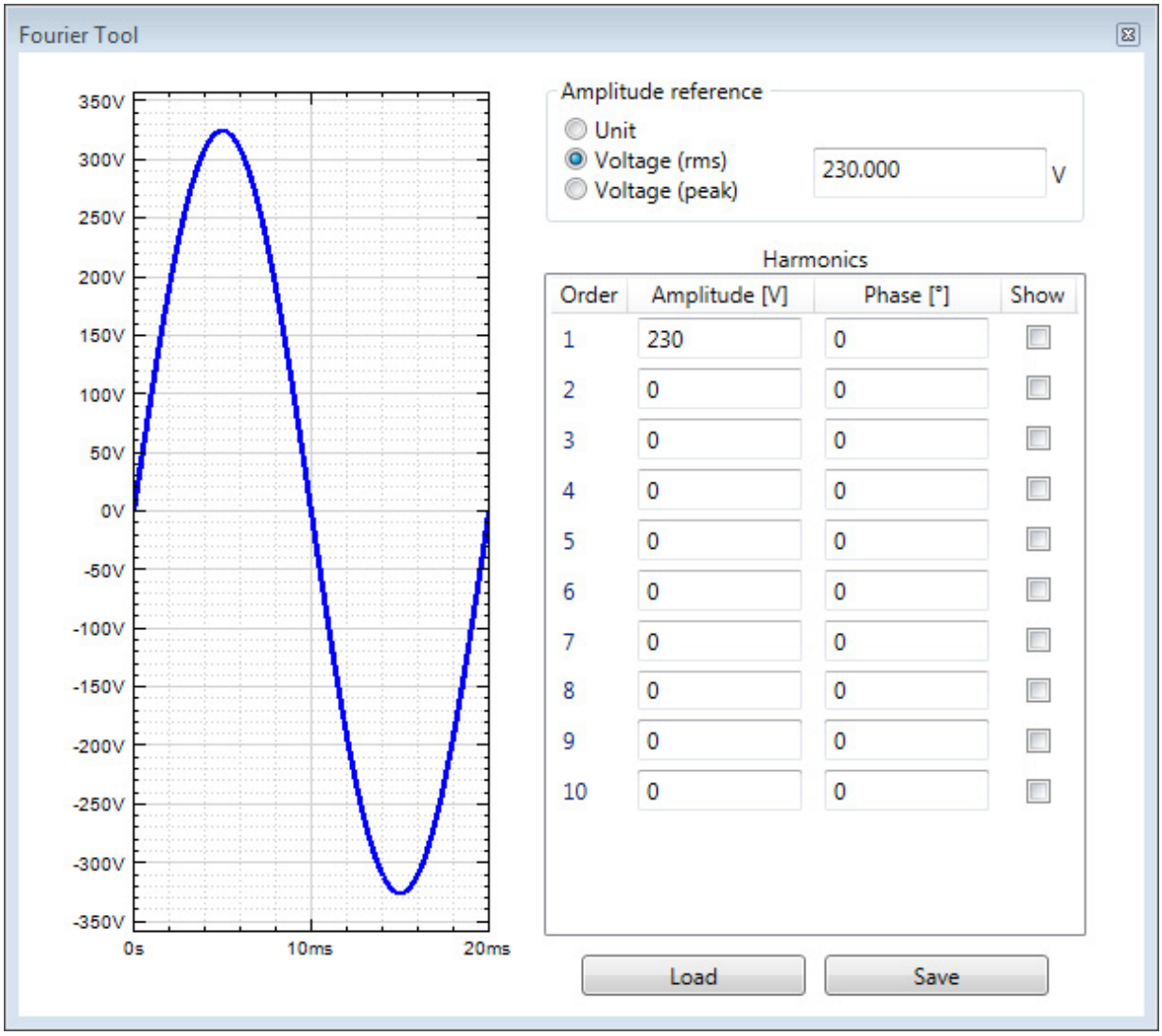


Fig. 24: *Dialog ‘Fourier Tool‘*

The dialog ‘Fourier Tool‘ is used when Managing user-defined Curves (7.3).

In particular, it is used for the following tasks:

- Creating a user-defined Curve (7.3.2)
- Saving a user-defined Curve (7.3.3)
- Loading a user-defined Curve (7.3.4)

4 Installing and Commissioning

4.1 Introduction

Installation and commissioning includes the following tasks:

- Installing ACSControl on a PC (4.2)
- Starting ACSControl (4.3)
- Connecting a TC.ACS Device (5.2)

For installing the TC.ACS device see the related device manual.

4.2 Installing ACSControl on a PC

4.2.1 Installation Requirements

4.2.1.1 Hardware

Resource	Requirements
CPU	1 GHz
RAM	2 (4) GB
Hard disk space	2 GB
Drive	CD-ROM (for software installation)
Screen resolution	1280 x 720 dpi or higher
Interface	• USB/COM (@ 921600 baud) or Ethernet • For Firmware update: RS-232/COM @ 38400 baud)
Internet interface	Internet access useful, e.g. for software updates, or data exchange, but not necessary

4.2.1.2 Software

Operating system	Requirements
MS Windows	32/64-bit systems: Win 7©, Win 8.1©, Win 10©
LINUX	can only be used via a Windows emulator

4.2.2 Installation Procedure

To install ACSControl on your PC, do the following:

⇨ Open the folder **ACSControl Installer**.

⇨ Right-click on the file **ACSControlInstaller.exe**.

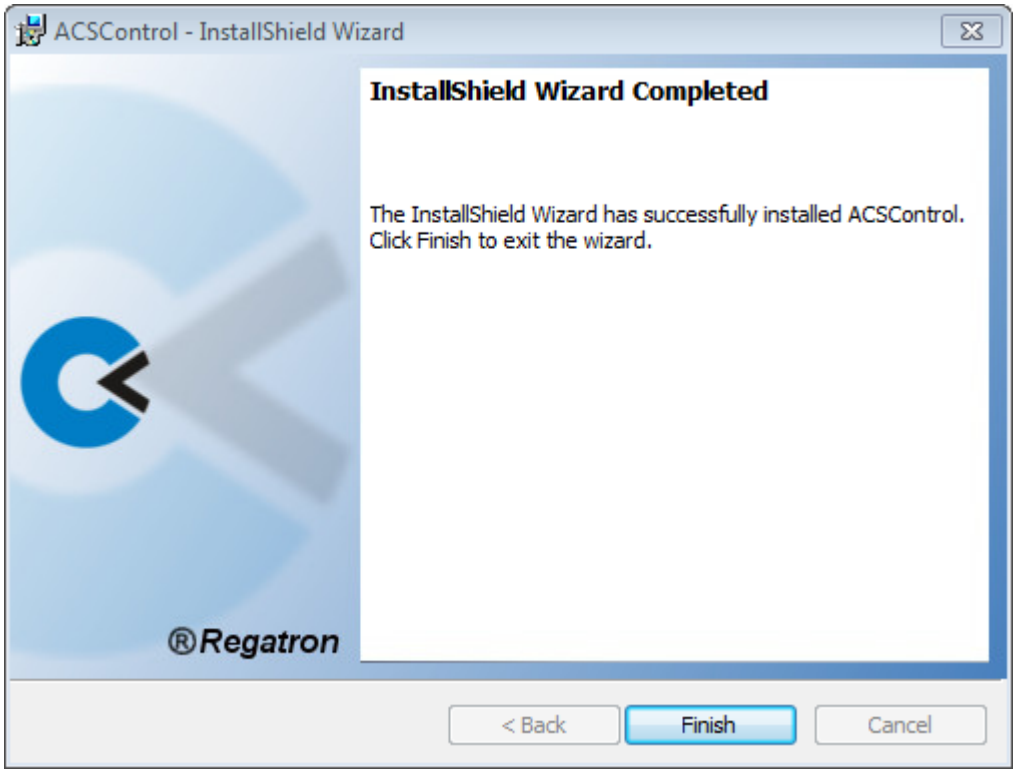
✓ A context menu opens.

⇨ Click on **Run as administrator**.

✓ The installation program starts.

⇨ Follow the instructions of the installation program.

✓ The program is being installed. When finished, the following message appears:



⇨ Click on **Finish**.

4.3 Starting ACSControl

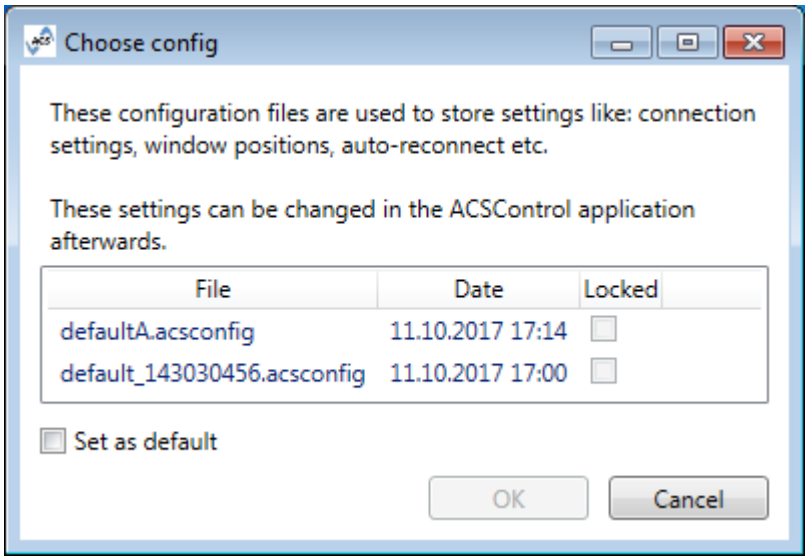
Prerequisites: ACSControl has been installed on your PC.

> *For **Installing ACSControl on a PC** see **4.2**.*

To start ACSControl, do the following:

⇨ Click on the ACS program icon .

✓ Unless a configuration file has been set as default, the dialog ‘Choose config‘ appears:



It offers the available configuration files. Each of these includes a specific configuration of the software.

> *If a configuration file is marked as locked, it is probably used by another instance of the software. Generally a configuration file should not be used twice. Nevertheless, you can unlock it via the context menu, if necessary.*

⇨ Select the configuration file you want to be used.

> *You can set a configuration file as default by activating the respective check box. If so, it will automatically be used when starting ACSControl. The dialog ‘Choose config‘ will not appear. You can always change this setting (see **5.5.3 Managing Configuration Files**).*

⇨ Click on **OK**.

✓ A starting screen appears. Afterwards the User Interface opens.

5 General Tasks when working with the TC.ACS Device

5.1 Introduction

General tasks are those tasks which need to be done no matter in which operation mode you are working with the TC.ACS. These are the following tasks:

- Connecting a TC.ACS Device (5.2)
- Setting general Configurations of the Connection (5.3)
- Disconnecting a connected Device (5.4)
- Configuring your ACSControl Application (5.5)
- Updating the Firmware (5.6)
- Executing Factory Tools (5.7)
- Arranging the User Interface (5.8)
- Configuring the TC.ACS Device (5.9)
- Working with Grid Files (5.10)
- Working with the internal Oscilloscope (5.11)
- Handling Errors (5.12)
- Discharging the TC.ACS Device (5.13)

5.2 Connecting a TC.ACS Device

5.2.1 Introduction

You can connect a TC.ACS device to your ACSControl software.

Prerequisites: The software is running. The PC on which the software is installed, is physically connected to the respective TC.ACS device.

For physically connecting a PC to the TC.ACS device see the TC.ACS Device Manual.
If your PC is not connected to the Internet, the USB driver must be manually installed from the software CD.

To connect a TC.ACS device, you have the following possibilities:

- Establishing a new Connection (5.2.2)
- Reestablishing a given Connection (5.2.3)

5.2.2 Establishing a new Connection

You have the following possibilities to establish a connection:

- Establishing a serial Connection (5.2.2.1)
- Establishing an Ethernet Connection (5.2.2.2)

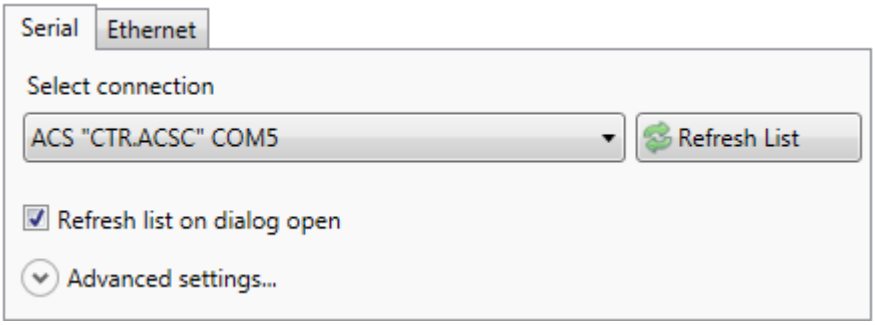
5.2.2.1 Establishing a serial Connection

You can establish a serial connection from a TC.ACS device to your ACSControl software in the following way:

⇨ In the Menu Bar, select **Device > Connection Manager**.

✓ The Dialog ‘Connection Manager‘ appears.

⇨ Select the tab ‘Serial‘:



The selection field **Select connection** offers the available connections, i.e. those COM ports on which a TC.ACS device is physically connected to the PC.

Clicking on ***Refresh List*** *refreshes the selection of available connections. When the check box* ***Refresh List on dialog open*** *is activated, the selection is refreshed automatically when the dialog opens.*

⇨ Select the COM port with item label part “CTR.ACSC”.

⇨ If necessary, set details for the connection via the drop-down menu **Advanced settings**.

The details in the drop-down menu ***Advanced settings*** *apply to any serial connection.*

⇨ Click on **Connect**.

✓ The connection is established.

⇨ Close the dialog.

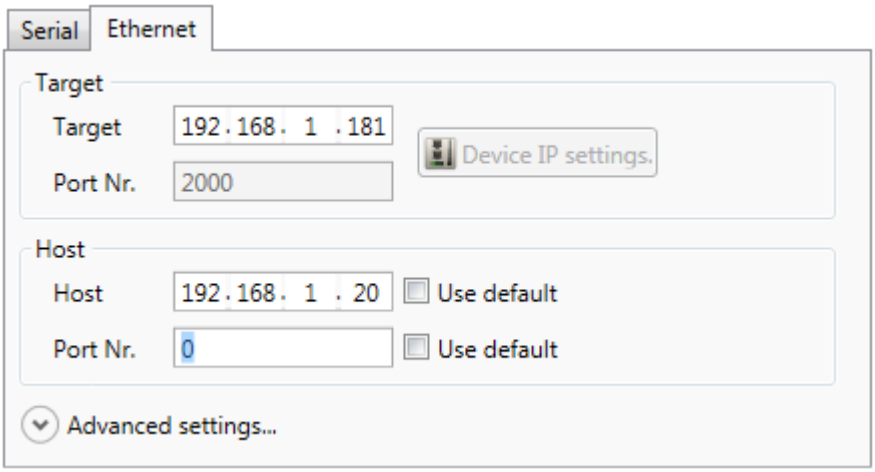
5.2.2.2 Establishing an Ethernet Connection

You can establish an Ethernet connection from a TC.ACS device to your ACSControl software in the following way:

⇨ In the Menu Bar, select **Device > Connection Manager**.

✓ The Dialog 'Connection Manager' appears.

⇨ Select the Tab 'Ethernet':



⇨ In the field **Target**, set the IP address of the TC.ACS device.

	*If the TC.ACS device is connected to your ACSControl via serial connection, the IP address can be displayed by clicking on **Device IP Settings**.*

⇨ In the field **Host**, enter the IP-Address of a host, or activate the check box **Use default**.

⇨ In the field **Port Nr.**, enter a port number or activate the check box **Use default**.

⇨ If necessary, set details for the connection via the drop-down menu **Advanced settings**.

	*The details in the drop-down menu **Advanced settings** apply to any Ethernet connection.*

⇨ Click on **Connect**.

✓ The connection is established.

⇨ Close the dialog.

5.2.3 Reestablishing a given Connection

To reestablish a given connection, you have the following possibilities:

- Reestablishing the first Connection available (5.2.3.1)
- Reestablishing the Connection used last (5.2.3.2)

*For **Connecting a TC.ACS Device** see **5.2**.*

5.2.3.1 Reestablishing the first Connection available

To reestablish the first connection available, do the following:

⇨ In the Menu Bar, select **Device > Connect**.

5.2.3.2 Reestablishing the Connection used last

To reestablish the connection used last, do the following:

⇨ In the Menu Bar, select **Device > Reconnect**.

5.3 Setting general Configurations of the Connection

You can set general configurations, i.e. configurations that hold for a serial as well as an Ethernet connection, in the following way:

⇨ In the Menu Bar, select **Device > Connection Manager**.

✓ The Dialog ‘Connection Manager‘ appears:

⇨ If you want the ACS device to be automatically shut off, when ACSControl does not properly work or is disconnected, then activate the check box **Enable Watchdog**.

⇨ If you want the connection given above to be automatically reestablished when starting ACSControl, then activate the check box **Auto connect at startup**.

5.4 Disconnecting a connected Device

To disconnect a connected TC.ACS device, do the following:

⇨ In the Menu Bar, select **Device > Connection Manager**.

✓ The Dialog ‘Connection Manager‘ appears.

⇨ Click on **Disconnect**.

5.5 Configuring your ACSControl Application

5.5.1 Introduction

You can individually configure your application of the ACSControl software.

Here you have the following possibilities:

- Editing Application Settings (5.5.2)
- Managing Configuration Files (5.5.3)
- Changing the User Level (5.5.4)
- Enabling Product Options (5.5.5)
- Managing Offline System Settings (5.5.6)
- Naming the connected Device (5.5.7)
- Configuring the Logging (5.5.8)

5.5.2 Editing Application Settings

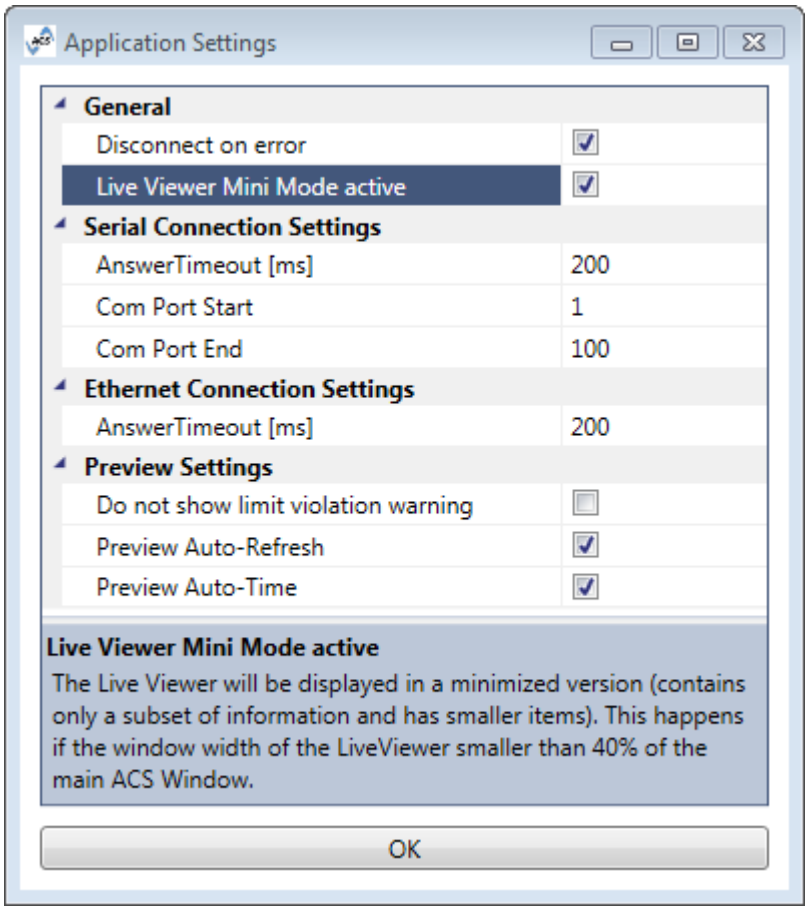
You can edit the following kinds of settings for your individual ACSControl application:

- **General settings**
- **Serial connection settings**
- **Ethernet connection settings**
- **Preview settings**

To edit application settings, do the following:

⇨ In the Menu ‘Settings’ select the menu item **Application Settings**.

✓ The dialog ‘Application Settings‘ appears:



A description of the currently selected setting is given at the bottom.

⇨ Edit the settings according to your needs.

⇨ Click on **OK**.

⇨ In the Menu ‘Settings’ select the menu item **Save**.

✓ Your changes are saved.

5.5.3 Managing Configuration Files

5.5.3.1 Introduction

A configuration file (file extension **.acsconfig**) contains configuration settings, i.e. values for the parameters that are needed to configure an application of ACSControl.

Basically, these are the following settings:

- Connection settings (see 3.6.2)
- Application settings (see 5.5.2)
- Offline system settings (see 5.5.6)
- User interface settings (see 5.8)
- Scope settings (see 5.11)
- Settings for the Basic Wave Form Generator Mode (see 6)
- Settings for the Load Simulation Mode (see 9)

There can be multiple configuration files. Regarding these files, you have the following possibilities:

- Saving a Configuration File (5.5.3.2)
- Unlocking a Configuration File (5.5.3.3)
- Deleting a Configuration File (5.5.3.4)
- Changing the Setting of a Configuration File as Default (5.5.3.5)

5.5.3.2 Saving a Configuration File

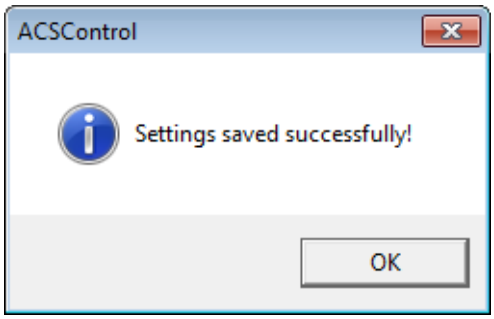
You can save the currently used configuration file either at its original location with its original name or you can save a copy of it as a new file with a new location and/or name.

*Only if a configuration file is saved at the original location, it will be available for selection when **Starting ACSControl**.*

If you want to save the configuration file at its original location with its original name, do the following:

⇨ In the Menu 'Settings' select the menu item **Save**.

✓ The configuration file is saved. The following message appears:



⇨ Click on **OK**.

If you want to save a copy of the configuration file as a new file, do the following:

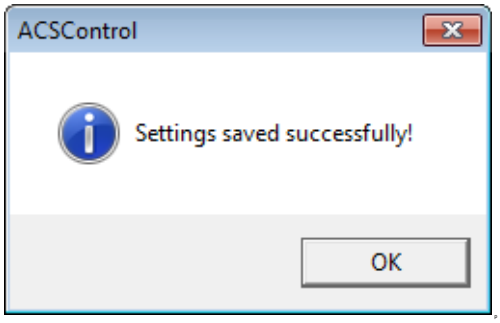
⇨ In the Menu 'Settings' select the menu item **Save Copy as**.

✓ The file system opens.

⇨ Select a location and enter a name. Here the file extension **.acsconfig** is added to the name automatically, if necessary.

⇨ Click on **Save**.

✓ The new configuration file is saved at the respective location with the respective name. The following message appears:



⇨ Click on **OK**.

5.5.3.3 Unlocking a Configuration File

Generally a configuration file should not be used twice. Nevertheless, you can unlock it, if necessary.

If a configuration file is locked, it is probably used by another instance of the software.
Your changes will be effective only after a restart of the software.

To unlock a configuration file, do the following:

⇨ In the Menu 'Settings', select the menu item **Edit Config Files**.

✓ The Dialog 'Edit Config Files' appears.

⇨ Right-click in the line of the file.

✓ A context menu appears.

⇨ Select **Force unlock**.

✓ The check box in the column **Locked** is deactivated.

⇨ Click on **Save**.

✓ Your changes are saved.

5.5.3.4 Deleting a Configuration File

You can delete a configuration file from the file system, if necessary.

To delete a configuration file, do the following:

⇨ In the Menu 'Settings', select the menu item **Edit Config Files**.

✓ The Dialog 'Edit Config Files' appears:

⇨ Right-click in the line of the file.

✓ A context menu appears.

⇨ Select **Delete**.

✓ The configuration file is deleted.

⇨ Click on **Save**.

✓ Your changes are saved.

5.5.3.5 Changing the Setting of a Configuration File as Default

One of the available configuration files can be set as default. If so, it will automatically be selected to be used when Starting ACSControl. The Dialog 'Edit Config Files' will not appear. Likewise this setting can be canceled. If there is no default configuration file, the Dialog 'Edit Config Files' will appear whenever Starting ACSControl.

Your changes will be effective only after a restart of the software.

To change the setting of a configuration file as default, do the following:

⇨ In the Menu 'Settings', select the menu item **Edit Config Files**.

✓ The dialog Dialog 'Edit Config Files' appears:

⇨ Select the configuration file.

⇨ Activate/deactivate the check box **Set as default**.

*If the check box **Set as default** cannot be activated, another configuration file is already set as default. If so, this setting must first be changed.*

⇨ Click on **Save**.

✓ Your changes are saved.

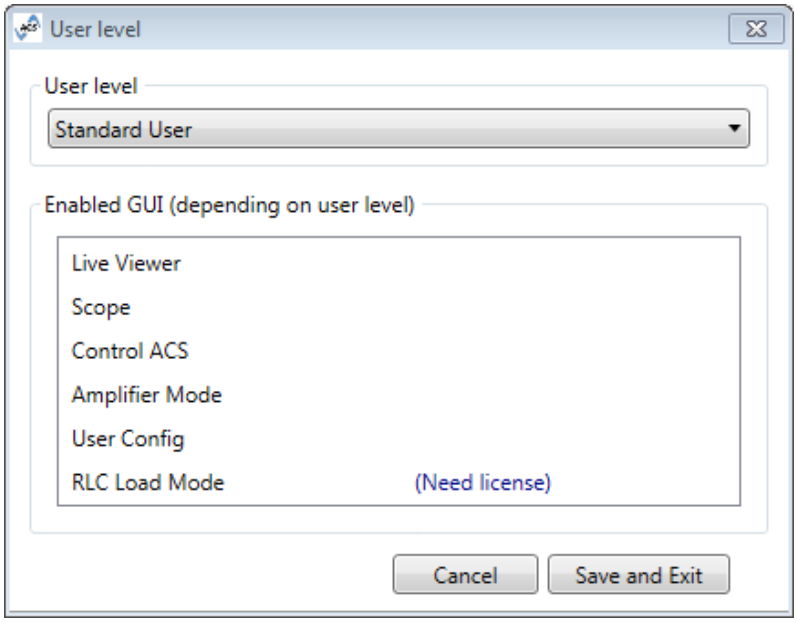
5.5.4 Changing the User Level

*For more information on **User Levels** see **2.3**.*

To change the user level, do the following:

⇨ In the Menu ‘Settings’, select the menu item **User Level**.

✓ The dialog ‘User level‘ appears:



⇨ In the drop-down menu **User Level**, select a user level.

✓ If you selected **Advanced User** or **Power User**, the field **Password** appears.

➢ If so, enter the required password.

⇨ Click on **Save and Exit**.

✓ Your user level is changed.

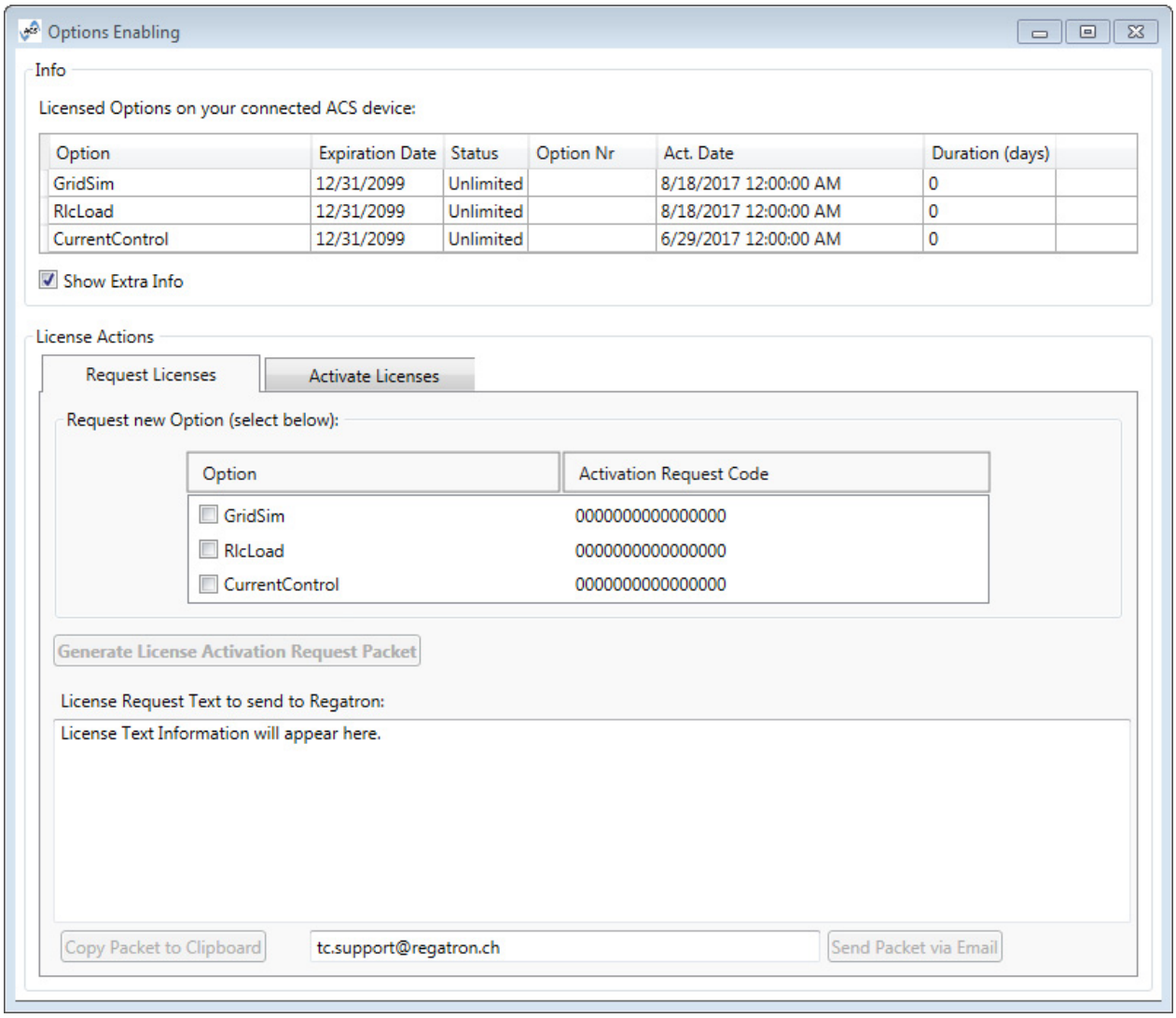
The change is instantly effective. It is not necessary to restart the software.

5.5.5 Enabling Product Options

To enable product options, do the following:

⇨ In the Menu ‘Device’, select **Options Enabling**.

✓ The dialog ‘Options Enabling‘ appears:



The section ‘Info‘ provides information on the options you are currently granted with information on the respective licenses.

⇨ In the tab ‘Request Licenses‘ of the section ‘License Actions‘, select the relevant license(s).

✓ The button **Generate License Activation Request Packet** is activated.

⇨ Click on the button.

✓ In the field **License Request Text to send to Regatron**, an automatically generated code number is displayed.

⇨ Click on **Send Packet via Email**.

✓ Your e-mail program opens providing an e-mail with your license request.

⇨ Enter additional information, if necessary and send the e-mail.

✓ Support will provide an activation code.

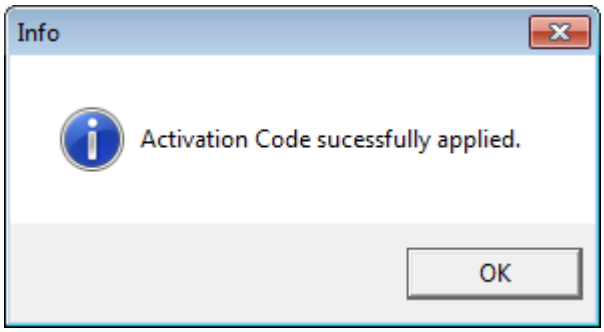
⇨ Select the tab ‘Activate Licenses‘.

⇨ In the field **Received Activation Codes**, enter the activation code.

	Each activation code newly generated renders the last one invalid.

⇨ Click on **Activate Licenses**.

✓ The following message appears:



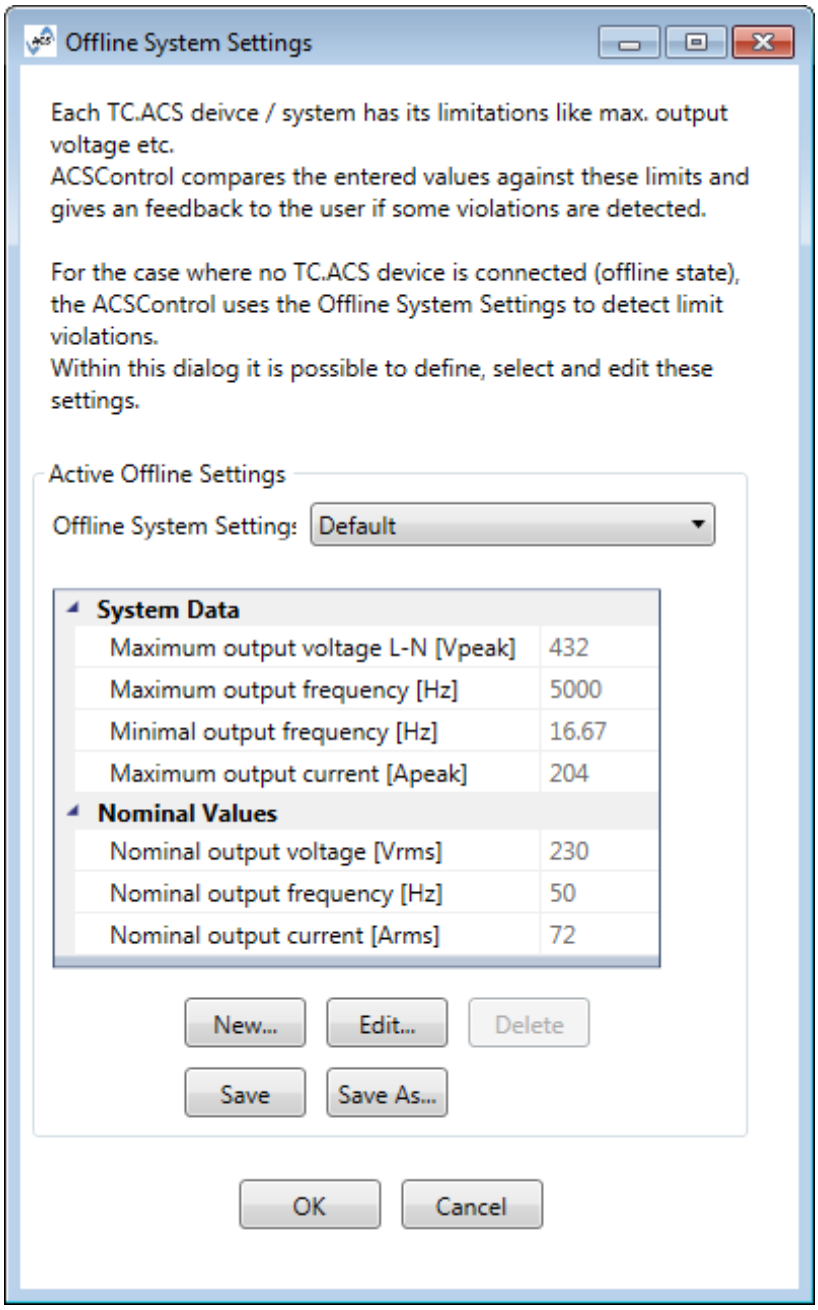
⇨ Click on **OK**.

✓ The requested option(s) is (are) activated. It appears (they appear) in the section ‘Info‘.

5.5.6 Managing Offline System Settings

5.5.6.1 Introduction

There are different types of the TC.ACS device with respect to their technical data like maximum output voltage, etc. When Working with the TC.ACS Device in Basic Waveform Generator Mode or when Working with the TC.ACS Device in Full Waveform Generator Mode, user entries are limited according to the settings of the currently connected device. If no device is connected, then specific offline system settings are considered instead. You can manage these settings via the dialog ‘Offline System Settings‘:



*The dialog ‘Offline System Settings‘ appears when selecting **Offline System Settings** in the **Menu ‘Settings’**.*

Here, you have the following possibilities:

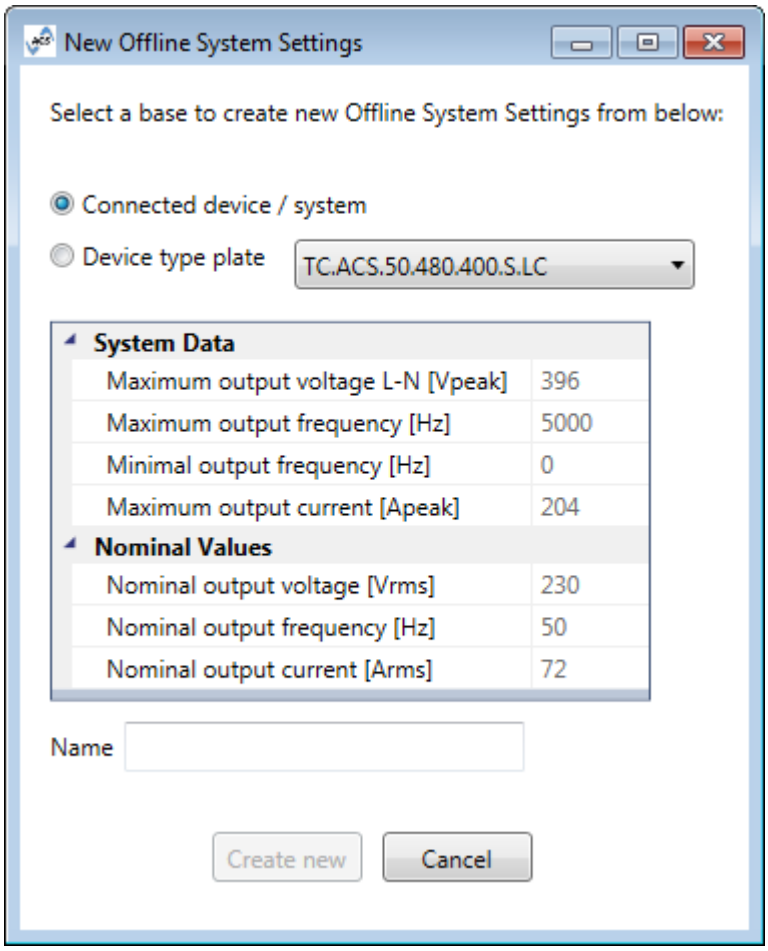
- Creating new Offline System Settings (5.5.6.2)
- Deleting given Offline System Settings (5.5.6.3)
- Editing Offline System Settings (5.5.6.4)
- Selecting Offline System Settings to be used (5.5.6.5)

5.5.6.2 Creating new Offline System Settings

To create new offline system settings, do the following:

⇨ In the dialog ‘Offline System Settings‘, click on **New**.

✓ The dialog ‘New Offline System Settings‘ appears:



⇨ Select a basic setting to start with. Here you have the following options:

- **Connected device / system**
- **Device type plate**

⇨ If you selected the second option, select a device type from the attached drop-down list.

✓ The settings are shown in the section below.

⇨ In the field **Name**, enter a name for the new settings.

⇨ Click on **Create New**.

✓ A message appears confirming your action.

5.5.6.3 Deleting given Offline System Settings

To delete given offline system settings, do the following:

⇨ In the drop-down list **Offline System Settings**, select the relevant settings.

✓ The settings are shown in the section below.

⇨ Click on **Delete**.

✓ A message appears confirming your action.

5.5.6.4 Editing Offline System Settings

To edit offline system settings, do the following:

⇨ In the drop-down list **Offline System Settings**, select the relevant settings.

✓ The settings are shown in the section below.

⇨ Click on **Edit**.

✓ The settings are now editable.

⇨ Edit the settings in the relevant fields.

⇨ If you want to save the settings using their original location and name, click on **Save**.

✓ A message appears confirming your action.

⇨ If you want to save the settings at a new location and/or a new name, do the following:

➢ Click on **Save as**.

✓ The file system opens.

➢ Select a location and enter a name.

➢ Save your entries to the file system.

✓ A message appears confirming your action.

5.5.6.5 Selecting Offline System Settings to be used

To select offline system settings to be used, do the following:

⇨ In the drop-down list **Offline System Settings**, select the relevant settings.

✓ The settings are shown in the section below.

⇨ Click on **OK**.

✓ A message appears confirming your action.

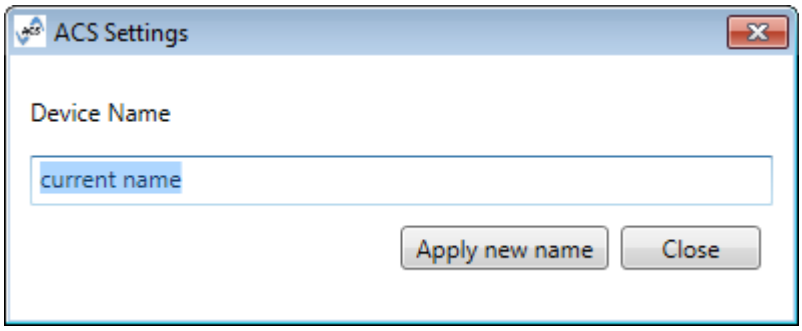
5.5.7 Naming the connected Device

You can name the ACS device, which you are connected to.

To name the connected device, do the following:

⇨ In the Menu ‘Settings’, select the menu item **Device Name**.

✓ The following dialog appears:



It shows the current device name, if given.

⇨ Enter a name.

⇨ Click on **Apply new name**.

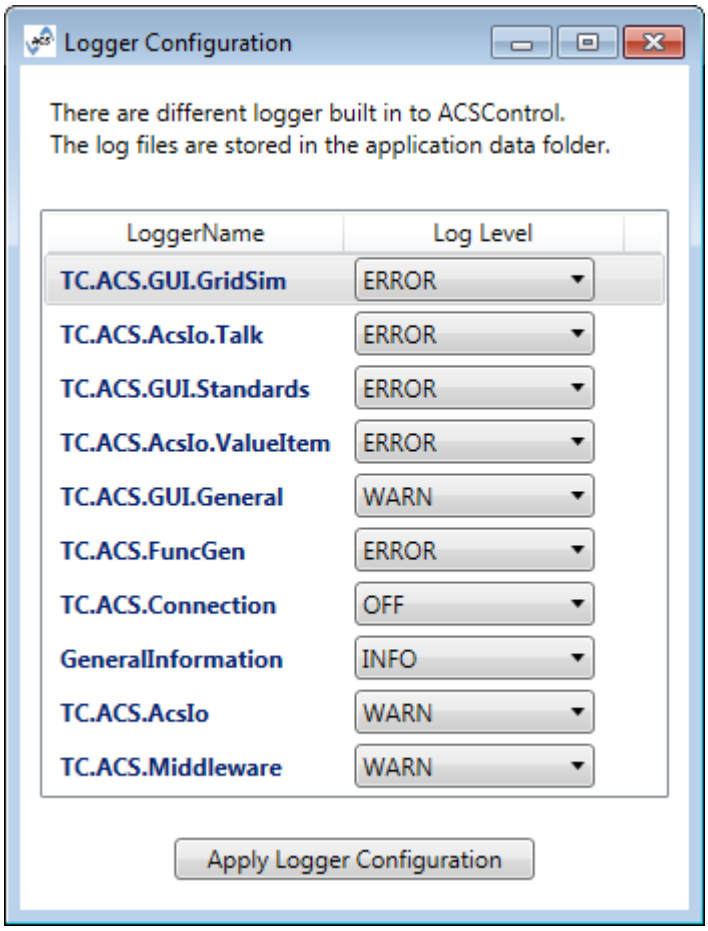
⇨ Click on **Close**.

✓ The name is given in the Status Bar.

5.5.8 Configuring the Logging

To configure the logging please contact Regatron Customer Support!

If necessary, you can configure the logging of ACSControl via the dialog ‘Logger Configuration‘:



*The dialog ‘Logger Configuration‘ appears when selecting **Logging Config** in the **Menu ‘Info’**.*

5.6 Updating the Firmware

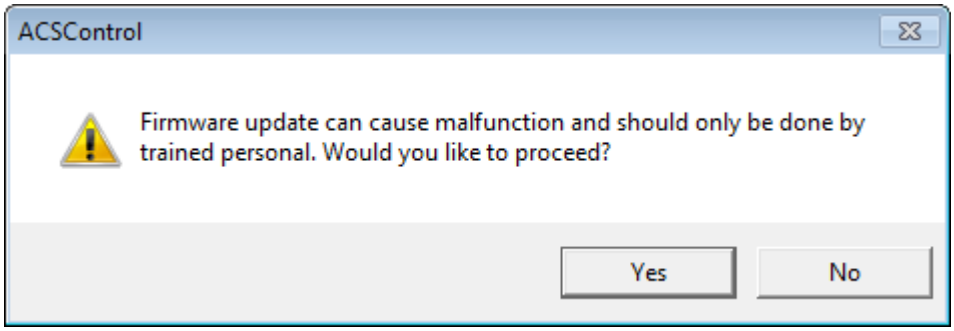
The ACS firmware incorporates multiple components each of which might need to be updated at some point.

Prerequisites: You are assigned the user level Advanced User. The TC.ACS device is switched on and connected to the ACSControl. The PC on which ACSControl is running is physically connected to the device either via interface RS-232 (for updating boards CTR.ACSO/CTR.ACSI) or USB-interface (for updating boards CTR.ACSO).

To update the firmware, do the following:

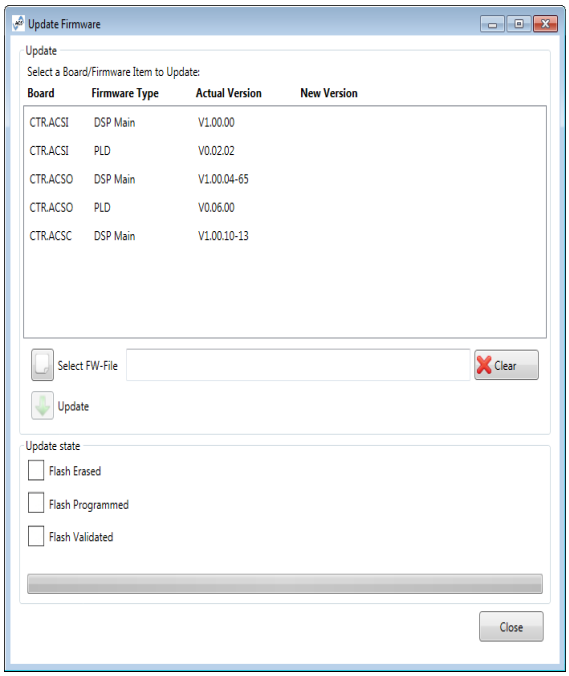
⇨ In the Menu 'Device', select **Update Firmware**.

✓ The following message appears:



⇨ Click on **Yes**.

✓ The dialog 'Update Firmware' appears:



⇨ Select the relevant firmware component.

	If you are going to update several components of the firmware, it is generally recommended to stick to the following sequence of the boards: 1st: ACSI, 2nd: ACSO, 3rd: ACSC

⇨ Click on .

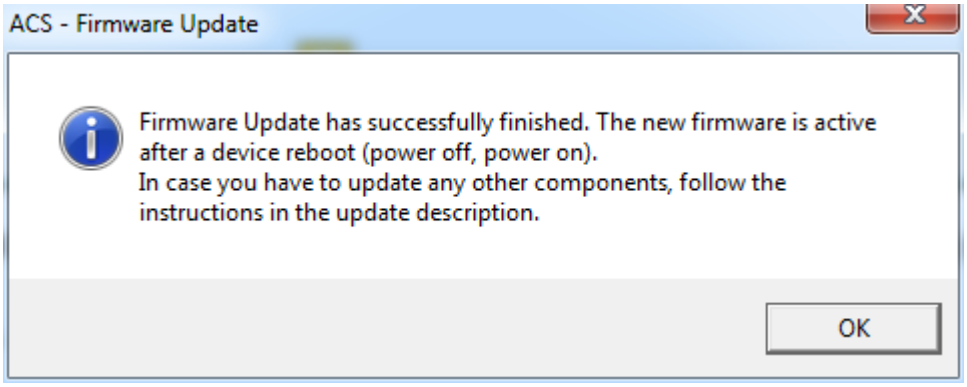
✓ Your file system opens.

⇨ Select the relevant update file.

⇨ Click on .

✓ The firmware component is updated.

✓ In the section ‘Update state‘ the progress is indicated. Once the update is finished, the following message appears:



⇨ Click on **OK** to close the message.

⇨ Repeat the procedure for other firmware components, if necessary.

⇨ Click on **Close** to close the dialog.

⇨ Switch off the device.

⇨ Switch on the device.

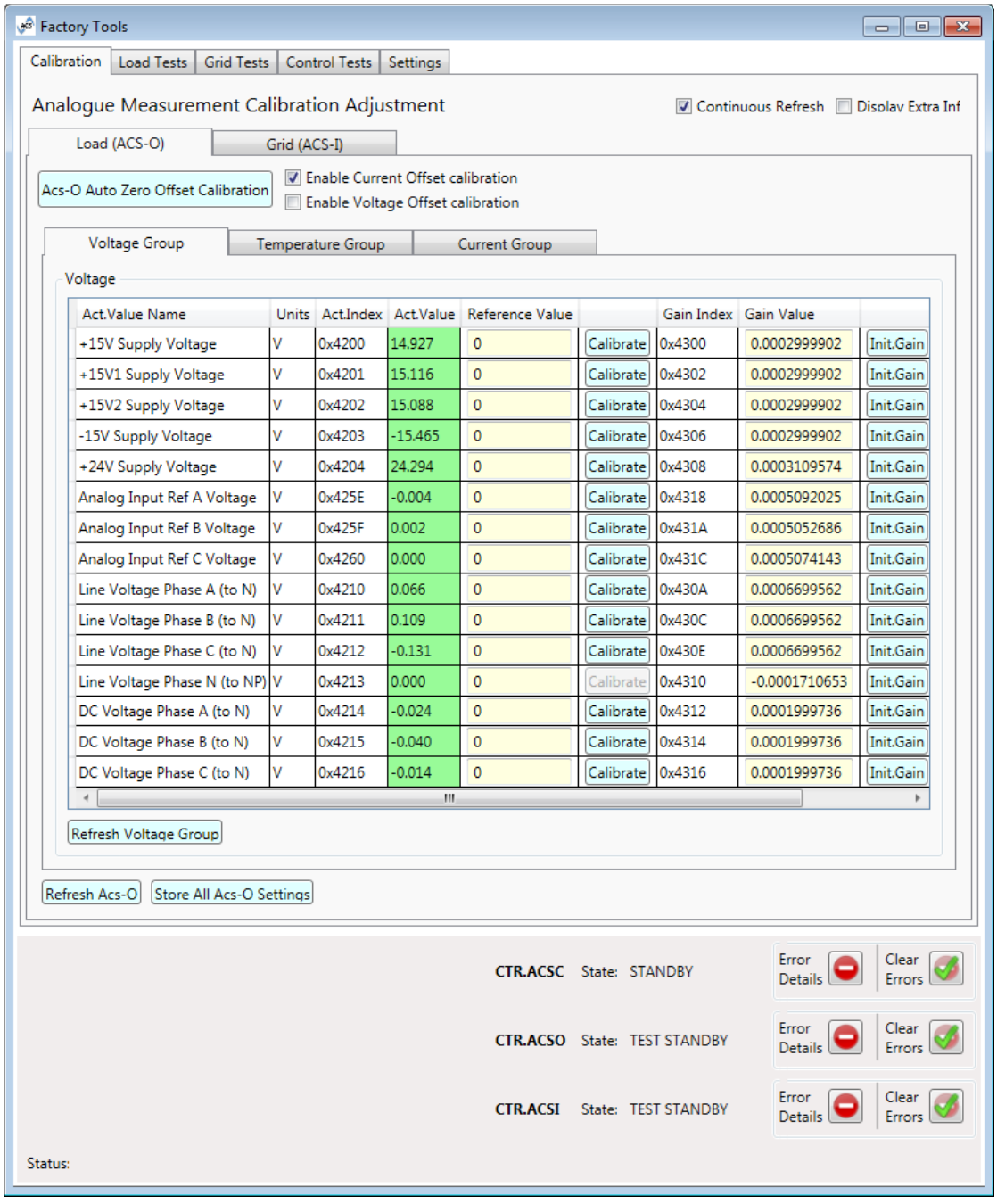
⇨ Reconnect the device to ACSControl.

	*For **Connecting a TC.ACS Device** see **5.2**.*

5.7 Executing Factory Tools

*Executing factory tools is reserved to the user level **Power User**.*
*To execute factory tools please contact **Support**!*

If necessary, you can execute factory tools via the dialog ‘Factory Tools‘:



*The dialog ‘Factory Tools‘ appears when selecting **Factory Tools** in the **Menu ‘Device’**.*

5.8 Arranging the User Interface

5.8.1 Introduction

You can individually arrange the ACSControl user interface according to your needs. Here you have the following possibilities:

- Arranging the Tool Bar (5.8.2)
- Arranging the Tab Section (5.8.3)

5.8.2 Arranging the Tool Bar

You can arrange the Tool Bar by moving the parts individually. Here you can place the parts on top of each other, side by side or one after another.

To move a part of the Tool Bar, do the following:

⇨ Move the pointer to the left border of the part.

✓ The pointer turns into a cross-arrow.

⇨ Left-click and move the part by drag & drop.

5.8.3 Arranging the Tab Section

You can individually arrange the Tab Section. Here you have the following possibilities:

- Showing a Tab (5.8.3.1)
- Moving a Tab (5.8.3.2)
- Separating a Tab (5.8.3.3)
- Changing the Order of Tabs (5.8.3.4)
- Refitting a separated Tab (5.8.3.5)
- Sizing Tabs (5.8.3.6)

*At any time you have the possibility of **Restoring the default Setting of the Tab Section** (see **5.8.3.7**).*

5.8.3.1 Showing a Tab

To show a tab, do the following:

⇨ In the Menu Bar click on **View**.

✓ A context menu appears.

⇨ Select the name of the respective tab.

✓ The tab is displayed.

5.8.3.2 Moving a Tab

A tab can be moved by drag & drop while the pointer is placed in the tab's header.

5.8.3.3 Separating a Tab

You can separate a tab from the row of tabs, such that it can be handled separately, e.g. moved to another monitor.

To separate a tab, simply move the tab (see 5.8.3.2) downwards, i.e. out of the row.

5.8.3.4 Changing the Order of Tabs

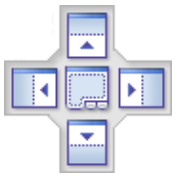
To change the order of tabs, move the tab (see 5.8.3.2) to the right or left inside the row.

5.8.3.5 Refitting a separated Tab

You can refit a tab that has been separated (see 5.8.3.3) into the main window of the ACSControl user interface. Here you can either dock the tab above, below, on the right or on the left of the other tabs, or you can refit it to its default position within the row.

To refit a separated tab, do the following:

⇨ Click into the header of the tab and move slightly.

✓ In the middle of the screen a docking compass  appears.

✓ It indicates the possible docking positions, where the center represents the in-line position.

⇨ Move the pointer (dragging the tab) to the docking compass and drop it at the respective position.

✓ The tab is placed accordingly.

5.8.3.6 Sizing Tabs

In case there are several tabs shown at the same time, you can move the borders between these, such that one tab becomes bigger while the others become smaller. You can do the same to maximize or minimize a tab that has been separated (see 5.8.3.3).

To size a tab, do the following:

⇨ Move the pointer to the border between two tabs.

✓ The pointer turns into a double-pointed arrow.

⇨ Left-click and move the border.

5.8.3.7 Restoring the default Setting of the Tab Section

You can restore the default setting of the Tab Section at any time.

To restore the default view, do the following:

⇨ In the Menu 'Settings', select the menu item **Reset Layout**.

✓ The default view of the Tab Section is displayed.

5.9 Configuring the TC.ACS Device

5.9.1 Introduction

You can configure a TC.ACS device via the Tab 'User Config' (3.4.4).

Here, you have the following possibilities:

- Setting Safety Limits with Respect to the Load (5.9.2.1)
- Enabling/disabling DC Voltage Rejection (5.9.3)
- Enabling/disabling RMS Control (5.9.4)
- Setting a Reactive Power (5.9.5)
- Selecting an Operation Mode (5.9.6)
- Setting Scaling Factors (5.9.7)

Prerequisites: The TC.ACS device is connected to your ACSControl software.

*For **Showing a Tab** see **5.8.3.1**.*
*For **Connecting a TC.ACS Device** see **5.2**.*

5.9.2 Setting Safety Limits

You have the following possibilities to set safety limits:

- Setting Safety Limits with Respect to the Load (5.9.2.1)
- Setting Safety Limits with Respect to the Sense Board (5.9.2.2)

5.9.2.1 Setting Safety Limits with Respect to the Load

You can set safety limits with respect to the load via the Tab 'User Config' (3.4.4).

To set safety limits with respect to the load, do the following:

⇨ In the Section 'Limiters Load', set limiters as follows:

- In the field **Voltage Limit**, enter a maximum voltage L - N.
- In the field **Reference Slope Limit**, enter a maximum voltage change over one micro-second.

⇨ In the Section 'Triplevels Load', set triplevels as follows:

- In the field **Phase Overcurrent 2**, enter a maximum current over a specified time period.
- In the field P**hase Overcurrent 2 Error Time**, enter a time period for maximum current.

⇨ In the Section 'I2t Supervision', set an I^2t supervision as follows:

- In the field **I limit high**, enter a maximum current over a specified time period.
- In the field **I limit low**, enter a maximum current [rms] over an infinite time.
- In the field **Time**, enter a time period for maximum current.

5.9.2.2 Setting Safety Limits with Respect to the Sense Board

The sense board is an optional interface board of the TC.ACS device. For more information see the related device manual.

You can set safety limits with respect to the sense board via the Tab 'User Config' (3.4.4).

To set safety limits with respect to the sense board, do the following:

⇨ In the Section 'Limiters Sense', enter a maximum voltage not to be exceeded on the sense input of the TC.ACS device.

⇨ In the Section 'Triplevels Sense', set the following limits for the sense board:

- In the field **Voltage Triplimit [V]**, enter a maximum voltage not be exceeded on the sense input.
- In the field **Max. Voltage Scaling Deviation [%]**, enter the maximum percentage deviation of the voltage at the device output from the voltage at the sense input.

If on the sense input of the TC.ACS device one of these limits is exceeded, then the TC.ACS will be shut off.
*In the maximum percentage deviation the scaling factor **Voltage Gain** given in the **Section 'Scaling Output'** is automatically taken into account.*

5.9.3 Enabling/disabling DC Voltage Rejection

In case there is an inductive component (e.g. a transformer) connected to the load side of the TC.ACS device, the DC voltage rejection can prevent a saturation. You can enable/ disable the DC voltage rejection via the Tab 'User Config' (3.4.4).

To enable/disable the DC voltage rejection, do the following:

⇨ In the Section 'ACS Operation Mode Configuration', select the relevant option.

5.9.4 Enabling/disabling RMS Control

RMS control improves the accuracy of the voltage control of the TC.ACS device. You can enable/disable the RMS control via the Tab 'User Config' (3.4.4).

To enable/disable the RMS control, do the following:

⇨ In the Section 'RMS Control', select one of the following options.

- **Disabled**: RMS Control is disabled, i.e. the accuracy is not improved.
- **Internal**: RMS Control is enabled, the accuracy is improved with respect to the device output.
- **Sense**: RMS Control is enabled, the accuracy is improved with respect to the sense board.

5.9.5 Setting a Reactive Power

Additional devices connected to the same grid, which the TC.ACS is connected to, may cause a phase-shifting between voltage and current. This phase-shifting can be compensated by an additional reactive power with the appropriate capacity/inductivity on the grid side. You can set a reactive power via the Tab 'User Config' (3.4.4).

⇨ In the Section 'Grid References' enter a value for the reactive power.

5.9.6 Selecting an Operation Mode

Danger	*The operation mode must not be changed in operation. The TC.ACS device must be switched off before.*

To select an operation mode of the TC.ACS device, do the following in the Section 'ACS Operation Mode Configuration' of the Tab 'User Config'.

⇨ In the subsection 'ACS Operation / Input Source', select an operation mode.

⇨ In the subsection 'Controller Mode Selection', select a controller mode.

	*If you selected Waveform Generator or Load Simulation Mode, the controller mode 'Current Controlled' is set automatically.* *The developer mode is not intended to be used by customers.*

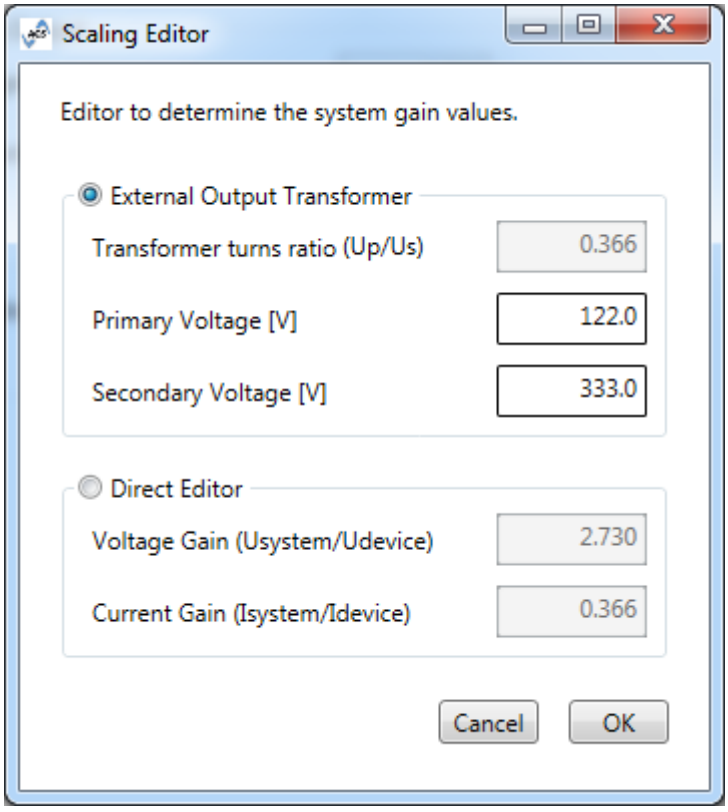
5.9.7 Setting Scaling Factors

In case you are using a transformator or other additional components, the output voltage and output current of the TC.ACS device may be altered on the way to your device under test. If so, you can set scaling factors for the voltage and the current. The relevant output values will automatically be adjusted according to these factors, such that the effective input values at your DUT are as wanted.

To set scaling factors, do the following:

⇨ In the Section 'Scaling Output' of the Tab 'User Config', click on **Scaling Editor**.

✓ The **Scaling Editor** appears:



Here you have the following possibilities:

- Setting Scaling Factors with Respect to the Output of an external Transformer (5.9.7.1)
- Setting independent Scaling Factors for Voltage and Current (5.9.7.2)

*For **Setting independent Scaling Factors for Voltage and Current** the user level **Advanced User** is required.*

5.9.7.1 Setting Scaling Factors with Respect to the Output of an external Transformer

To set scaling factors with respect to the output of an external transformer, do the following:

⇨ Activate the option **External Output Transformer**.

⇨ In the field **Primary Voltage**, enter the voltage at the TC.ACS device output.

⇨ In the field **Secondary Voltage**, enter the voltage at the transformer output.

⇨ Click into the field **Primary Voltage** once more.

✓ The field **Transformer turns ration (Up/Us)** gives the ratio of these two values (i.e. the inverse of the voltage gain).

⇨ Click on **OK** to close the dialog.

✓ In the Section 'Scaling Output' the voltage gain and the current gain are given.

5.9.7.2 Setting independent Scaling Factors for Voltage and Current

If current and voltage scaling refer to different points in your system, you might want to set the respective scaling factors independently.

To set independent scaling factors for voltage and current, do the following:

⇨ Activate the option **Direct Editor**.

⇨ In the field **Voltage Gain (Usystem/Udevice)**, enter a voltage gain.

⇨ In the field **Current Gain (Isystem/Idevice)**, enter a current gain.

⇨ Click on **OK** to close the dialog.

✓ In the Section 'Scaling Output' the voltage gain and the current gain are given.

5.10 Working with Grid Files

The operation and behavior of TC.ACS is controlled by internal control parameters. These internal control parameters are held in so-called grid files.

*To work with grid files, please contact **Support**.*

5.11 Working with the internal Oscilloscope

The software ACSControl has an integrated oscilloscope functionality, which allows the observation of constantly varying signals.

*To work with the internal oscilloscope, please contact **Support**.*

5.12 Handling Errors

5.12.1 Introduction

You can handle errors via the buttons in the Status Bar.

Here you have the following possibilities:

- Showing Errors (5.12.2)
- Showing the Error History (5.12.3)
- Clearing Error Messages (5.12.4)

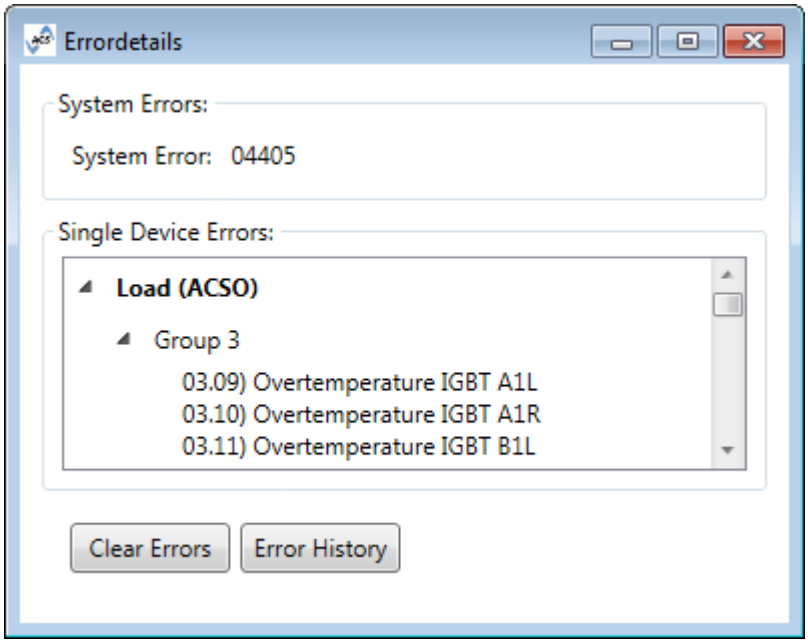
5.12.2 Showing Errors

If there are any errors, you can show these.

To show errors, do the following:

⇨ In the Status Bar, click on  .

✓ The dialog ‘Errordetails‘ appears:



It provides the error codes for currently existing system errors as well as device errors. Here the device errors are sorted with respect to the board type and error groups.

	*For the meaning of error codes please contact **Support**.* *For **Showing the Error History** see **5.12.3**.* *For **Clearing Error Messages** see **5.12.4**.*

5.12.3 Showing the Error History

*As an alternative to the procedure here described, you can also select **Error History** in the **Menu 'Device'** to show the error history.*

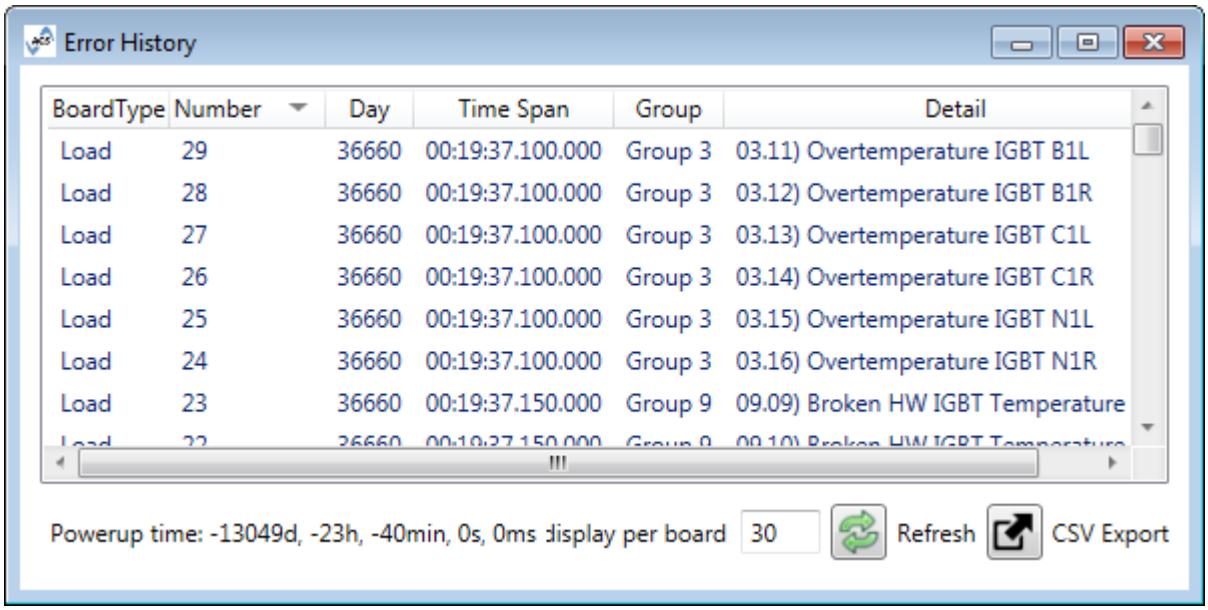
To show the error history, do the following:

⇨ In the Status Bar, click on .

✓ The dialog 'Errordetails' appears.

⇨ Click on **Error History**.

✓ The dialog 'Error History' appears:



It provides a list of all errors that have been observed in the past.

The error history can be exported as a CSV file by clicking on the respective button.

5.12.4 Clearing Error Messages

Once you have solved the underlying problems, you can clear the error messages.

To clear error messages, do the following:

⇨ In the Status Bar click on ,

or

⇨ in the dialog 'Errordetails' click on **Clear Errors**.

✓ In the dialog 'Errordetails' the error messages disappear.

5.13 Discharging the TC.ACS Device

In order to save energy and to protect your device, it is recommended to discharge the TC.ACS device whenever you stop working with it.

To discharge the device, do the following:

⇨ In the Operating Part of the Tool Bar, click on  .

In Amplifier Mode and in Load Simulation Mode you can also click on **Discharge.**

✓ The device is discharged. On it's front the LED for VOLTAGE extinguishes.

6 Working with the TC.ACS Device in Basic Waveform Generator Mode

6.1 Introduction

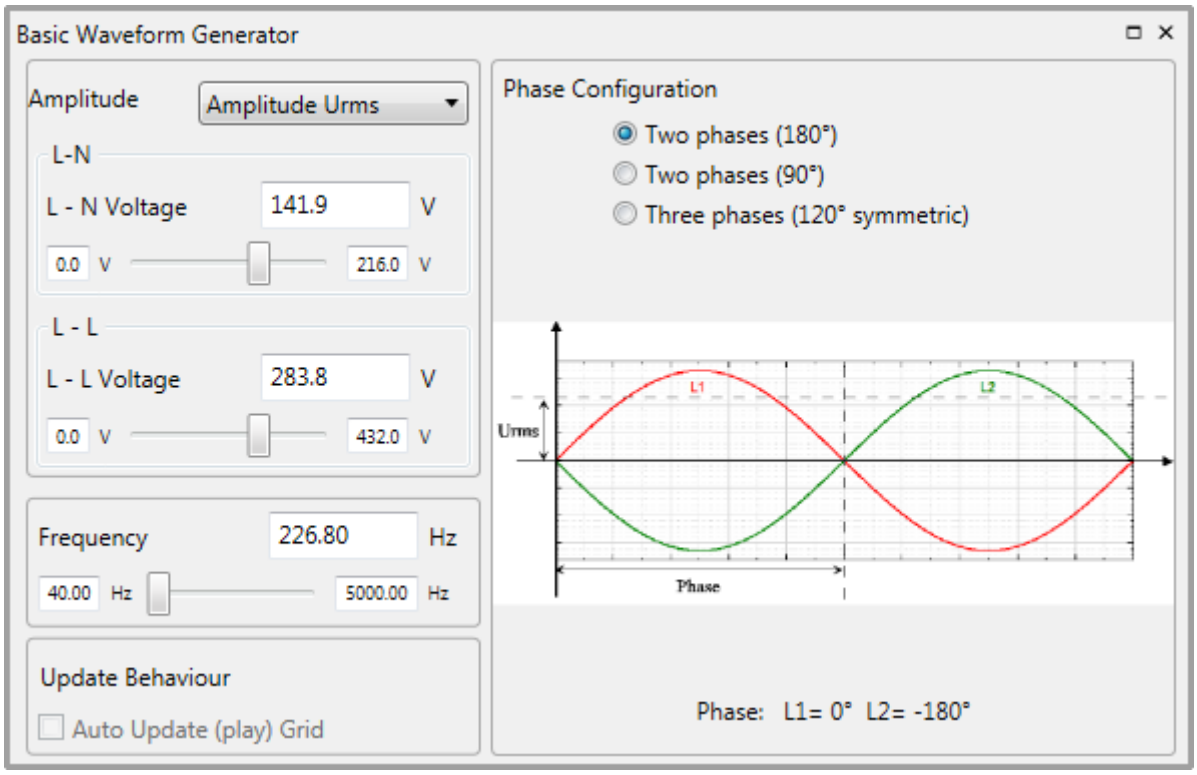
In the Basic Waveform Generator Mode the TC.ACS device simulates a grid. I.e. it generates a signal waveform that resembles the signal given by a grid, i.e. a sine wave. This signal is configured by ACSControl. It is transmitted from the PC to the TC.ACS device via a remote data interface connection.

Working with the TC.ACS Device in Basic Waveform Generator Mode includes the following tasks:

- Configuring the Signal (6.2)
- Operating the TC.ACS Device (6.3)

6.2 Configuring the Signal

You can configure the sine wave signal via the Tab 'Basic Waveform Generator':



*Changes of the configuration will be effective when **Starting the Output of the Signal** for the next time. Only if the check box **Auto Update (play) Grid** is activated, the changes are instantaneously transmitted to the signal currently being put out (see **6.3.3**).*

To configure the signal, do the following:

⇨ In the field **Amplitude**, specify the amplitude of the signal in the following way:

- ➢ Select the kind of amplitude you want to work with.
- ➢ In the field **L – N**, move the slider to set the voltage between phase and neutral.
- ➢ In the field **L – L**, move the slider to set the voltage between two phases.

The value range covered by the slider can also be set (within the limits of the device).

⇨ In the field **Frequency**, specify the frequency of the signal.

⇨ In the field **Phase Configuration**, select a phase configuration of the signal.

6.3 Operating the TC.ACS Device

DANGER

Electric shock!
Avoidance:
- *Device and load must be isolated against accidental contact.*
- *No maintenance work must be carried out.*
- *Warning signs must be used and the area must be cordoned off.*

6.3.1 Introduction

You can operate the TC.ACS device in basic waveform generator mode via the Operating Part of the Tool Bar. Here, you have the following possibilities:

- Starting the Output of the Signal (6.3.2)
- Stopping the Output of the Signal (6.3.4)
- Discharging the TC.ACS Device (5.13)

Prerequisites: The waveform generator mode is selected as operation mode. A load is connected to the TC.ACS device.

*For **Selecting an Operation Mode** see **5.9.6**. For connecting a load to the TC.ACS device see the TC.ACS device manual.*

6.3.2 Starting the Output of the Signal

To start the output of the signal, do the following:

In the Operating Part of the Tool Bar, click on ▶.

✓ The signal is being put out. On the front of the ACS device, the LED for **VOLTAGE** lights up. On the Status Bar, the device state goes to **SWITCHED ON**.

6.3.3 Modifying the Signal while Running

Once the output has been started (see 6.3.2), you have the possibility of Configuring the Signal directly. To do so you first need to activate the check box **Auto Update (Grid)**.

6.3.4 Stopping the Output of the Signal

To stop the output of the signal, do the following:

⇨ In the Operating Part of the Tool Bar, click on ■.

✓ The output of the signal is stopped. On the front of the ACS device, the LED for **VOLTAGE** starts blinking. On the Status Bar, the device state goes to **READY**.

⇨ Discharge the device, if necessary.

*For **Discharging the TC.ACS Device** see **5.13**.*

7 Working with the TC.ACS Device in Full Waveform Generator Mode

7.1 Introduction

In the Full Waveform Generator Mode the TC.ACS device simulates a grid. I.e. it puts out signal functions that resemble those being put out by a grid or multiple other sources. Here ACSControl allows to generate all kinds of signal waveforms and sequences of these in order to represent the influences of various factors (e.g. failures or interferences in the power system). The resulting signal is transmitted from the PC to the TC.ACS device via a remote data interface connection.

*Working with the TC.ACS Device in Full Waveform Generator Mode involves basic concepts. For learning these concepts see **7.2 Basic Concepts**.*

Working with the TC.ACS Device in Full Waveform Generator Mode includes the following tasks:

- Managing user-defined Curves (7.3)
- Editing a Block (7.4)
- Editing a Sequence (7.5)
- Managing Blocks and Sequences (7.6)
- Operating the TC.ACS Device (7.7)

7.2 Basic Concepts

7.2.1 Introduction

This chapter introduces the basic concepts, which Working with the TC.ACS Device in Full Waveform Generator Mode is based upon. The main concepts (others are derived from these) are the following:

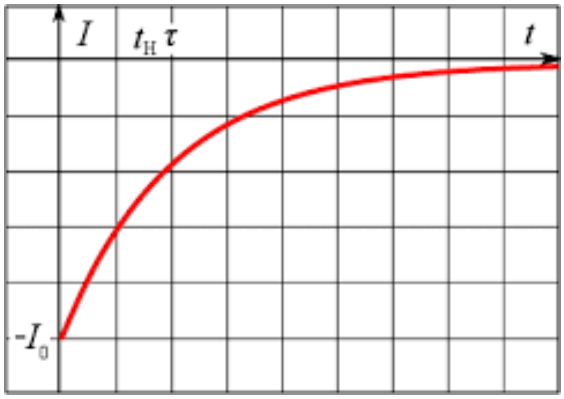
- Curve (7.2.2)
- Block (7.2.3)
- Sequence (7.2.4)

*The concepts here introduced are defined solely for **Working with the TC.ACS Device in Full Waveform Generator Mode**. Definitions may not apply beyond this context.*

7.2.2 Curve

A curve is the graphical (mathematical) representation of the behavior of a potentially alternating parameter, i.e. the development of the parameter's value over time.

Example: The charging curve of a capacitor:



Many curves can be given as modifications of simple waveforms. These can be divided into the following kinds of waveforms:

- Periodic Waveforms (7.2.2.1)
- Non-periodic Waveforms (7.2.2.3)

In ACSControl a number of these waveforms is predefined. Furthermore, ACSControl provides the possibility to create user-defined curves, i.e. by Fourier Synthesis of periodic Waveforms (7.2.2.2). Each of these waveforms can be modified in the following ways:

- Modulation (7.2.2.4)
- Added Waveform (7.2.2.5)

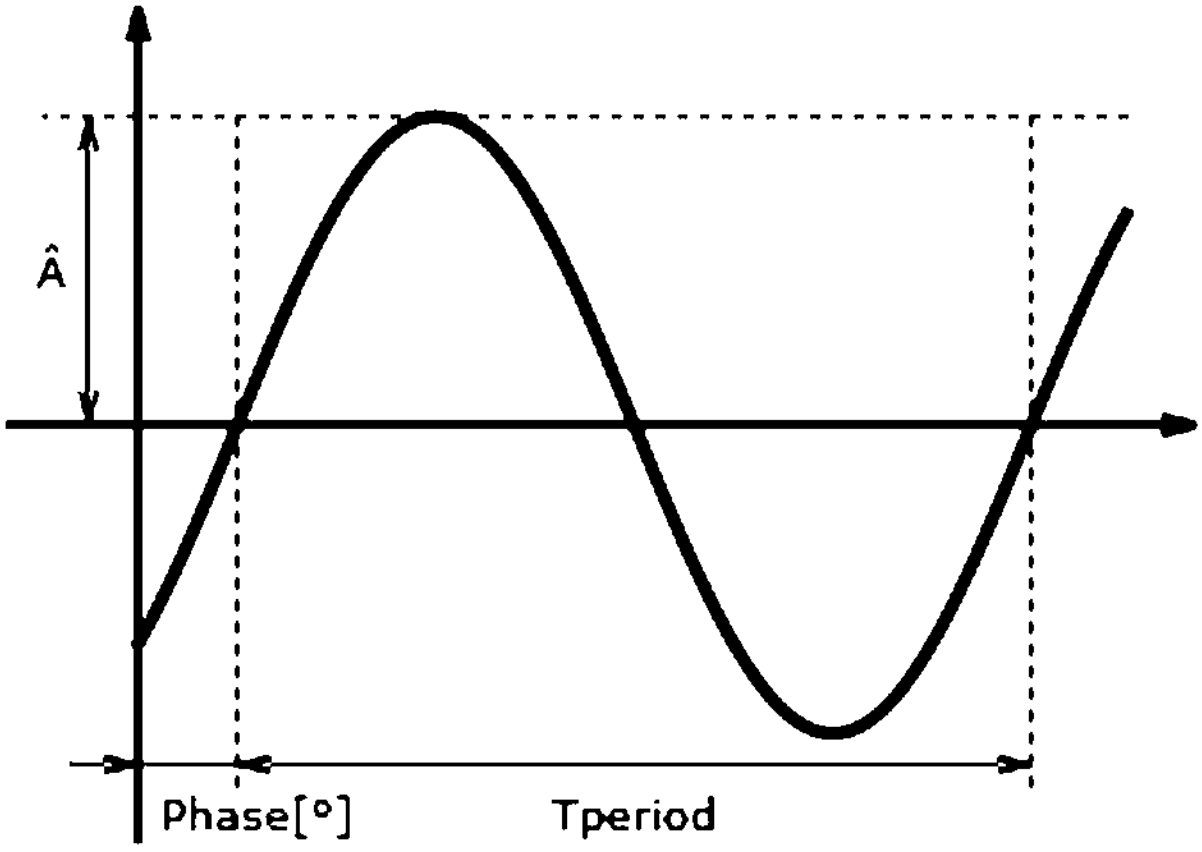
7.2.2.1 Periodic Waveform

A periodic waveform is one which repeats the exact same shape again and again.

Example: A sine curve

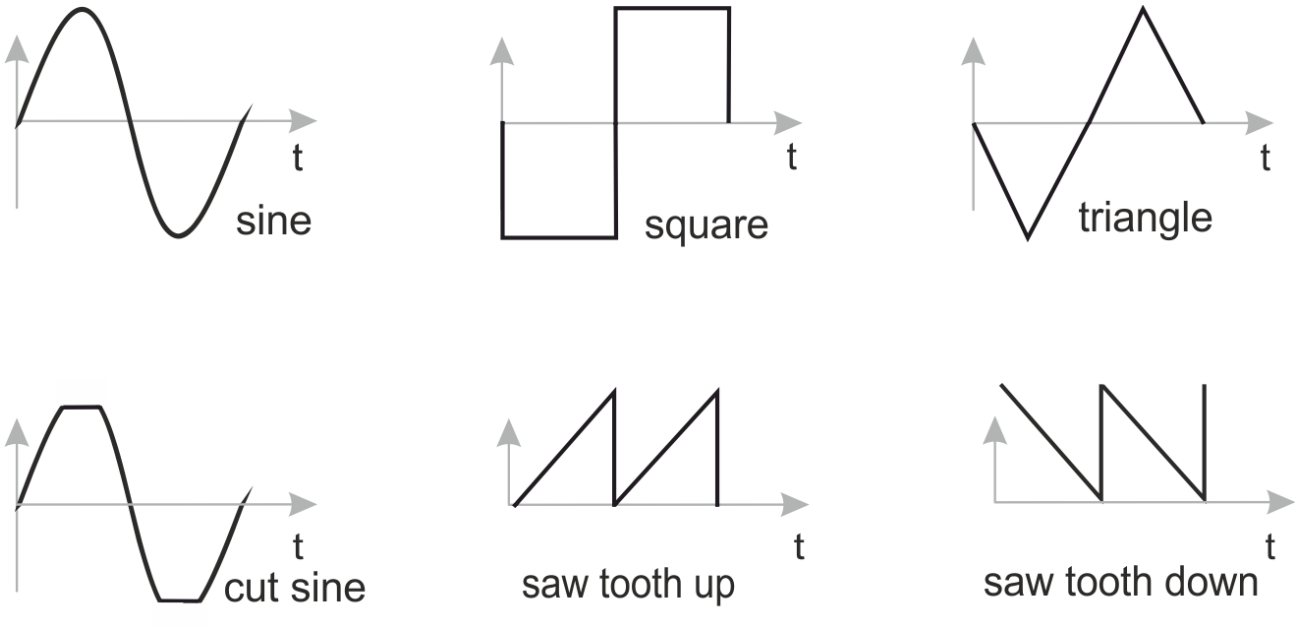
Here, a periodic waveform is generally specified by the following parameters:

- **Amplitude**, i.e. the absolute value of the waveform (given as maximum value or RMS)
- **Frequency**, i.e. the number of occurrences of a complete waveform cycle per time unit
- **T period**, i.e. the period of time of a complete waveform cycle (given in time units)
- **Phase**, i.e. the position of a point in time (an instant) on a waveform cycle



The values of the frequency and T period are reciprocal. Hence, each one of them automatically gives the other.
*Periodic waveforms can be altered by **Modulation** (**7.2.2.4**).*

In ACSControl the following periodic waveforms are predefined:

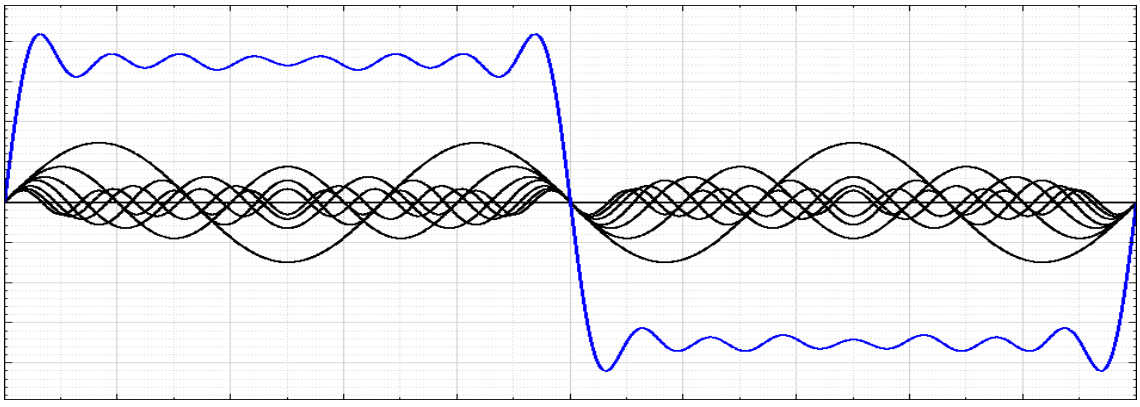


Here the waveform cut sine wave is basically a sine wave, which is cut off at a limit value.

7.2.2.2 Fourier Synthesis of periodic Waveforms

Fourier synthesis is the summation of a number of so-called harmonics (i.e. sine curves with a frequency that is a positive integer multiple of a specific reference frequency) resulting in a new Curve. While the frequency of each harmonic is given, the amplitude as well as the phase may here be individually defined.

Example: A specific summation of harmonics of a sine curve (black) gives a new Curve (blue), that almost reminds of a square wave:



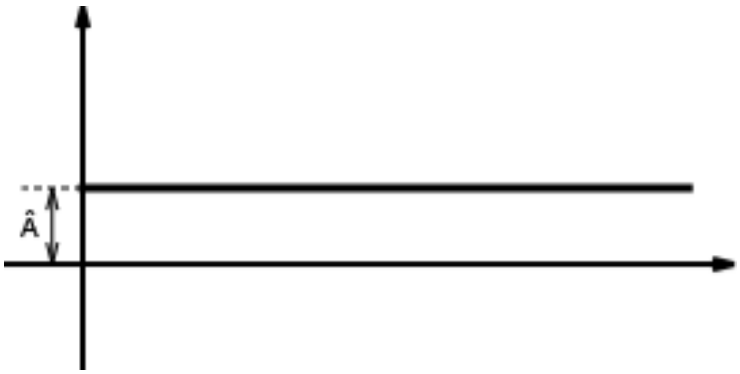
*Theoretically, any **Periodic Waveform** can be given by Fourier synthesis.*

7.2.2.3 Non-periodic Waveform

A non-periodic waveform is one which does not repeat in any way. Hence there are no general parameters to specify it. Instead each waveform has its own specific parameters.

In ACSControl the following non-periodic waveforms are predefined:

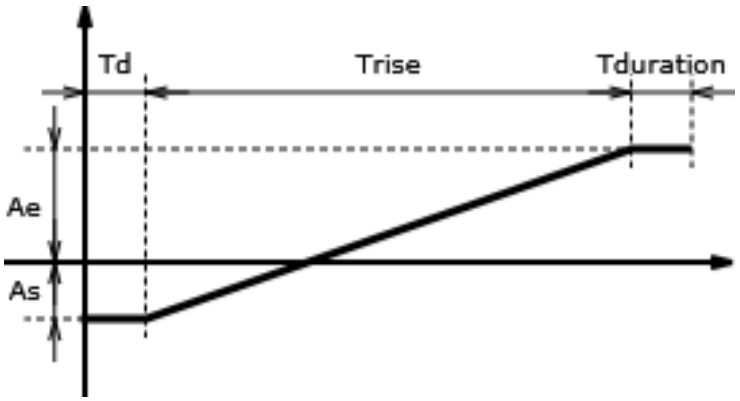
- **DC ±**



The DC± curve is a simple straight line parallel to the zero level. I.e. it represents a value that is constant over time, either positive (DC+) or negative (DC-). It is specified by the following parameters:

➢ **Amplitude**, i.e. the absolute value of the waveform

- **Ramp Curve**



The ramp curve is a straight line leading from one level to another. I.e. it represents the linear development of a value over a certain amount of time, either increasing or decreasing. It is specified by the following parameters:

➢ **Amplitude start**, i.e. the absolute value of the waveform at the starting level

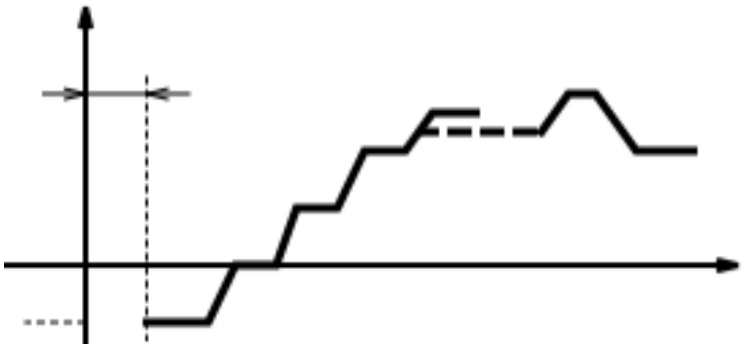
➢ **Amplitude end**, i.e. the absolute value of the waveform at the ending level

➢ **T delay**, i.e. the period of time while the value stays on the starting level

➢ **T rise**, i.e. the period of time while the value changes

➢ **T duration**, i.e. the period of time while the value stays on the ending level

- **Step Curve**

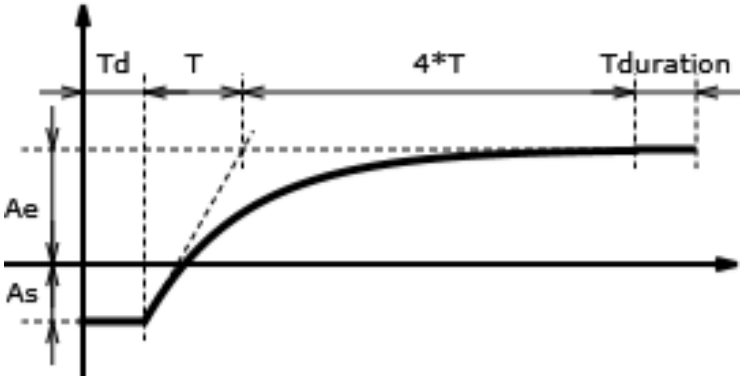


The step curve basically is a sequence of steps, each of which is an individually defined. It is specified by the following parameters:

- **Amplitude start**, i.e. the absolute value of the waveform at the starting level
- **T delay**, i.e. the period of time while the value stays on the starting level
- for each individual step:
  - **Rise time**, i.e. the period of time while the value changes
  - **Amplitude**, i.e. the absolute value of the waveform at the ending level
  - **Duration**, i.e. the period of time while the value stays on the ending level

Thus, each single step corresponds to a **Ramp Curve** where the starting values are each time given by the end values of the preceding step.

- **Exponential Curve**



The exponential curve is a curve leading from one level to another (with decreasing slope). I.e. it represents a nonlinear development of a value over a certain amount of time, either increasing or decreasing. It is specified by the following parameters:

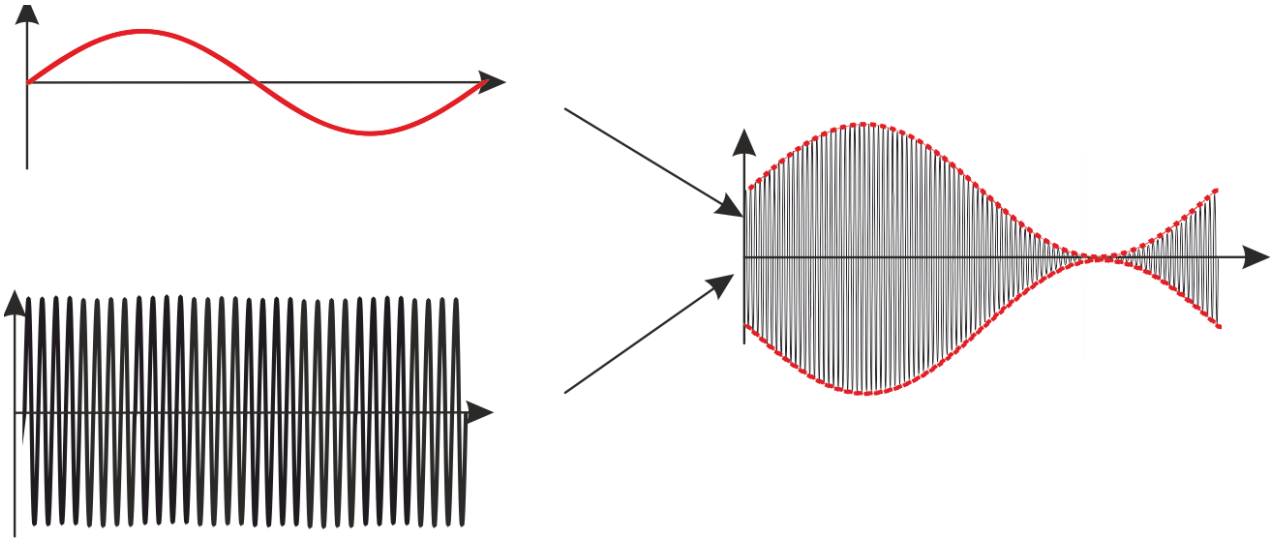
- **Amplitude start**, i.e. the absolute value of the waveform at the starting level
- **Amplitude end**, i.e. the absolute value of the waveform at the ending level
- **T delay**, i.e. the period of time while the value stays on the starting level
- **T+4*T**, i.e. the period of time while the value changes
- **T duration**, i.e. the period of time while the value stays on the ending level

7.2.2.4 Modulation

Modulation is a way of mathematically altering one (main) waveform on the basis of another (modulation) waveform. ACSControl supports the following kinds of modulation:

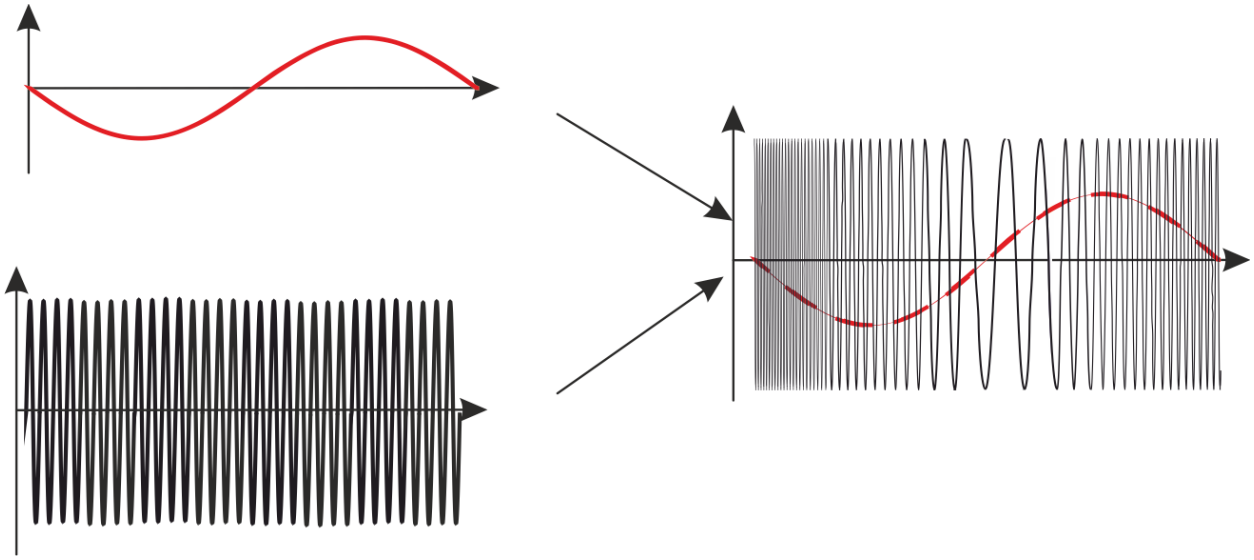
- **Amplitude Modulation**

  In amplitude modulation (AM), the *amplitude* of the main waveform (black) is varied in proportion to a modulation waveform (red):



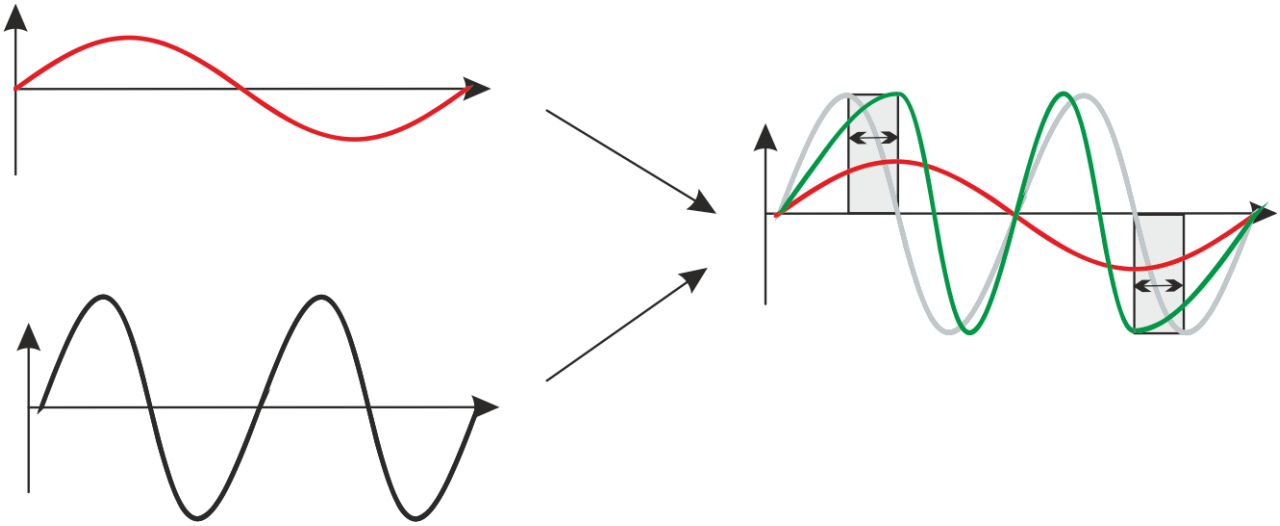
- **Frequency Modulation**

  In frequency modulation (FM), the *frequency* of the main waveform (black) is varied in proportion to a modulation waveform (red):



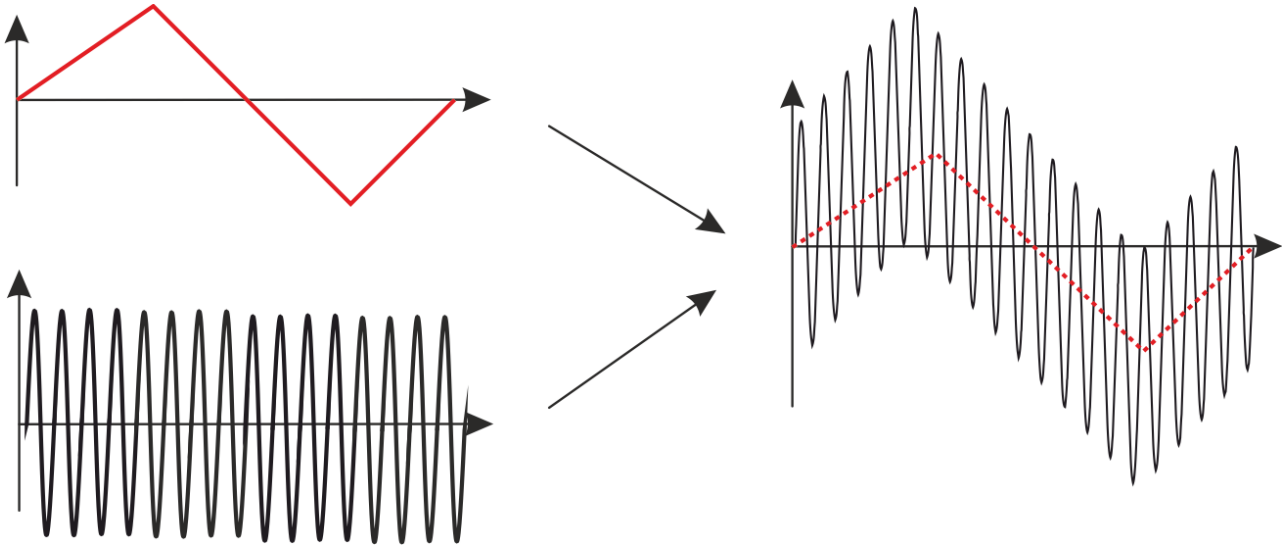
- **Phase Modulation**

  In phase modulation (PM), the *phase* of the main waveform (black) is varied in proportion to a modulation waveform (red):



7.2.2.5 Added Waveform

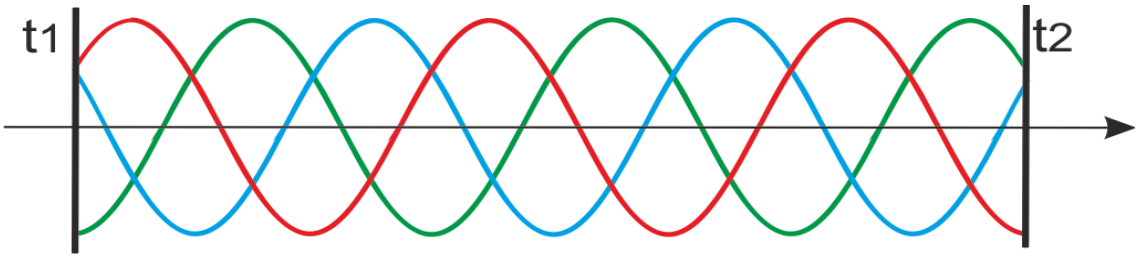
An added waveform (red) is a waveform that is simply added to the main waveform (black):



7.2.3 Block

A block is a composition of time-dependent Curves for individual phases (max. 4 for the phases L1, L2, L3 and L4) of a signal. The block has a defined length in time, which applies for all Curves included. However, between the individual Curves there may be a phase shift.

Example: Three sine curves (with a phase shift of 120°) starting at the same point in time and ending at the same point in time may build a block:



The data defining a block are given as a Block File (7.2.3.1).

7.2.3.1 Block File

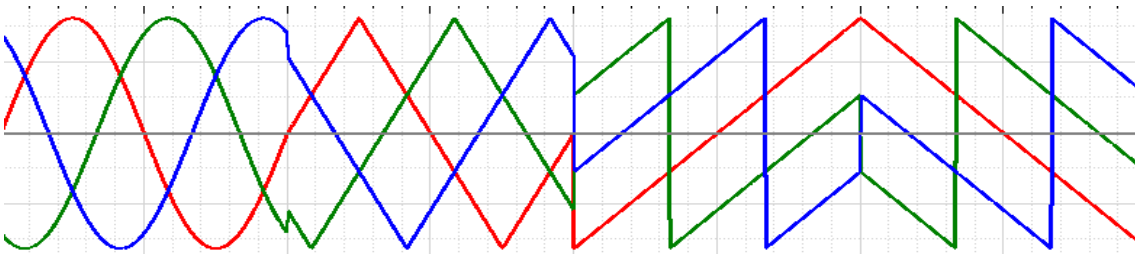
A block file (file extension **.block**) is a file that includes all data defining a Block.

Per default, block files are saved to:
%ProgramData%\Regatron\ACSControl\CurveData.

7.2.4 Sequence

A sequence is a number of Blocks, which are run sequentially, i.e. one after another, when the sequence is run:

Example: Four consecutive Blocks (sine, triangle, saw tooth up and saw tooth down):



The data defining a sequence are given as a Sequence File (7.2.4.1).

7.2.4.1 Sequence File

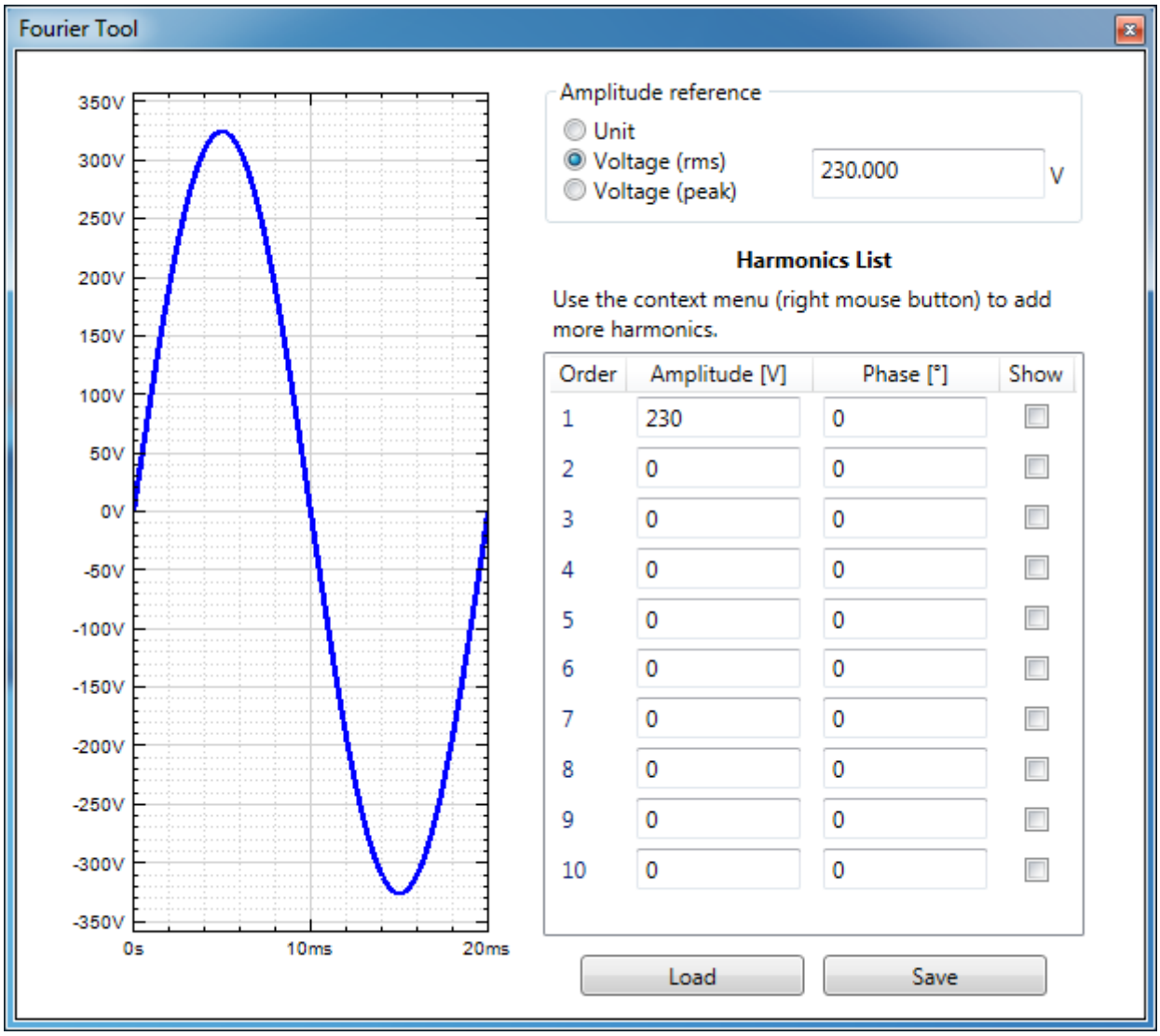
A sequence file (file extension **.sequ**) is a file that includes all data defining a Sequence.

Per default, sequence files are saved to
%ProgramData%\Regatron\ACSControl\CurveData.

7.3 Managing user-defined Curves

7.3.1 Introduction

You can manage user-defined Curves with the help of the Dialog 'Fourier Tool':



Here you have the following possibilities:

- Creating a user-defined Curve (7.3.2)
- Saving a user-defined Curve (7.3.3)
- Loading a user-defined Curve (7.3.4)

7.3.2 Creating a user-defined Curve

You can create user-defined Curves via Fourier Synthesis of periodic Waveforms.

To create a user-defined Curve, do the following:

⇨ In the Menu Bar, click on **Tools > Fourier**.

✓ The Dialog 'Fourier Tool' appears.

⇨ In the section 'Amplitude reference', enter an amplitude reference. This can either be given as a voltage value (rms or peak) or it can be given in plain numbers (unit). In the latter case, you can select between rms and peak voltage at a later point.

⇨ In the section 'Harmonics' enter amplitude and phase for each harmonic you want to be part of the resulting Curve.

You can add more or delete given harmonics via the context menu (right-click inside the section 'Harmonics').

✓ The resulting Curve is shown in the preview part of the dialog.

You can show any of the harmonics by activating the corresponding check box.

7.3.3 Saving a user-defined Curve

You can save a user-defined Curve, that is currently shown in the Dialog 'Fourier Tool', to the file system.

To save a user-defined Curve, do the following:

⇨ In the Dialog 'Fourier Tool' click on **Save**.

✓ The file system opens to the directory ***%ProgramData%\Regatron\ACSControl\CurveData***.

⇨ Select a directory from the file system, if necessary.

⇨ Give a name in the field **file name**, if necessary.

⇨ Click on **OK**.

✓ The Curve is saved under the respective name in the respective directory. Unless you have changed the directory, it is now available in the selection field of the Phase-specific Section of the Tab 'Block' and the Tab 'Sequence'.

7.3.4 Loading a user-defined Curve

You can load a user-defined Curve from the file system.

To load a user-defined Curve, do the following:

⇨ In the Menu Bar, select **Tools > Fourier**.

✓ The Dialog 'Fourier Tool' opens.

⇨ In the dialog click on **Load**.

✓ The file system opens to the directory ***%ProgramData%\Regatron\ACSControl\CurveData.***

⇨ Select the relevant Curve.

⇨ Click on **Open**.

✓ The Curve is shown in the dialog.

7.4 Editing a Block

7.4.1 Introduction

You can edit a Block in the related Menu ‘Block’.

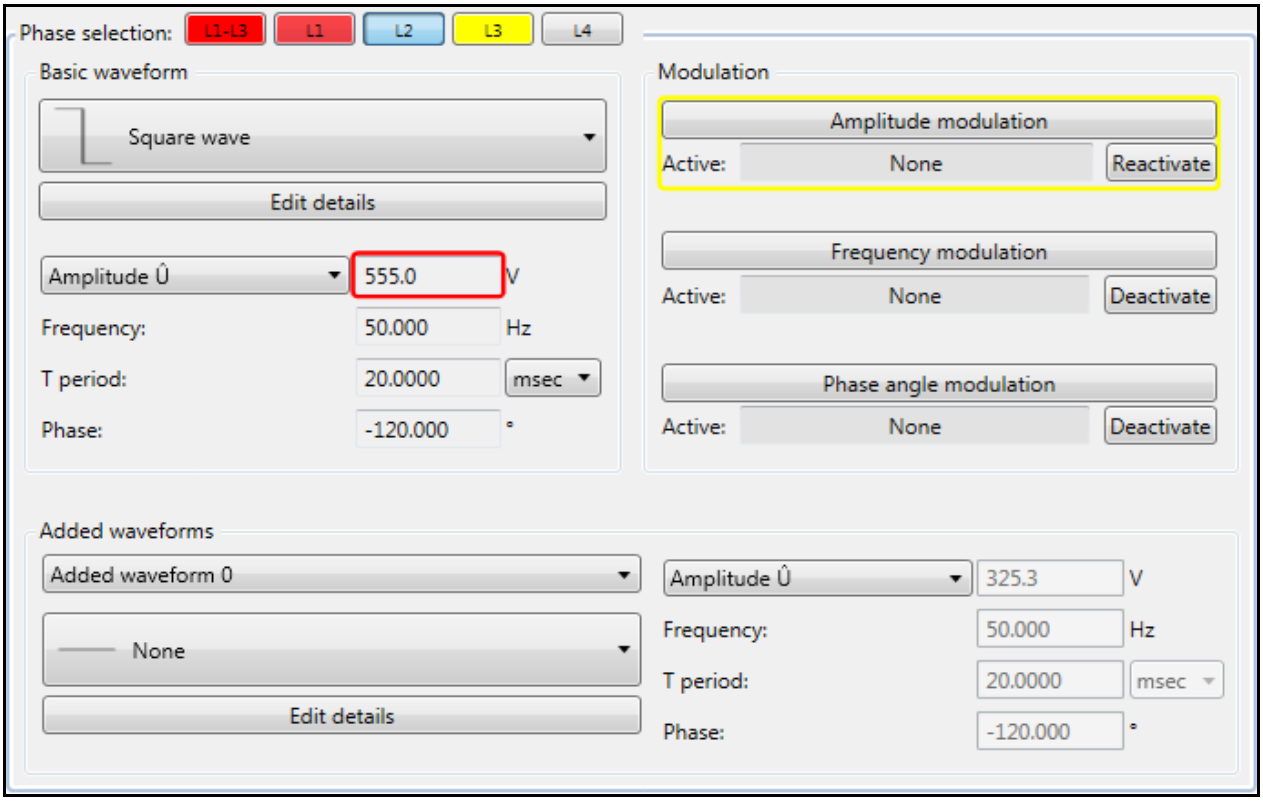
Here, you have the following possibilities:

- Editing the Curves of a Block (7.4.2)
- Specifying the Setup of a Block (7.4.3)

7.4.2 Editing the Curves of a Block

7.4.2.1 Introduction

You can individually edit the Curves for each phase of a Block in the Phase-specific Section of the related Tab ‘Block’:



Editing a Curve necessarily includes the following tasks:

- Selecting the Phase (7.4.2.2)
- Specifying the basic Waveform (7.4.2.3)

Furthermore you have the following possibilities:

- Specifying a Modulation (7.4.2.4)
- Specifying Added Waveforms (7.4.2.5)

7.4.2.2 Selecting the Phase

You can select the relevant phase in the Sub-section 'Phase selection':

To select the phase, do one of the following:

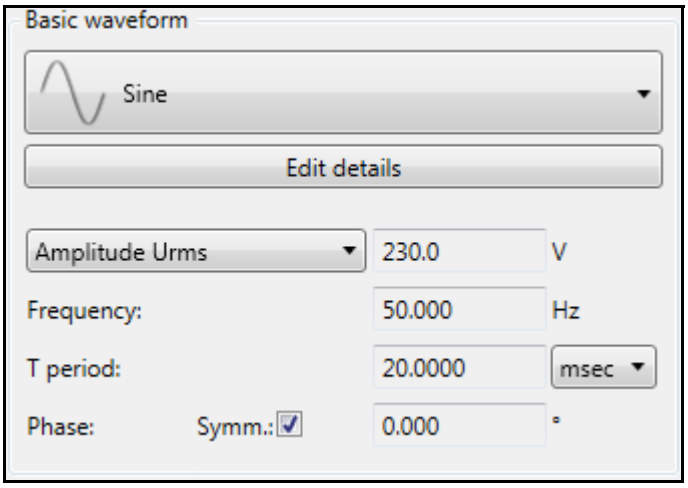
⇨ If you want to edit the Curves for the phases individually, select an individual phase.

⇨ If you want to edit the Curves for the phases L1-L3 all at once, select L1-L3.

*The **Sub-section 'Basic waveform'** will appear slightly different depending on whether or not in the **Sub-section 'Phase selection'** there is **L1-L3** selected.*

7.4.2.3 Specifying the basic Waveform

With respect to the phase(s) currently selected in the Sub-section 'Phase selection', you can specify the basic waveform in the Sub-section 'Basic waveform':



To specify the basic waveform, do the following:

⇨ Click anywhere on the selection field.

✓ The selection field expands and offers the available waveforms.

⇨ Select a waveform.

⇨ Specify values in the following fields (if applicable):

- Amplitude, i.e. the absolute value of the waveform (given as maximum value or RMS)
- Frequency, i.e. the number of occurrences of a complete waveform cycle per time unit
- T period, i.e. the period of time of a complete waveform cycle (given in time units)
- Phase, i.e. the position of a point in time (an instant) on a waveform cycle

*Clicking on **Edit details** opens a curve editor which also allows for specifying the parameters and provides a preview of the resulting waveform.*

If in the Sub-section 'Phase selection' L1-L3 is selected, do one of the following:

⇨ If you want L1-L3 to be in phase, do the following:

- Deactivate the check box **Symm**.
- In the field **Phase**, enter a value for the absolute phase shift of L1-L3.

⇨ If you want L1-L3 to be symmetrically arranged (phase shift 120°), do the following:

- Activate the check box **Symm**.
- In the field **Phase**, enter a value for the absolute phase shift of L1.

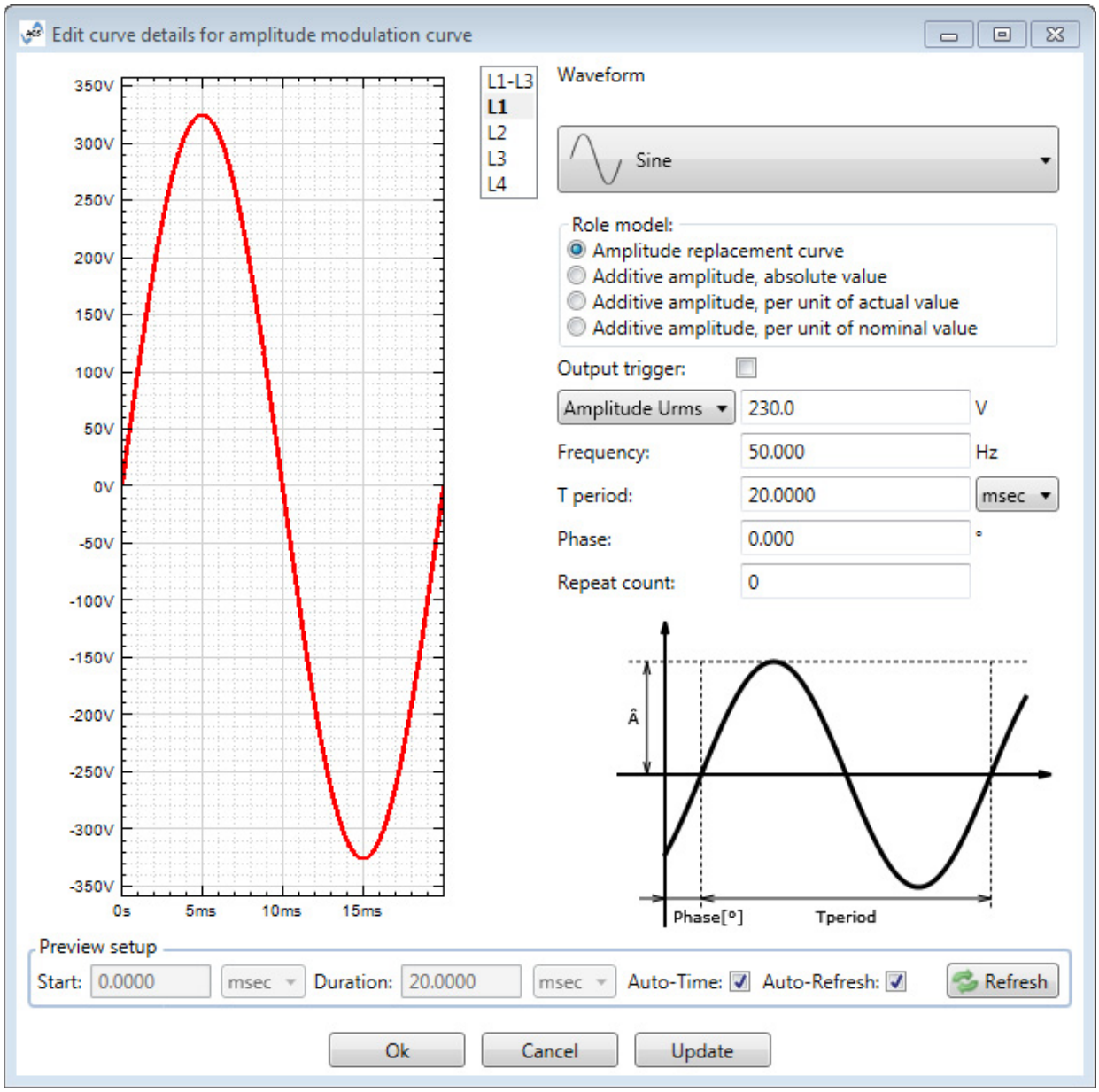
7.4.2.4 Specifying a Modulation

You can specify a Modulation of a Curve in the Sub-section ‘Modulation’ of the Phase-specific Section of the Tab ‘Block’.

To specify a Modulation of a Curve, do the following:

⇨ Select the kind of Modulation by clicking on the respective field.

✓ The dialog ‘Edit curve details for amplitude/frequency/phase modulation curve‘ is shown:



⇨ Specify the basic waveform of the modulation Curve (see 7.4.2.4).

*For the **Non-periodic Waveforms** ramp curve, step curve and exponential curve the following holds:*
*A duration time of 0 (zero) means that the modulation will end at the end of the ramp, step or exponential slope. However, the basic **Curve** will continue, i.e. there will still a signal be put out.*

⇨ In the section 'Role Model', select one of the following options about how the amplitude/ frequency/phase of the modulation Curve is taken into account:

- **Amplitude/Frequency/Phase replacement curve**

  the amplitude/frequency/phase of the modulation Curve replaces that of the basic Curve.

- **Additive amplitude/frequency/phase, absolute value**

  the amplitude/frequency/phase of the modulation Curve is added to that of the basic Curve.

- **Additive amplitude/frequency, per unit of actual value**

  the amplitude/frequency of the modulation Curve is added to that of the basic Curve and it is given as a multiple of that value

- **Additive amplitude/frequency, per unit of nominal value**

  the amplitude/frequency of the modulation Curve is added to that of the basic Curve and it is given as a multiple of the nominal value in the Section 'Block setup'.

⇨ If you want a trigger signal to be put out in the moment the Modulation starts, activate the check box **Output Trigger**.

*A **Modulation** on the basis of a **Non-periodic Waveform** only starts after a delay time.*

⇨ In the field **Repeat count**, specify how often the modulation Curve will be repeated.

⇨ If you want the Tab 'Preview' to be updated according to your specifications, click on **Update**.

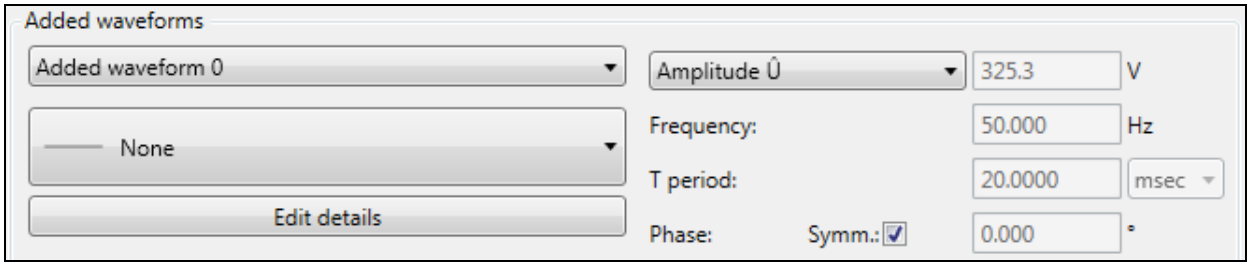
⇨ Click on **Ok**.

✓ The dialog closes.

⇨ If you want to deactivate/reactivate the modulation, click on the corresponding button.

7.4.2.5 Specifying Added Waveforms

You can specify one or two Added Waveforms for a Curve in the Sub-section 'Added waveforms':



To specify an Added Waveform, do the following:

⇨ Click anywhere on the selection field.

✓ The selection field expands and offers the available waveforms.

⇨ Select a waveform.

⇨ Click on **Edit details**.

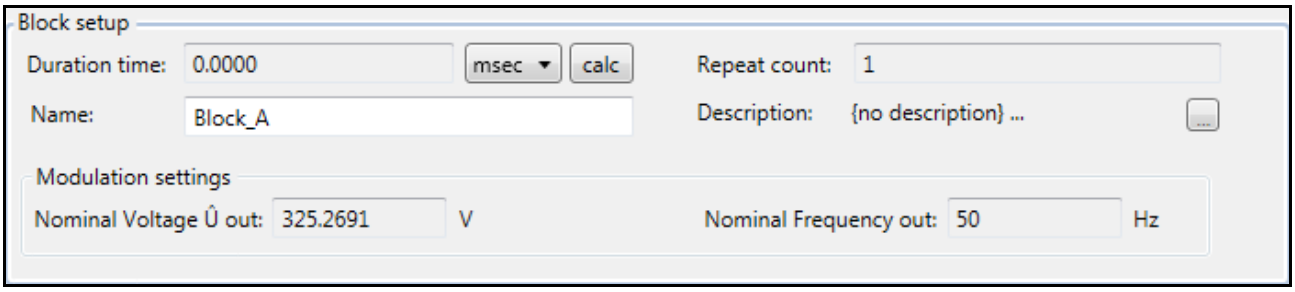
✓ A curve editor opens.

⇨ Specify the parameters in the corresponding entry fields (see 7.4.2.4).

For those parameters, which are not applicable for the selected waveform, entry fields are shown grayed and values cannot be edited.
*Clicking on **Edit details** opens the curve editor which also allows for specifying the parameters.*
*If your **Added Waveform** is a cut sine, you also need to specify a limit, i.e. a value where the sine curve is cut. You can do so in the curve editor.*

7.4.3 Specifying the Setup of a Block

You can specify the setup of a Block in the Section 'Block setup' of the Tab 'Block':



To specify the setup of a Block, do the following:

⇨ In the field **Duration time**, specify how long the Block lasts.

	A duration time of 0 (zero) means an infinite period of time. *When clicking on **calc**, the minimum duration time for the block is calculated and automatically entered.*

⇨ In the field **Repeat Count**, specify how often the Block will be repeated.

	A repeat count of 0 (zero) means an infinite number of repetitions.

⇨ In the field **Name**, give a name for the Block.

⇨ In the field **Description**, give a description for the Block.

⇨ In the field **Modulation settings**, specify the following values, if necessary:

- **Nominal Voltage Û out**, i.e. a reference value to be used in amplitude Modulation
- **Nominal Frequency out**, i.e. a reference value to be used in frequency Modulation

	*The values in the field **Modulation settings** are used only for **Specifying a Modulation**, if the option **Additive amplitude/frequency, per unit of nominal value** is used.*

7.5 Editing a Sequence

7.5.1 Introduction

You can edit a Sequence with the help of the Sequence Part of the Tool Bar:

Here, you have the following possibilities:

- Moving a Block within a Sequence (7.5.2)
- Adding a Block to a Sequence (7.5.3)
- Removing a Block from a Sequence (7.5.4)

7.5.2 Moving a Block within a Sequence

*You can right-click anywhere in the **Tab 'Sequence'** to have the functionalities of the **Sequence Part** of the **Tool Bar** provided in a context menu.*

You can move individual Blocks within a Sequence to change their chronological order.

Prerequisites: The Tab 'Sequence' is shown for the respective Sequence.

To move a Block do the following:

⇨ Select the Block in the Overview Section of the Tab 'Sequence'.

⇨ In the Sequence Part of the Tool Bar or in the context menu, click on one of the following buttons (depending on where you want to move the Block):

- Click on  to move a Block to the start of the Sequence.
- Click on  to move a Block to an earlier stage of the Sequence.
- Click on  to move a Block to a later stage of the Sequence.
- Click on  to move a Block to the end of the Sequence.

7.5.3 Adding a Block to a Sequence

You can add Blocks to a Sequence, one after another.

Each time you can either add a new Block or you can add a Block from the file system.

Prerequisites: The Tab 'Sequence' is shown for the respective Sequence.

To add a Block do the following:

⇨ If you want to add a new Block, do the following:

➢ In the Sequence Part of the Tool Bar or in the context menu, click on  .

⇨ If you want to add a Block from the file system, do the following:

➢ In the Sequence Part of the Tool Bar or in the context menu, click on  .

✓ The file system opens.

➢ Select a Block from the file system and click on **OK**.

✓ The Block is added in the Overview Section of the Tab 'Sequence'. The Section 'Block setup' lays focus on the new Block.

*A new **Block** is automatically given the following default values:*
- *Name: 'Item#'*
- *Description: '(no description)'*
- *Repeat count: '1'*

*These values can be changed either directly in the **Overview Section** or in the **Section 'Block setup'**.*

7.5.4 Removing a Block from a Sequence

You can remove Blocks from a Sequence, one after another.

Prerequisites: The Tab 'Sequence' is shown for the respective Sequence.

To remove a Block, do the following:

⇨ Select the Block in the Overview Section of the Tab 'Sequence'.

⇨ In the Sequence Part of the Tool Bar or in the context menu, click on  .

✓ The Block is deleted from the Overview Section of the Tab 'Sequence'.

7.6 Managing Blocks and Sequences

7.6.1 Introduction

You can manage Blocks and Sequences either via the Menu ‘Waveform Generator’ in the Menu Bar or via the Managing Part of the Tool Bar.

Here, you have the following possibilities:

- Creating a new Block or Sequence (7.6.2)
- Opening a saved Block or Sequence (7.6.3)
- Closing an open Block or Sequence (7.6.4)
- Saving a Block or Sequence (7.6.5)
- Saving all open Blocks and Sequences (7.6.6)
- Specifying the Preview Setup (7.6.7)

7.6.2 Creating a new Block or Sequence

To create a new Block or Sequence, do the following:

⇨ In the Menu ‘Waveform Generator’, select **New** / , or in the Tool Bar, click on / .

✓ The Tab ‘Block’ / Tab ‘Sequence’ is shown for the new Block / Sequence.

7.6.3 Opening a saved Block or Sequence

You can open a Block or Sequence, that has been saved to the file system.

To open a saved Block or Sequence, do the following:

⇨ In the Menu ‘Waveform Generator’, select **Open**, or in the Tool Bar, click on .

✓ The file system opens.

⇨ Select the relevant Block File / Sequence File.

⇨ Click on **OK**.

✓ The Tab ‘Block’ / Tab ‘Sequence’ opens showing the Block / Sequence.

7.6.4 Closing an open Block or Sequence

To close an open Block or Sequence, do the following:

⇨ In the Menu ‘Waveform Generator’, select **Close**, or in the Tab ‘Block’ / Tab ‘Sequence’, click on **X**.

✓ The Tab ‘Block’ / Tab ‘Sequence’ is closed.

7.6.5 Saving a Block or Sequence

You can save a Block or Sequence, that is currently shown, to the file system.

To save a Block or Sequence, do the following:

⇨ In the Menu 'Waveform Generator', select **Save**, or in the Tool Bar, click on .

- ✓ For a Block / Sequence that has already been saved, changes are saved to the same location with the same name.
- ✓ For a Block / Sequence, that has not yet been saved, the file system opens to the directory used last.

If you want to save a file, that has already been saved, to a new location/ with a new name, you need to select **Save as** *in the* ***Menu 'Waveform Generator'****.*

⇨ If so, do the following:

- ➢ Select a directory from the file system, if necessary.
- ➢ Give a name in the field **file name**, if necessary.
- ➢ Click on **OK**.
- ✓ The Block / Sequence is saved under the respective name in the respective directory.

7.6.6 Saving all open Blocks and Sequences

You can save all Blocks and Sequence currently opened, i.e. store them to the file system.

To save all open Blocks and Sequences, do the following:

⇨ In the Menu 'Waveform Generator', select **Save**, or in the Tool Bar, click on .

- ✓ For all Blocks / Sequences that have already been saved to the file system, changes are saved.
- ✓ For each Block / Sequence, that has not yet been saved, the file system opens to the directory used last.

⇨ If so, do the following with respect to each of them:

- ➢ Select a directory from the file system, if necessary.
- ➢ Give a name in the field **file name**, if necessary.
- ➢ Click on **OK**.
- ✓ The Blocks / Sequences are saved under the respective names in the respective directories.

7.6.7 Specifying the Preview Setup

You can edit the preview setup of a Block or a Sequence in the Tab ‘Preview’.

*The Auto-Refresh and the Auto-Time functionality can generally (i.e. for each newly created preview) be set in the dialog ‘Application Settings‘ (see **5.5.2**).*

To specify the preview setup, you can do the following:

⇨ To activate/deactivate auto-refresh, activate/deactivate the check box **Auto-Refresh**.

⇨ To activate/deactivate auto-time, activate/deactivate the check box **Auto-Time**.

⇨ To specify the start of the preview, do the following:

- ➢ Deactivate the check box **Auto-Time**, if necessary.
- ✓ The fields **Start** and **Duration** are activated.
- ➢ Select a time unit from the drop-down field.
- ➢ Fill in the field **Start**.
- ➢ Click on **Refresh**.
- ✓ The preview is adapted.

⇨ To specify the duration of the preview, do the following:

- ➢ Deactivate the check box **Auto-Time**, if necessary.
- ✓ The fields **Start** and **Duration** are activated.
- ➢ Select a time unit from the drop-down field.
- ➢ Fill in the field **Duration**.
- ➢ Click on **Refresh**.
- ✓ The preview is adapted.

7.7 Operating the TC.ACS Device

DANGER	***Electric shock!*** ***Avoidance:*** - *Device and load must be isolated against accidental contact.* - *No maintenance work must be carried out.* - *Warning signs must be used and the area must be cordoned off.*

7.7.1 Introduction

You can operate the TC.ACS device in Full Waveform Generator Mode via the Operating Part of the Tool Bar:

Here, you have the following possibilities:

- Running a Block or a Sequence (7.7.2)
- Stopping a Block or Sequence (7.7.3)
- Pausing a running Block or Sequence (7.7.4)
- Resuming a paused Block or Sequence (7.7.5)
- Jumping to the next Block in a Sequence (7.7.6)
- Showing a phase-specific Preview of a Block (7.7.7)
- Setting the Trigger Output (7.7.8)
- Discharging the TC.ACS Device (5.13)

*When one **Block** succeeds another, specific algorithms are used to avoid unnecessary discontinuities. Therefore there may be a little delay (maximally the period of time of a complete waveform cycle of the basic curve of phase L1) before a new **Block** starts.*

Prerequisites: The waveform generator mode is selected as operation mode.

*For **Selecting an Operation Mode** see **5.9.6**.*
For connecting a load to the TC.ACS device see the TC.ACS device manual.

7.7.2 Running a Block or a Sequence

You can run the Block or a Sequence, which is currently focused on, i.e. for which the Tab 'Block' / Tab 'Sequence' is fully shown. To run a Block or a Sequence, do the following:

⇨ In the Operating Part of the Tool Bar, click on ▶.

- ✓ On the front of the ACS device, the LED for **VOLTAGE** lights up.
- ✓ On the Status Bar, the device state goes to **SWITCHED ON**.
- ✓ The Block / Sequence is being run. The Tab 'Sequence Tracer' shows the progress.

7.7.3 Stopping a Block or Sequence

You can stop a running or paused Block or Sequence. To stop a Block or Sequence, do the following:

⇨ In the Operating Part of the Tool Bar, click on ■.

- ✓ On the front of the ACS device, the LED for **VOLTAGE** goes to blinking.
- ✓ On the Status Bar, the device state goes to **READY**.

⇨ Discharge the device, if necessary.

7.7.4 Pausing a running Block or Sequence

*When a a running **Block** or **Sequence** is paused, the output remains on with the actual amplitude and frequency, but any **Modulation** as well as the time counter of the block duration is halted.*

To pause a running Block or Sequence, do the following:

⇨ In the Operating Part of the Tool Bar, click on ▮▮.

- ✓ The Block / Sequence is paused. The Tab 'Sequence Tracer' shows the halt.

7.7.5 Resuming a paused Block or Sequence

To resume a paused Block or a Sequence, do the following:

⇨ In the Operating Part of the Tool Bar, click on ▮▶.

- ✓ The paused Block / Sequence is resumed. The Tab 'Sequence Tracer' shows the progress.

7.7.6 Jumping to the next Block in a Sequence

While a Block is running, you can jump right to the following Block within the same Sequence, i.e. stop the current Block and run the next one instead. To jump to the next Block in a Sequence, do the following:

⇨ In the Operating Part of the Tool Bar, click on  .

✓ The current Block is stopped and the next Block is being run. The Tab 'Sequence Tracer' shows the process.

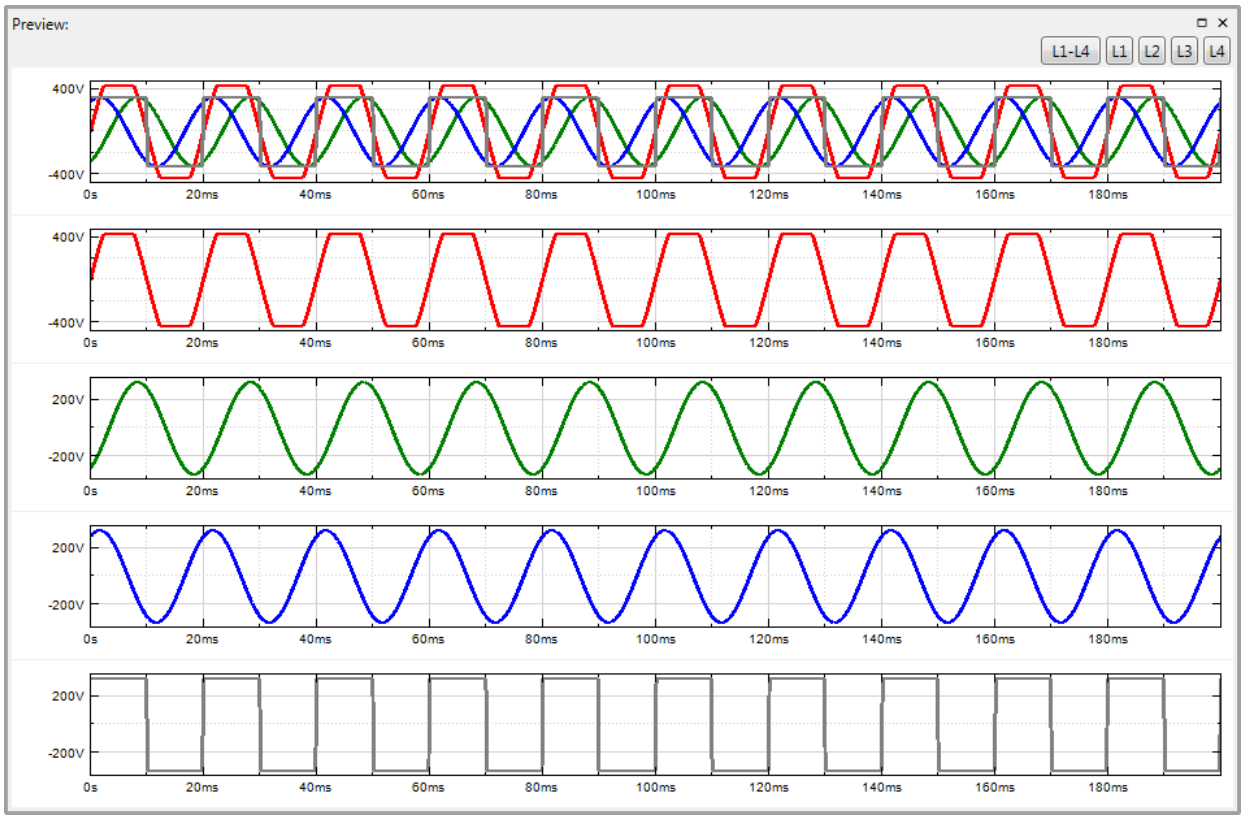
7.7.7 Showing a phase-specific Preview of a Block

Prerequisites: The Tab 'Block' is shown for the Block.

To show a phase-specific preview of a Block, do the following:

⇨ In the Operating Part of the Tool Bar, click on  .

✓ The Tab 'Preview' opens showing a phase-specific preview of the Block:



Here each of the four possible phases of a signal or the sum of these can be selected.

*The phase-specific preview cannot be refreshed. After changes of the **Block** it must be shown anew.*

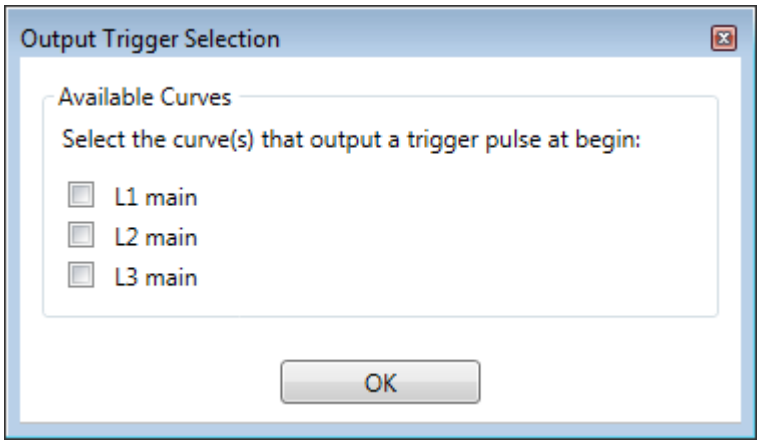
7.7.8 Setting the Trigger Output

A trigger signal can be put out with the actual start of a Curve, i.e. when a Block is run. Here the trigger does not necessarily exactly coincide with the start of the Curve or the Block. It rather depends on the basic waveform. If the basic waveform includes a delay (as some of the Non-periodic Waveforms do), the trigger signal will not be put out before the end of that delay.

To set the trigger output, do the following:

⇨ In the Operating Part of the Tool Bar, click on  .

✓ The dialog ‘Output Trigger Selection‘ appears:



⇨ Select the Curve(s)/phase(s), for which the trigger signal is to be put out.

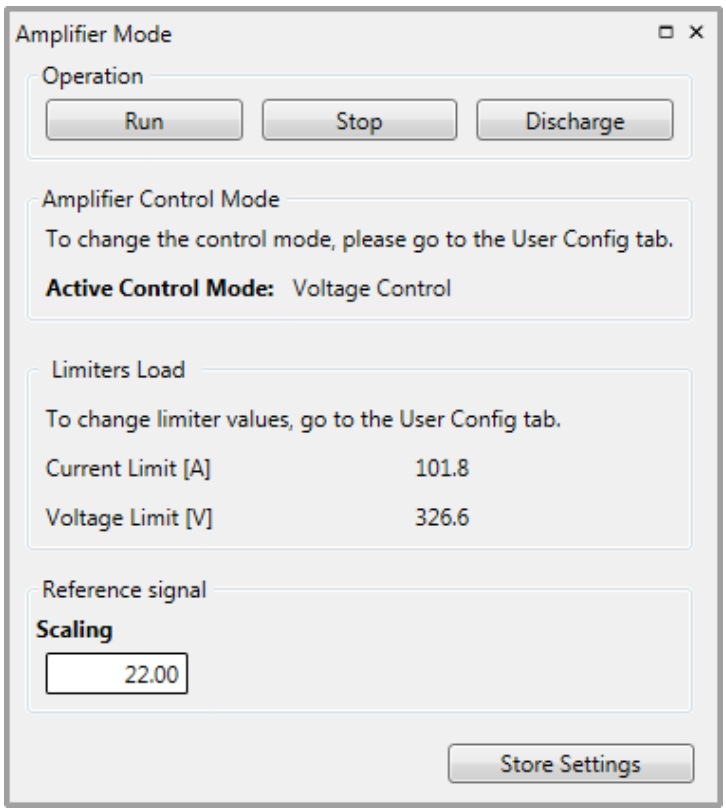
⇨ Click on **OK**.

8 Working with the TC.ACS Device in Amplifier Mode

8.1 Introduction

In the Amplifier Mode the TC.ACS device works as a triphase voltage or current amplifier. I.e. it receives external signals via its analog interfaces for each phase. These signals are amplified and then put out. Here any device, which creates electrical signals, can be used as an external signal generator.

You can work with the TC.ACS device in Amplifier Mode via the Tab 'Amplifier Mode':



Here, you have the following possibilities:

- Setting a Scaling Factor for the Reference Signal (8.2)
- Starting the Operation in Amplifier Mode (8.3)
- Stopping the Operation in Amplifier Mode (8.4)
- Discharging the TC.ACS Device (5.13)

Prerequisites: The Amplifier Mode is selected as operation mode. A load is connected to the TC.ACS device.

*For **Selecting an Operation Mode** see **5.9.6**.*
For connecting a load to the TC.ACS device see the TC.ACS device manual.

8.2 Setting a Scaling Factor for the Reference Signal

To set a scaling factor for the reference signal, do the following:

⇨ In the Section 'Reference Signal', set a factor. As it is a multiplication factor, the following values/value ranges have the following meaning:

- = 1: signal is unaltered
- > 1: signal is amplified
- < 1: signal is diminished

	*For more information on the scaling factor see **3.4.6.4**.*

8.3 Starting the Operation in Amplifier Mode

 **DANGER**	***Electric shock!*** ***Avoidance:*** - *Device and load must be isolated against accidental contact.* - *No maintenance work must be carried out.* - *Warning signs must be used and the area must be cordoned off.*

To start the operation in Amplifier Mode, do the following:

⇨ In the Section 'Operation', click on **Run**.

✓ On the front of the ACS device, the LED for VOLTAGE lights up.

✓ On the Status Bar, the device state goes to SWITCHED ON.

8.4 Stopping the Operation in Amplifier Mode

To stop the operation in Amplifier Mode, do the following:

⇨ In the Section 'Operation', click on **Stop**.

✓ On the front of the TC.ACS device, the LED for VOLTAGE goes to blinking.

✓ On the Status Bar, the device state goes to READY.

⇨ Discharge the device, if necessary.

	*For **Discharging the TC.ACS Device** see **5.13**.*

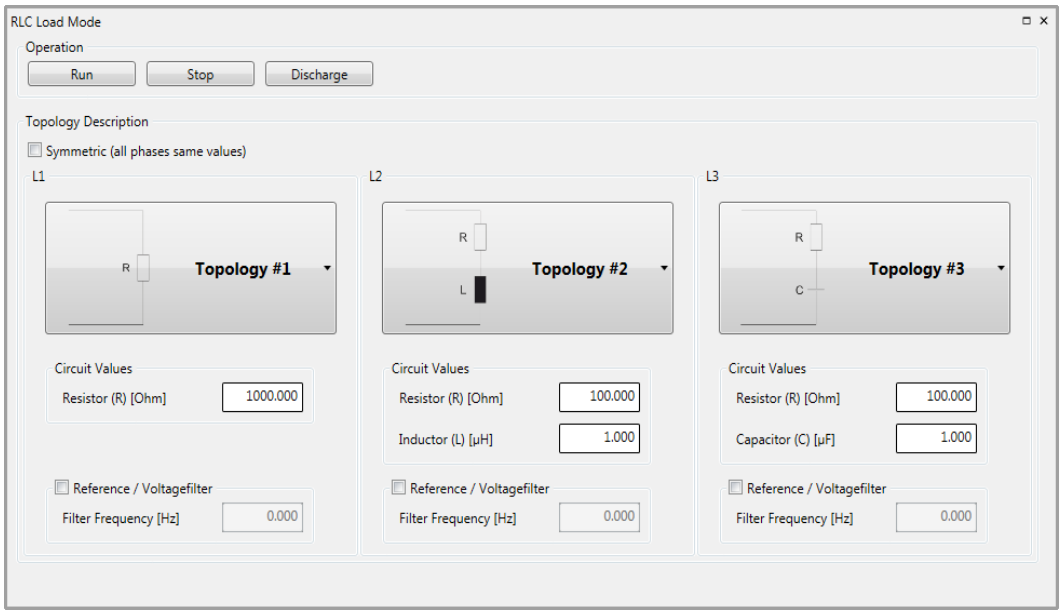
9 Working with the TC.ACS Device in Load Simulation Mode

9.1 Introduction

In the Load Simulation Mode the TC.ACS device simulates loads and their properties within specified RLC-circuit topologies.

*The Load Simulation Mode is an optional feature. It needs to be enabled via key code and an external hardware filter may be needed for specific load source combinations. Contact **Support**, if necessary.*

You can work with the TC.ACS device in Load Simulation Mode via the Tab 'RLC Load Mode':



Here, you have the following possibilities:

- Configuring an RLC-Circuit (9.2)
- Starting the operation in Load Simulation Mode (9.3)
- Stopping the operation in Load Simulation Mode (9.4)
- Discharging the TC.ACS Device (5.13)

Prerequisites: The Load Simulation Mode (see 2.1) is selected as operation mode. The TC.ACS device is connected to the mains on the mains side and to a DUT (device under test) on the load side.

*For **Selecting an Operation Mode** see **5.9.6**.*
For connecting the TC.ACS device see the TC.ACS device manual.

9.2 Configuring an RLC-Circuit

You can configure an RLC-Circuit for a specific phase in the relevant part of the Section 'Topology Description'. Here you have the following possibilities:

- Setting a Filter Frequency (9.2.3) (•)
- Setting Circuit Values (9.2.2)
- Setting a Filter Frequency (9.2.3)

Danger	*The RLC-Circuit must not be changed in operation. The TC.ACS device must be switched off.*

	*If the check box **Symmetric (all phases same values)** is activated, then the topology and values given for phase L1 are automatically taken for phases L2 and L 3 as well.*

9.2.1 Selecting a Circuit Topology

Prerequisites: The TC.ACS device is switched off.

To select a topology for an RLC-circuit, do the following:

⇨ In the Section 'Topology Description', select a topology.

✓ In the Subsection 'Circuit Values', the corresponding parameters are given.

9.2.2 Setting Circuit Values

Prerequisites: The TC.ACS device is switched off.

To set values for an RLC-Circuit, do the following:

⇨ In the Subsection 'Circuit Values' of the Section 'Topology Description', set values for the following parameters (depending on the selected topology):

- **Resistor (R1) [Ohm]**: Resistance of R_1 (value range: 0.001 … 100000.000)
- **Inductor (L1) [µH]**: Inductance of L_1 (value range: 0.001 … 100000.000)
- **Capacitor (C1) [µF]**: Capacity of C_1 (value range: 0.001 … 100000.000)

9.2.3 Setting a Filter Frequency

Prerequisites: The TC.ACS device is switched off.

To set a filter frequency for an RLC-Circuit, do the following:

⇨ In the Section 'Reference Signal', set

9.3 Starting the operation in Load Simulation Mode

 **DANGER**	***Electric shock!*** ***Avoidance:*** - *Device and load must be isolated against accidental contact.* - *No maintenance work must be carried out.* - *Warning signs must be used and the area must be cordoned off.*

To start the operation in Load Simulation Mode, do the following:

⇨ In the Section 'Operation', click on **Run**.

✓ On the front of the TC.ACS device, the LED for CURRENT lights up.

✓ On the Status Bar, the device state goes to SWITCHED ON.

9.4 Stopping the operation in Load Simulation Mode

To stop the operation in Load Simulation Mode, do the following:

⇨ In the Section 'Operation', click on **Stop**.

✓ On the front of the ACS device, the LED for CURRENT goes to blinking.

✓ On the Status Bar, the device state goes to READY.

⇨ Discharge the device, if necessary.

	*For **Discharging the TC.ACS Device** see **5.13**.*

10 Support

10.1 Introduction

Regatron Customer Support assists you in case of questions on hardware, software, interfaces and maintenance as well as in the event of a repair.

This section answers the following questions:

- How can you contact Regatron Customer Support? (10.2)
- What does Regatron Customer Support need to know? (10.3)

10.2 How can you contact Regatron Customer Support?

The Regatron Customer Support address is the following:

Regatron AG
Technical Customer Support
Feldmuehlestrasse 50
CH-9400 Rorschach
SWITZERLAND

E-mail: tc.support@regatron.ch

Phone: +41 (0)71 846 67 44

Web: www.regatron.com

10.3 What does Regatron Customer Support need to know?

To help you in a most efficient way, Regatron Customer Support needs the following information:

- Contact Information (10.3.1)
- Device Information (10.3.2)
- Problem Description (10.3.3)

*You can send **Contact Information** and **Device Information** in advance. This way Regatron Customer Support will have it available in the support case.*

10.3.1 Contact Information

Contact information is the following:

- Name of your company
- Name of a contact person, i.e. the person with whom further contact will be made
- E-mail address, telephone number (extension) of the contact person
- Support number, e.g. S12345678 (if you have already received one for your problem from Regatron Customer Support)

10.3.2 Device Information

The most important device information is the following:

- Device Type, input and output data
- Serial number
- Version(s) of software(s)
- Installed hardware and software options

Device Type, input and output data as well as the serial number are given on the type plate attached to the device on its rear side.

*The most convenient way to send complete device information is to send a **support info file** (see section **10.3.2.1**).*

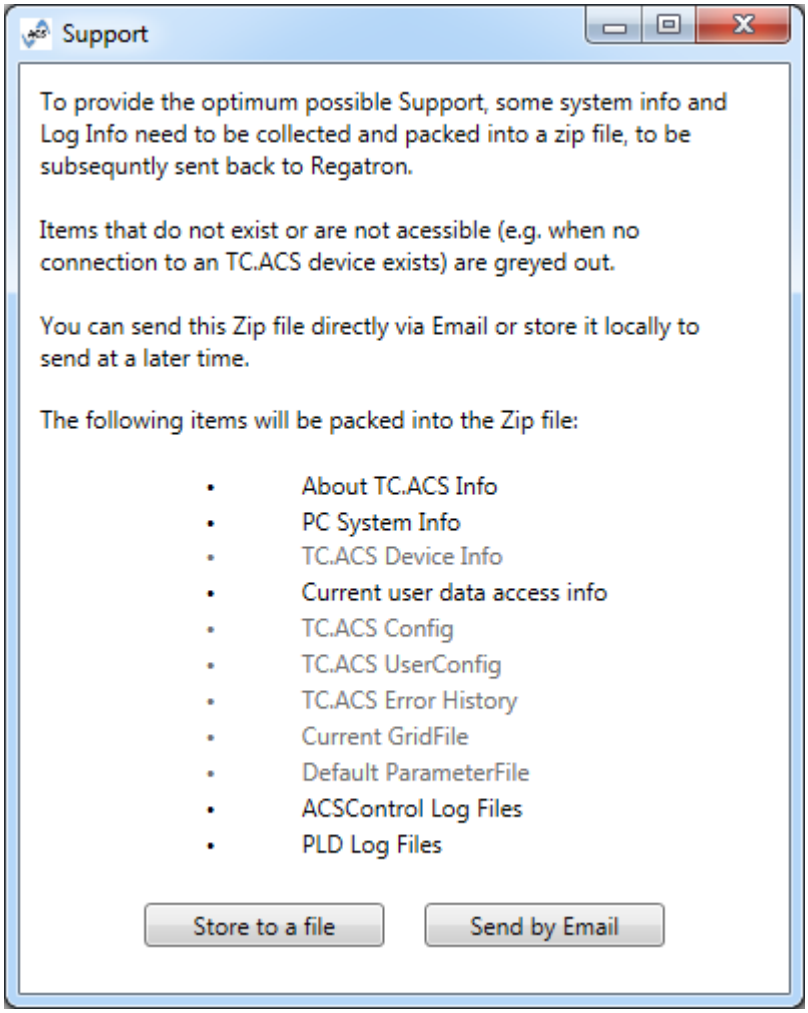
10.3.2.1 Sending a Support Info File

If necessary, you can create a support info file, i.e. a file that provides complete device information.

To create a support file, do the following:

⇨ In the Menu Bar, click on **Info > Support**.

✓ The dialog **Support** appears:



⇨ If you want to send the support info file to the Regatron Customer Support, click on **Send by Email**.

⇨ If you want to store the support info file to your file system, click on **Store to a file**.

10.3.3 Problem Description

A problem description should document the actual technical problem using measured results, logs, photographs, screen shots or a scope analysis (software ACSControl), etc..

In specific, answers to the following questions would be of help:

- How exactly is the TopCon device applied?
- What kind of load is connected?
- What is the operating point of the application (voltage, current, power)?
- What are the operating conditions (laboratory, ambient temperature, pollution, etc.)?
- How does the problem show? When did it first occur?
- Does the problem occur permanently or does it occur sporadically?