calmet

Calpro 300

PC SOFTWARE
FOR C300 CALIBRATOR CONTROL
(basic version – C300 Calibrator control)
Calpro 300 Basic

USER'S MANUAL

CONTENTS

1. PC SOFT APPLICATION

PC Soft *Calpro 300* is dedicated for control of three phase power Calibrator and Tester type C 300.

PC Soft *Calpro 300 Basic* (basic version of *Calpro 300* software) enables:

- setting the voltage U, current I, phase shift φ, phase between voltages (for asymmetric circuit), frequency f, active power P, reactive power Q and apparent power S in symmetric and asymmetric circuit of connection,
- setting the wave shape of voltage and current with following functions:
  - o harmonics – setting the magnitude and phase of harmonics,
  - o interharmonics – setting the frequency, magnitude and phase of interharmonics,
  - o shape – selecting the wave shape of voltage and current,
- configuring of pulse output,
- control of calibrator's outputs ON or OFF (operate / standby function),
- control of vector rotation direction and connection configuration.

PC Soft *Calpro 300 TS* (Test System), compared to the *Calpro 300 Basic*, in addition enables automatic tests of electricity meters, protective relays, current transducers, current clamps and measurement transducers. *Calpro 300 TS* aids analog and digital meters testing – customer data base, devices, testing procedures and results data base, result table, diagram and report generation.

PC Soft *Calpro 300 PQ* (Power Quality), compared to *Calpro 300 Basic*, in addition enables programming of Power Quality parameters.

2. HARDWARE REQUIREMENTS AND INSTALLATION

Minimum requirements for proper PC Soft operation are: PC Pentium III 500 MHz, with memory RAM 128MB and graphic card resolution 1024x600. For PC Soft installation is required 10MB of free space on the Hard Disc (+ space for stored results, procedures etc.). Operation system MS Windows 2000/XP/Vista/7/8 type 32/64-bit. Calibrator is connected to the PC by the interface RS232C or USB interface with converter USB ↔ RS232C.

Installation version of *Calpro 300* PC Soft is placed on the CDROM. In order to install PC Soft, the CDROM should be placed into the CD drawer and installation software *Calpro 300 Setup.exe* should be started. Installation software will copy all needed files and create group and short cut to the *Calpro 300* in Windows Start Menu.

3. PC SOFT START UP

To start PC Soft one should choose the shortcut to the *Calpro 300* PC Soft in Windows Start Menu and press left mouse button. On the computer screen will appear start window (Fig.3.1) which contains the fields as follow:

1   tools bar of software with menu:

       File (for files opening and saving),

       View (for opening and closing status and tools bar),

       Options (for setting language, communication and configuring of *pulse output*),

       Help (information about software),

2   function field,

3   calibrator status field,

4   operation field,

5   communication status bar with information.

       Calpro300 v.1.0.20.1 − version of the Calpro300 software,

       S/N: 21144 − serial number of the connected C300 calibrator,

       Connected: COM6 − COM port number of the connected C300 calibrator,

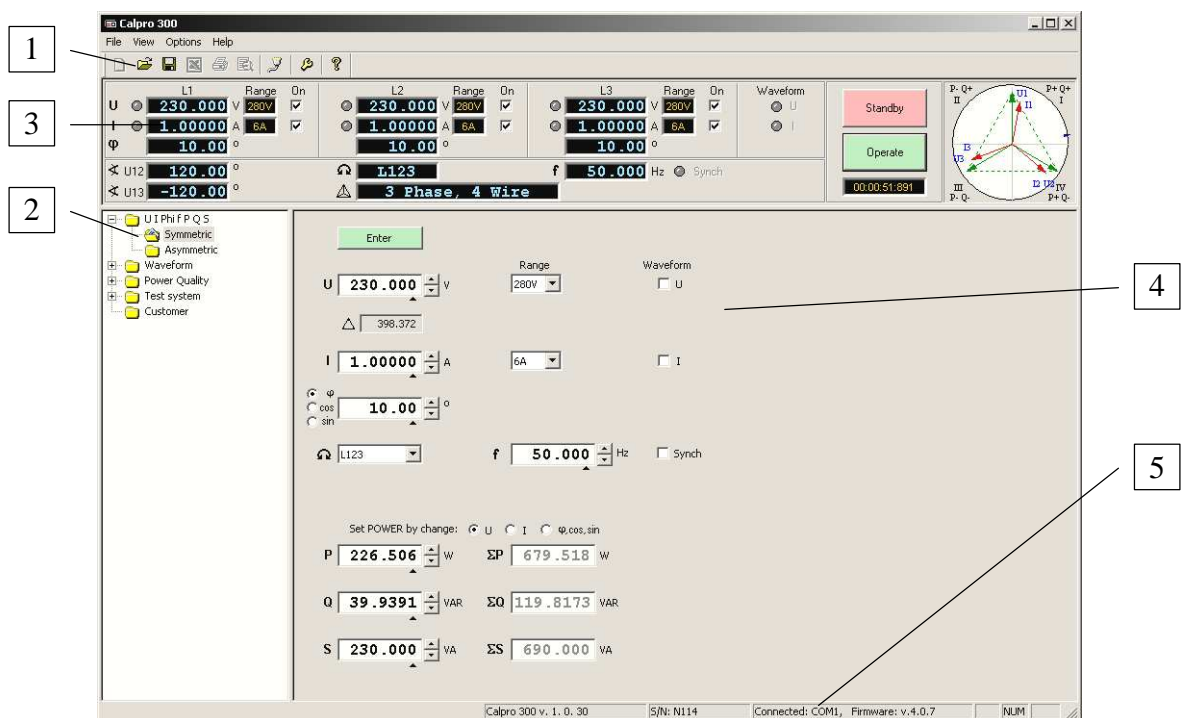   Firmware v.2.5.6.3 − Firmware version of the connected C300 calibrator.

Fig.3.1. Start window of *Calpro 300* PC Soft

3.1. LANGUAGE SETTING

PC Soft *Calpro 300* can work in many languages. Pressing the button *Options→Languages* in start window tools bar (pos.1 Fig.3.1) will open the next window *Languages* (Fig.3.2) for language selection. Number of available languages depends on the software version. After language selection one need to confirm it by pressing the button *OK*.
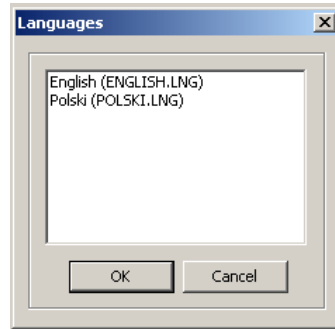

Fig.3.2. *Languages* window

3.2. COMMUNICATION WITH CALIBRATOR SET UP

To set up communication between computer and calibrator one should press button *Options→Communication* (or press button 🖉) of the start window tools bar (Fig.3.1). It will appear window *Communication* (Fig.3.3).
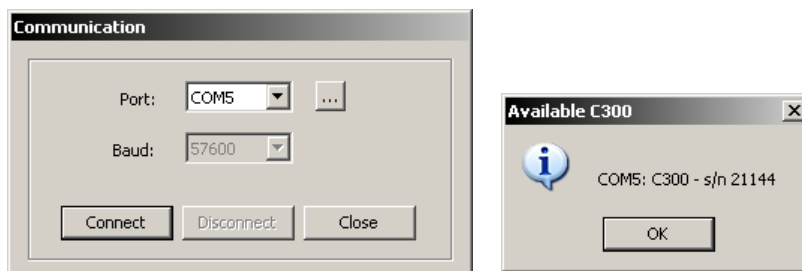

Fig.3.3. *Communication* window and *Available C300* window

All transmission parameters of calibrator are set as a constant. The only one parameter which can be changed is the number of serial port of computer. In order to change the port number one need to select it from the list by pressing the button with the down arrow. If the case, where is not known the number of COM port, the user should press the ... button to start searching of C300 calibrators connected to the PC computer (searching can takes a few minutes). After that the *Available C300* window will appear with a list of the C300 calibrators connected to the PC computer.

After pressing the button *Connect* the changes will be accepted and computer will try to connect with Calibrator. If everything is correct there is displayed message: *Connected*.

3.3. SETTING IMPULSE OUTPUT PARAMETERS AND SOUND SIGNALS

To set up parameters of the impulse output *S0* one should press button *Options→Preferences* of the start window tools bar (Fig.3.1). It will appear window *Communication* (Fig.3.4).

1   field *Output constant C* for edition output constant *C* of pulse output,

2   field *pulse/kWh* for selecting unit of constant *C*: *pulse/kWh*, *pulse/Wh* or *Wh/pulse*,

3   field *Unit* for selecting the power of a calibrator's pulse output: active power *P*, reactive power *Q* or apparent power *S*,

4   field *Sound* enabling sounds signals in automatic procedures in functions: *Power quality* and *Test system*,

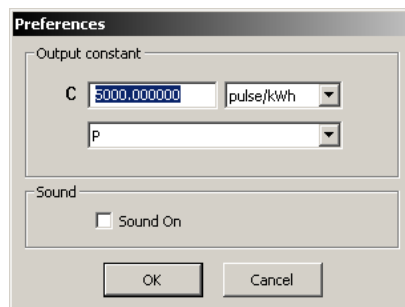5   buttons: *OK* for accepting and *Cancel* for cancelling changes.

Fig.3.4. *Preferences* window

Once configured pulse output will be saved in the program *Calpro 300*. To turn off the pulse output set value 0 in the *Output constant C* field (Fig.3.4 pos.1).

3.4. FUNCTIONS

Function field of start window (Fig.3.1 pos.2) enables to choose function as follow (Fig.3.5):

▪ function *U I Phi f P Q S* for setting the value of voltage U, current I, phase shift φ (*Phi*), frequency f, active power P, reactive power Q and apparent power S in symmetric circuit (*Symmetric*) and phase shift between voltages in asymmetric circuit (*Asymmetric*),

▪ function *Waveform* for setting the wave shape of voltage and current with functions:

    o   *Harmonics* for setting the magnitude and phase of harmonics

    o   *Interharmonics* for setting the frequency, magnitude and phase of interharmonics,

    o   *Shape* for selecting the wave shape of voltage and current,

▪ function *Power Quality* for setting up the parameters of Power Quality – function available in software version *Calpro 300 PQ* (Power Quality),

▪ function *Test system* for automatic testing of electricity meters, protective relays, current transducers, current clamps and measurement transducers. It aids analog and digital meters testing – function available in software version *Calpro 300 TS* (Test System),

▪ function Customer for preparing Data Base of customers - function available in software version *Calpro 300 TS* (Test System).
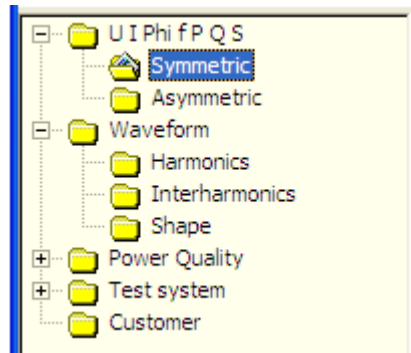
Fig. 3.5. Function field

3.5. STATUS FIELD OF CALIBRATOR

Status field of Calibrator (pos.3 Fig.3.1) presents the actual state of calibrator's outputs (Fig.3.6) and contains fields as follow:

1   field *U* - value of output voltage and field *Range* of selected ranges of channel *L1*, *L2* and *L3*,

2   field *I* – value of output current and field *Range* of selected ranges of channel *L1*, *L2* and *L3*,

3   lamps *U* and *I* – signalization of voltage and current output state. State *Operate* – grey lamp, state *Standby* – red lamp,

4   switch *On* – selective turn ON/OFF of current and voltage output. State ☑ of field means switch ON of the output. State ON of the output can be changed by *Operate* or *Standby* by means of software buttons *Operate / Standby*. State with empty field means switch OFF of the output – the output is in state *Standby,*

5   field *φ* - value of phase shift in channels *L1*, *L2*, *L3*,

6   fields u₁₂ and u₁₃ – phase shift between voltages U1-U2 and U1-U3,

7   fields 🎧 and △ – direction of vector rotation and type of connection,

8   field *f* – value of output signals frequency,

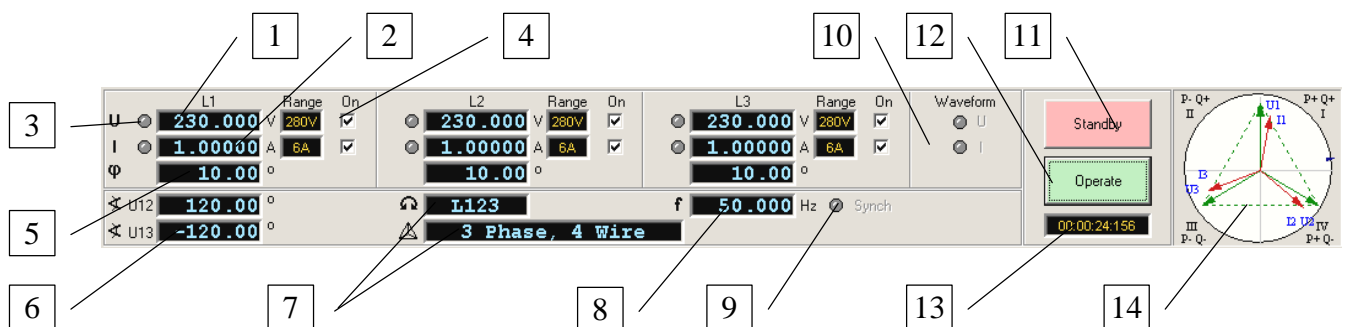9   lamp *Synch* – signalization of synchronism with power net frequency,

Fig.3.6. Status field of calibrator

10 lamps *Waveform U I* – signalization switching on of waveform in output voltage or current,

11 software button *Standby* – switches the calibrator output to the *Standby* state,

12 software button *Operate* – switches the calibrator output to the *Operate* state. To the *Operate* state are switched only outputs, for which field *On* is marked ☑ and they are not switched OFF by means of switches *STB* on the front plate of calibrator,

13 time counter field of *Operate* state. Counter is controlled by the *Operate* (pos.12) and *Standby* (pos.11) buttons,

14 vector diagram of voltage and current in *Operate* state. Mouse clicking on the graph opens zoomed vector diagram (Fig.3.6).

   Vector diagram of voltage, current and power (Fig.3.7) presents actual state of calibrator's outputs and contains components as follow:

1   vectors *U1*, *U2* and *U3* of voltages in *Operate* state,

2   vectors *I1*, *I2* and *I3* of currents in the *Operate* state,

3   resultant power vector indicator,

4   voltage vector scale,

5   current vector scale,
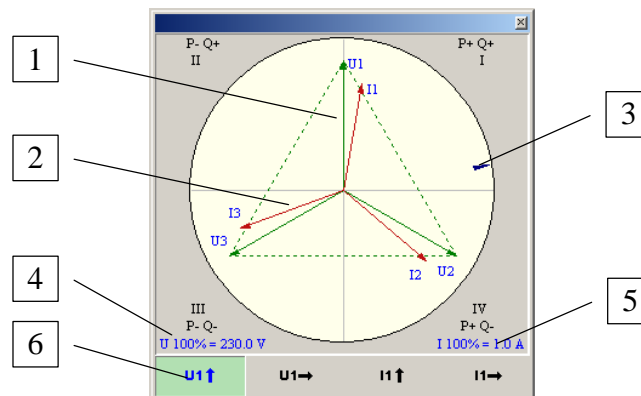
6   buttons for orientation change.

Fig.3.7. Vector diagram of currents and voltages

3.6. OPEARATION FIELD

   Operation field of the start window (pos.4 Fig.3.1), depends on the selected function (pos.2 Fig.3.1) enables:

▪ setting the value of voltage U, current I, phase shift φ, frequency f, active power P, reactive power Q and apparent power S (function *U I Phi f P Q S Symmetric*),

▪ setting the value of voltage U, current I, phase shift φ, phase shift between voltages, frequency f, active power P, reactive power Q and apparent power S (function *U I Phi f P Q S Asymmetric*),

▪ setting the wave shape of voltage and current (function *Harmonics, Interharmonics, Shape*),

▪ setting the parameters of Power Quality (function *Power Quality*) available in version *Calpro 300 PQ*,

▪ entering data to the Data Base of devices and measurement procedures, realization of automatic tests, visualization of results, storage of results (function *Test system*). Entering data to the Customer Data Base (function *Customer*) available in version *Calpro 300 TS*.

4. PROGRAMMING SETTINGS OF U+I+φ+f+P+Q+S

Function field of start window (Fig.3.1 pos.2) enables selection of functions:

- *U I Phi f P Q S / Symmetric* (Fig.3.5) for setting the values of three phase vector in symmetric circuit,

- *U I Phi f P Q S / Asymmetric* (Fig.3.5) for setting the values of three phase vector in asymmetric circuit.

4.1. SYMMETRIC SOURCE

Operation field of function *U I Phi f P Q S / Symmetric* (Fig.4.1) enables setting the values of three phase vector in symmetric circuit and has fields as follow:

1 field *U* - setting the value of output voltage and field *Range*. Setting the range to *Auto* automatically set the optimal range for voltage setting,

2 field *I* – setting the value of output current and field *Range*. Setting the range to *Auto* automatically set the optimal range for current setting,

3 field *φ / sin / cos* – setting the value of phase shift or value of power factor cosφ (sinφ) with sign selection *L / C*,

4 field *f* – setting the value of voltage and current frequency with the field *Synch* – selection of synchronisation with power net frequency,

Fig.4.1. Operation field of function *U I Phi f P Q S / Symmetric*

5   fields *P*, *Q*, *S* – setting the value of single phase active, reactive or apparent power and sum of them *ΣP*, *ΣQ*, *ΣS*,

6   field *Set POWER by change U / I / φ / sin / cos* – selecting the quantity which will be changed during the power *P*, *Q*, *S* setting change,

7   field 🎧 - selection of vector rotation direction for phases *L123* and *L132*,

8   field informing about phase−to−phase voltages,

9   fields *Waveform U I* – switching ON/OFF waveform in output voltage and current,

10   indicator ♠ - selection of decimal position under the setting value for change the value by means of arrow buttons ▲ / ▼ ,

11   button *Enter* – entering set values to the output of calibrator.

4.2. ASYMMETRIC SOURCE

Operation field of function *U I Phi f P Q S / Asymmetric* (Fig.4.2) enables setting the values of three phase vector in symmetric circuit and has fields as follow:

1   field *U* - setting the value of output voltage and field *Range*. Setting the range to *Auto* automatically set the optimal ranges for voltage settings. Marked field ☑ *All* enables to set the same values for three channels *L1*, *L2*, *L3*,

2   field *I* – setting the value of output current and field *Range*. Setting the range to *Auto* automatically set the optimal ranges for current settings. Marked field ☑ *All* enables to set the same values for three channels *L1*, *L2*, *L3*,
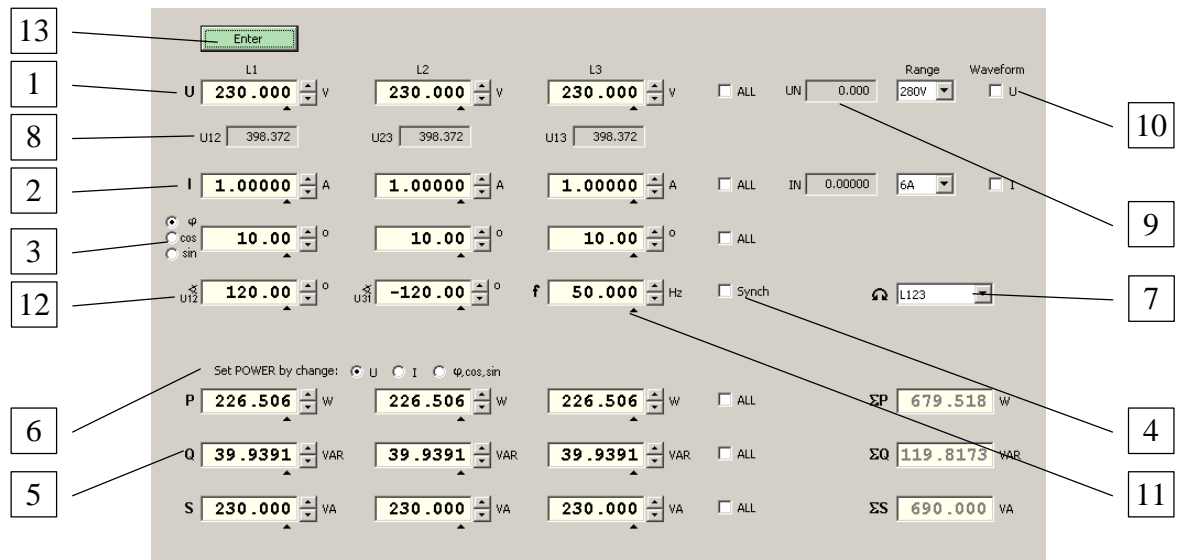

Fig.4.2. Operation field of function *U I Phi f P Q S / Asymmetric*

3   field *φ / sin / cos* – setting the value of phase shift or value of power factor cosφ (sinφ) with sign selection *L / C*. Marked field ☑ *All* enables to set the same values of phase shift or power factor for three channels *L1*, *L2*, *L3*,

4   field *f* – setting the value of voltage and current frequency with the field *Synch* – selection of synchronisation with power net frequency,

5   fields *P*, *Q*, *S* – setting the value of single phase active, reactive or apparent power and sum of them   *ΣP*, *ΣQ*, *ΣS*. Marked field ☑ *All* enables to set the same values of power for three channels *L1*, *L2*, *L3*,

6   field *Set POWER by change U / I / φ / sin / cos* – selecting the quantity which will be changed during the power *P*, *Q*, *S* setting change,

7   field ⟲ - selection of vector rotation direction for phases *L123* or *L132*,

8   field informing about values of phase−to−phase voltages,

9   field informing about values of neutral voltage and current,

10   fields *Waveform U I* – switching ON/OFF waveform in output voltage and current,

11   indicator ▲ - selection of decimal position under the setting value for change of value by means of arrow buttons ▲ / ▼ ,

12   fields U_{12} and U_{13} - setting of phase shift between voltage U1-U2 and U1-U3,

13   button *Enter* – entering set values to the output of calibrator.

5. WAVEFORM PROGRAMMING

Start window field of function (pos.2 Fig.3.1) enables selection of function *Waveform* for setting the wave shape of voltage and current (Fig.3.5) with following functions:

- *Harmonics* – for setting the magnitude and phase shift of harmonics,
- *Interharmonics* – for setting the frequency, magnitude and phase of interharmonics,
- *Shape* – for selecting the wave shape of voltage and current.

5.1. HARMONICS PROGRAMMING

Harmonics function (Fig.3.5) enables setting the magnitude and phase of harmonics (in range specified in *C300 user manual*, table 2.1). Operation field of function *Harmonics* can work in *Oscilloscope* mode (Fig.5.1) or in *Harmonics* mode (Fig.5.2) and contains fields as follow:

1 button tabs *U1*, *U2*, *U3*, *I1*, *I2*, *I3* for selecting channel to set harmonics,

2 column *No* – number of harmonic with scroll bar,

3 column *Amplitude [%]* – setting the magnitude of harmonic in percent of first harmonic magnitude,

4 column *Phase [°]* – setting the phase shift of harmonic in degrees with reference to the first harmonic,

5 field for selecting channels in which harmonics will be programmed:
   - *U1 for all outputs* – setting the same magnitude and harmonic phase shift in all channels like in channel U1,
   - *U1 for U, I1 for I* – setting the same magnitude and harmonic phase shift in all voltage channels like U1 and setting the same magnitude and harmonic phase shift in all current channels like I1,
   - *Individual* – individual setting the magnitude and harmonic phase shift in each channel,

6 field of waveform shape visualisation for one signal period (selected mode *Oscilloscope* Fig.5.1) or bar graph diagram of harmonics (selected mode *Harmonics* Fig.5.2). Shape is presented in two colours:
   - blue – presented shape is programmed in the C300 calibrator,
   - green – presented shape is not programmed in the C300 calibrator,

7 buttons *Oscilloscope* and *Harmonics* – selecting mode of visualization pos.6,

8 coefficients field of programmed shape of signal:
   - *CF* –crest factor,
   - *SF* – shape factor,
   - *THD* – total harmonic distortion,
   - *TDF* – total distortion factor,

9 button *Clear* – for erasing set values of harmonics,

10 field *Copy from* – tool for copying set data from one channel to another,

11 field *Improved quality* to adjust a quality of the harmonics data,

12 button *Load* and progress bar *0% - 100%* - uploading data of harmonics to the calibrator.
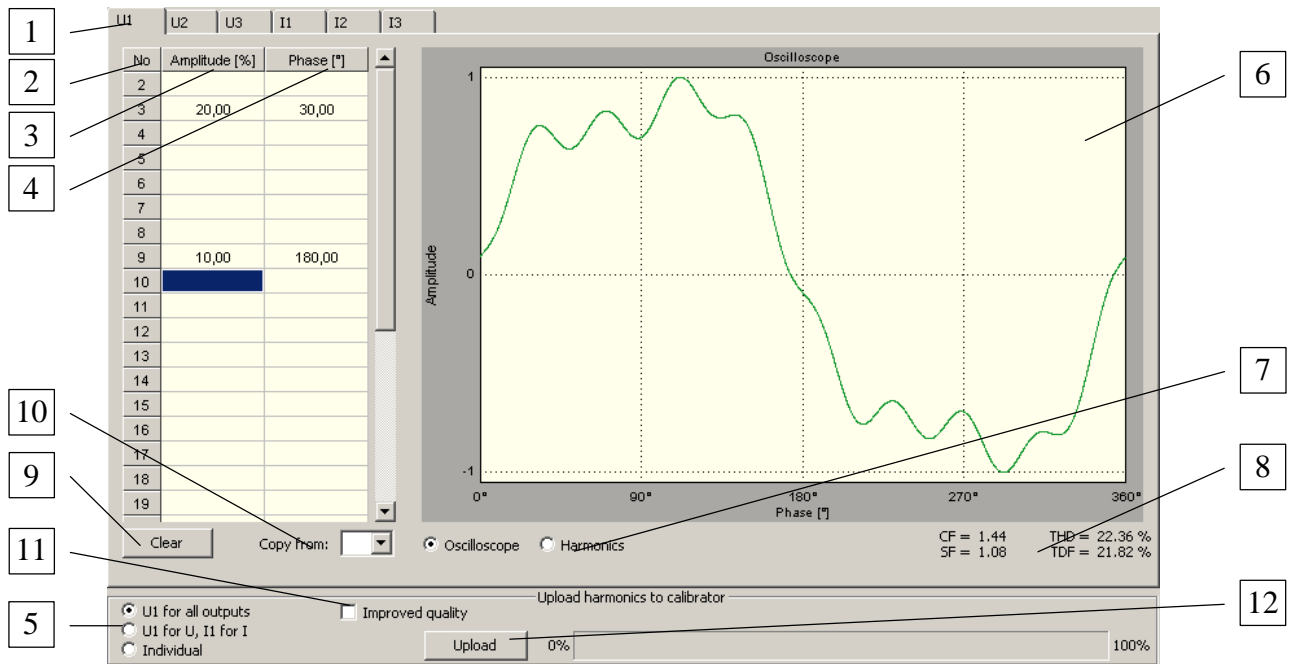
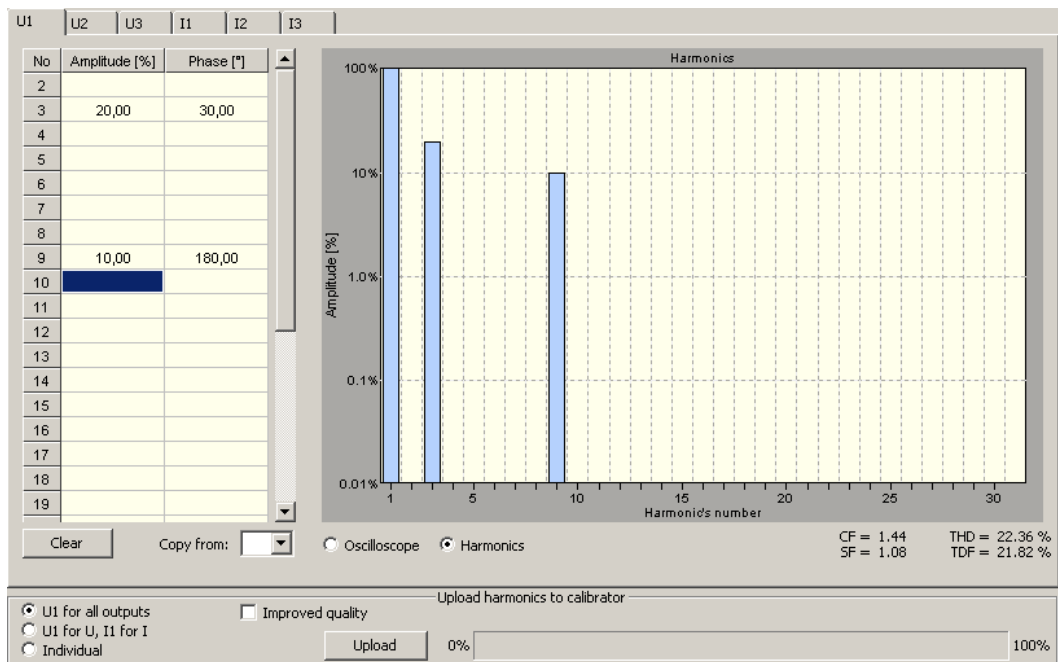Fig.5.1. Operation field of function *Harmonics* in *Oscilloscope* mode

Fig.5.2. Operation field of function *Harmonics* in *Harmonics* mode

5.2. INTERHARMONICS PROGRAMMING

Interharmonics function (Fig.3.5) enables setting the frequency, magnitude and phase of interharmonics (in range specified in *C300 user manual*, table 2.1). Operation field of function *Interharmonics* can work in *Oscilloscope* mode (Fig.5.3) or in *Interharmonics* mode (Fig.5.4) and contains fields as follow:

1 column *Frequency* with *f1, f2, f3* fields – setting the frequency of interharmonic in Hz,

2 column *Amplitude* with *U1, U2, U3* (*I1, I2, I3*) fields – setting the magnitude of interharmonic in percent of first harmonic magnitude,

3 column *Phase* with *φ1, φ2, φ3* fields – setting the phase shift of interharmonic in degrees with reference to the first harmonic,

4 button *Interharmonics* – selecting interharmonics for voltage *U* or current *I*,

5 field *All* – setting the same frequency, magnitude and interharmonic phase shift in all voltage (current) channels like in channel *U1* (*I1*),

6 field of waveform shape visualisation for one signal period (selected mode *Oscilloscope* Fig.5.3) or bar graph diagram of interharmonics (selected mode *Interharmonics* Fig.5.4),

7 buttons *Oscilloscope* and *Interharmonics* – selecting mode of visualization pos.6,

8 coefficients field of programmed shape of signal:
   - *CF* –crest factor,
   - *SF* – shape factor,
   - *TID* – total interharmonic distortion,
   - *TDF* – total distortion factor,

9 button *Upload* – uploading data of interharmonics to the calibrator.
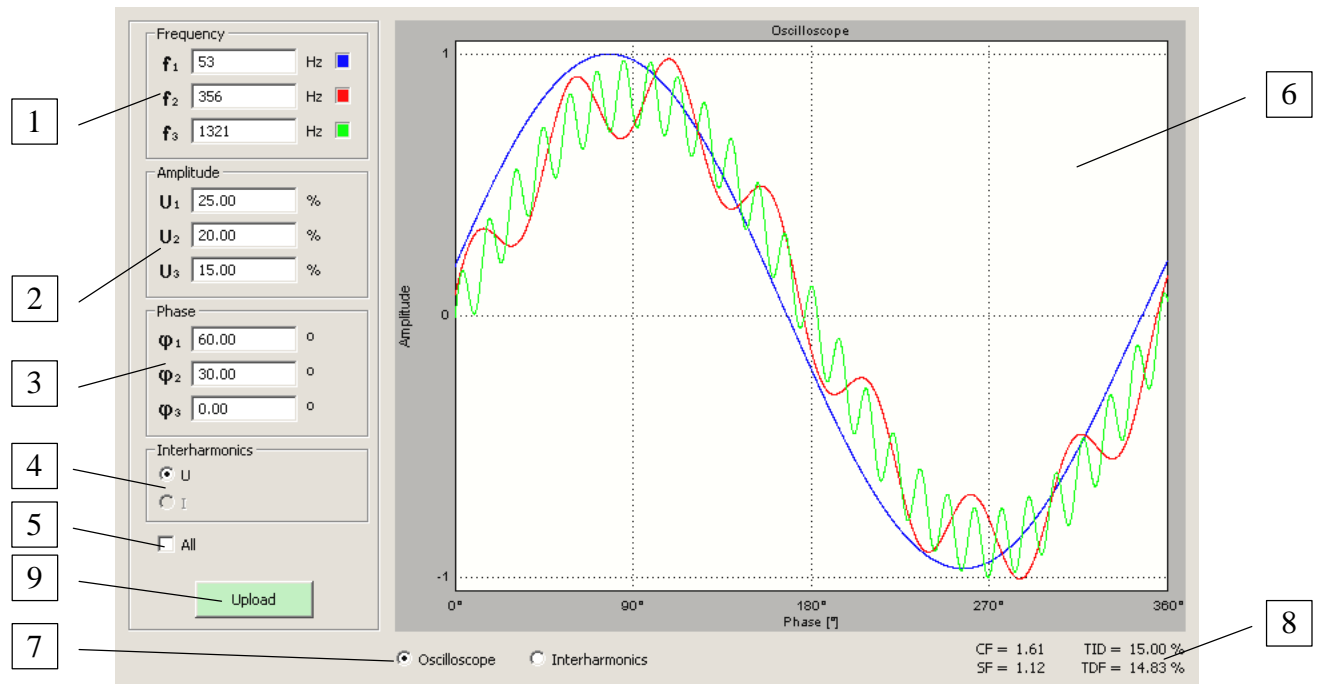
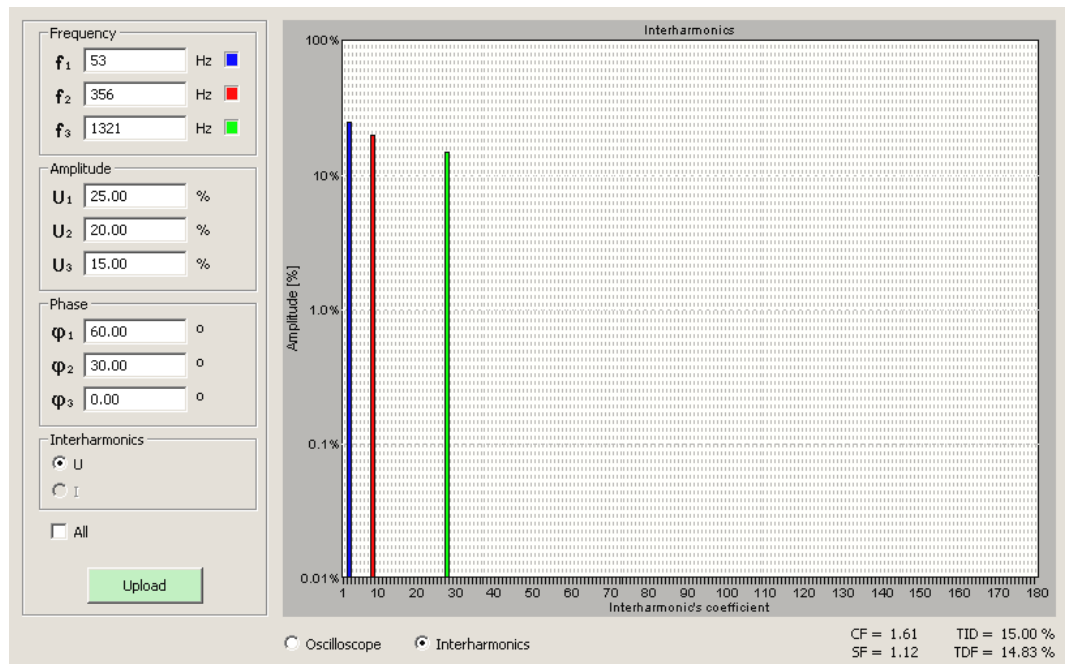Fig.5.3. Operation field of function *Interharmonics* in *Oscilloscope* mode

Fig.5.4. Operation field of function *Interharmonics* in *Interharmonics* mode

5.3. SHAPE PROGRAMMING

Shape function (Fig.3.5) enables selecting the wave shape of voltage and current. Operation field of function *Shape* (Fig.5.5) contains fields as follow:

1   button tabs *U1*, *U2*, *U3*, *I1*, *I2*, *I3* for selecting channel to set wave shape,

2   button *Sinus* for selecting sinusoidal wave shape without distortion,

3   button *Phase Fired* for selecting phase fired wave shape,

4   button *Triangle* for selecting triangle wave shape,

5   buttons *Burst 1, Burst 2, Burst 3* for selecting sinusoidal wave shape with voltage dips. Field pos.6 is non active for *Burst* function – dips are generating only in voltage channels, in current channels are sinusoidal wave shape

6   field for selecting channels in which shape will be programmed:
   - *U1 for all outputs* – setting the same shape in all channels like in channel U1,
   - *U1 for U, I1 for I* – setting the same shape in all voltage channels like U1 and setting the same shape in all current channels like I1,
   - *Individual* – individual setting the shape each channel,

7   field of waveform shape visualisation for one repeating cycle of signal,

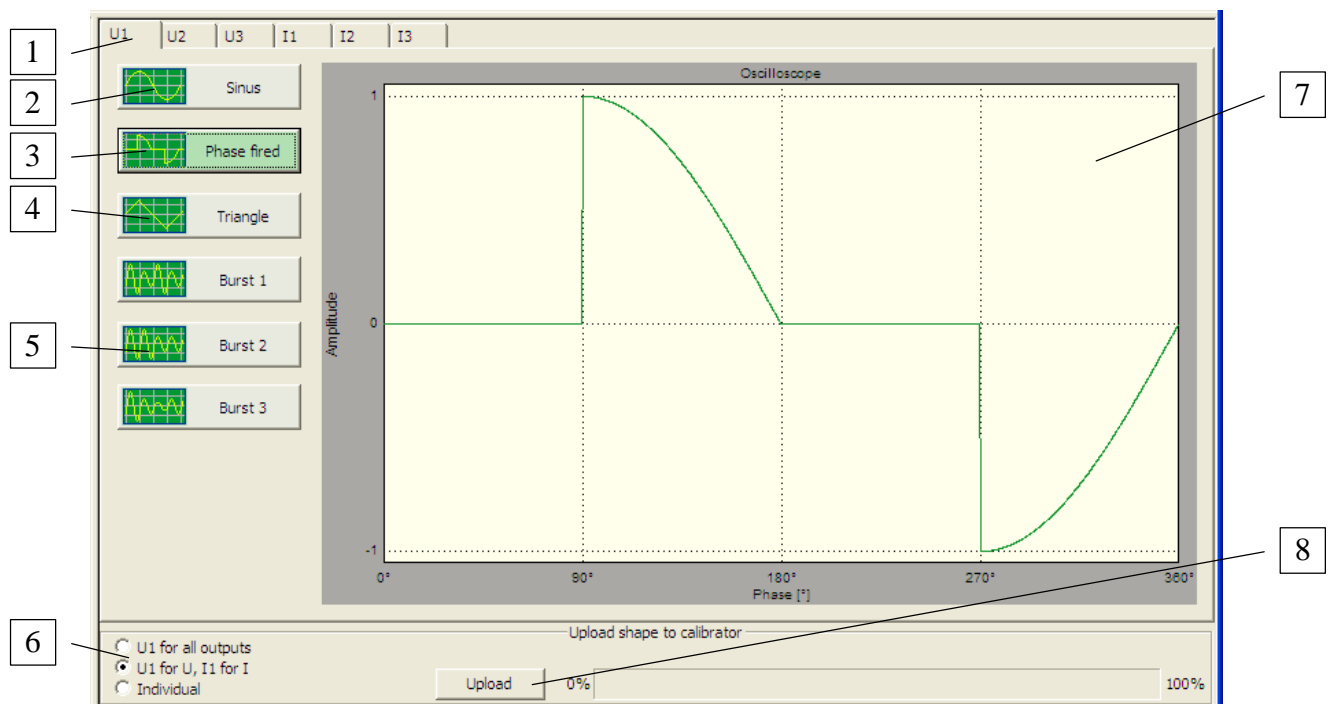8   button *Load* and progress bar *0% - 100%* - uploading data of wave shape to the calibrator.

Fig.5.5. Operation field of function *Shape*