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# Operating Instructions

HAEFELY TEST AG



## **OT 257AC**

### Operating Terminal for AC Systems

### **Revision History**

V3.1	8/2009	HPM	Sequce commands changed
V3.2	12/2009	HPM	Support of exciter tap changer added
V3.3	6/2011	HPM	Additional remote on Winsocket
V3.4	9/2013	THG	Additional remote commands
V3.5	07/2016	KB	Rework of whole manual
V3.6	10/2016	KB	Some wrong textes corrected
V3.7	01/2017	KB	Changes of version 2.0.19 added
V3.8	03/2017	KB	Changes of version 2.0.20 added
V3.9	01/2018	KB	Changes of version 2.0.23 added

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# 1 Introduction

The *OT257 AC* Haefely AC Control System offers you simple and comfortable operation of your system. You have the choice among various operating modes in which you can rationally and securely subject your test object to the required tests.

This User's Guide also provides descriptions of those system parts that are only available for Resonant Test Systems (RTS).

You can operate your system manually in the standard *Manual Test* operating mode. Functions such as high voltage on/off, regulating transformer up/down, tap selection, and much more can all be initiated by a keystroke or mouse click. All information needed for these changes is shown on the screen.

The optional *Sequences* software package allows you to program and sequentially summarise all functions available in the *manual operating mode*. This allows you to repeatedly and reproducibly subject your test objects to the identical test cycle. Not only final tests, but also type tests are realisable using the sequences. These help you to considerably reduce both your operational effort and test expenses by systematic and rational handling.

By using the optional *Remote* software package, you have the possibility of remotely controlling your *OT257 AC* Control System from a separate (host) computer. In this operating mode you can transmit commands to the Control System via Ethernet TCP/IP. The commands received are executed and the requested data transmitted back to the computer over the Net. The *Remote* option allows you to remotely control your AC system from any arbitrarily selected location.

The control system includes a comprehensive on-line help that is only a keystroke away.



Without fail, read chapter **Dangers and Safety Directives** before switching on your system.

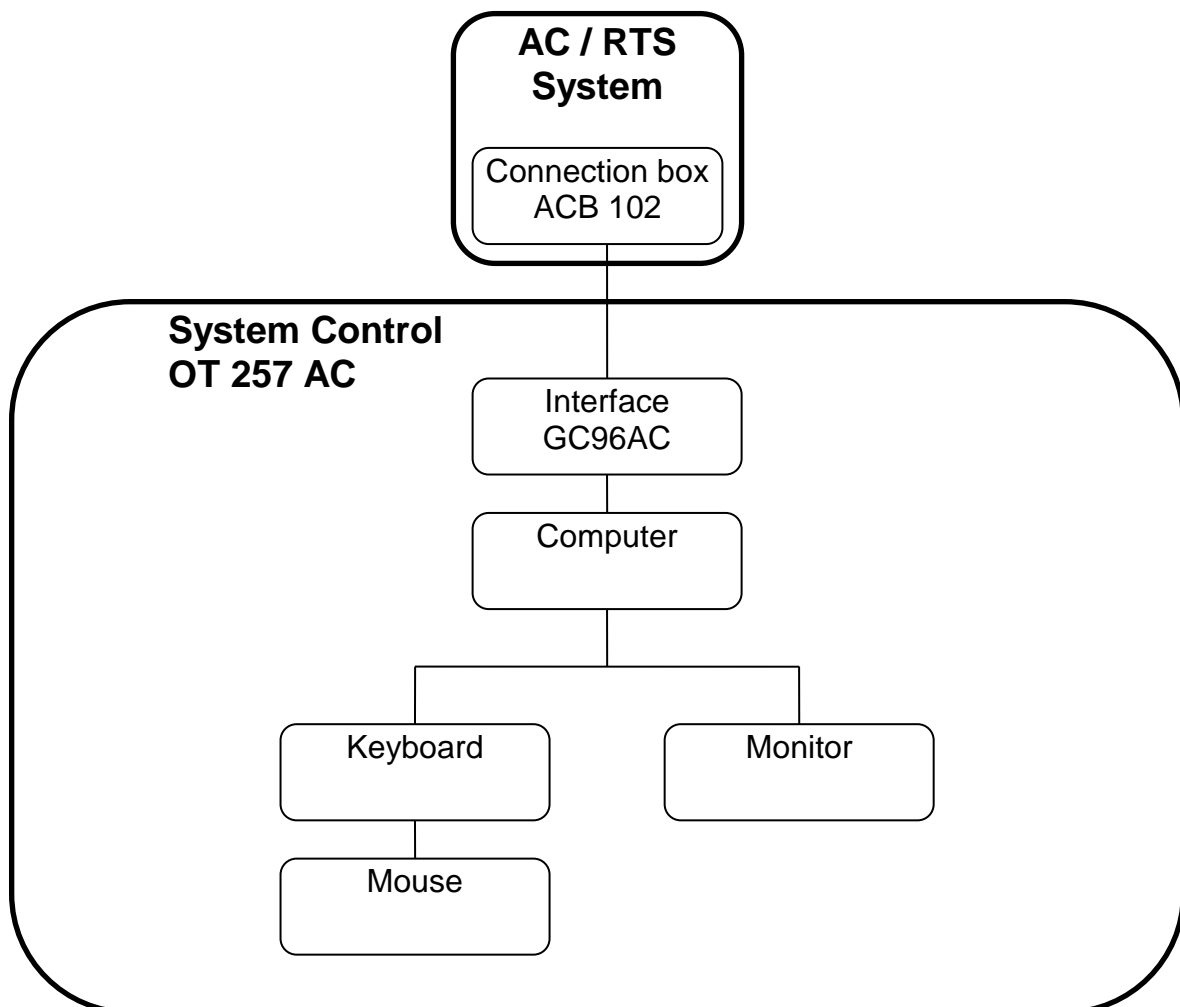


The system must be operated by trained personnel only.

# 2 Functional Description of the Control System

This chapter provides a short overview of both system types (AC and RTS) and a short description of the individual control system modules (examples). You can find the detailed information in the User Guides of the specific systems.

## 2.1 Block Diagram of the Control System



## 2.1.1 AC / RTS - Systems

AC or RTS systems are assembled in various configurations. Each system comes with a User's Guide that exactly describes all system parts used.

The following system parts can be found in AC and RTS systems:

- power switch and load switch
- regulating transformer or frequency converter
- compensating reactor
- filter
- exciter with and without taps
- reactor or High Voltage transformer in a vessel or cylinder design
- high voltage divider
- control desk or control rack
- connection box.

## 2.1.2 ACB 102 Connection Box

The *Connection box* is the interface between the Control System (GC96AC device) and the high voltage side of the AC System. It is positioned near the high voltage system parts and concentrates the individual control and measurement lines of the system into up to two control cables. The individual connections are detailed in the User's Guide for the AC Systems.

## 2.1.3 Mechanical Construction of the Desk

**Front view:** (example of a rack version)





## 2.1.4 Desk / Rack

OT257 AC is a modular system, available in desk or rack versions. The design of both systems is based on 19" rack elements. A short description of the individual modules follows. Detailed information is available in the User's Guide for each module.

Desk and rack are connected to the AC System with different cables. The interfaces are located on the control side of the GC96AC module and on the system side for the ACB 102 connection box. All control inputs and outputs are protected against transient interference voltages and electromagnetic coupling. Part of the protection is provided by the shielded cables. As a result they must not, under any circumstance, be replaced by cables of other types.

## 2.1.5 Module GC96AC (AC Control & Interface Module)

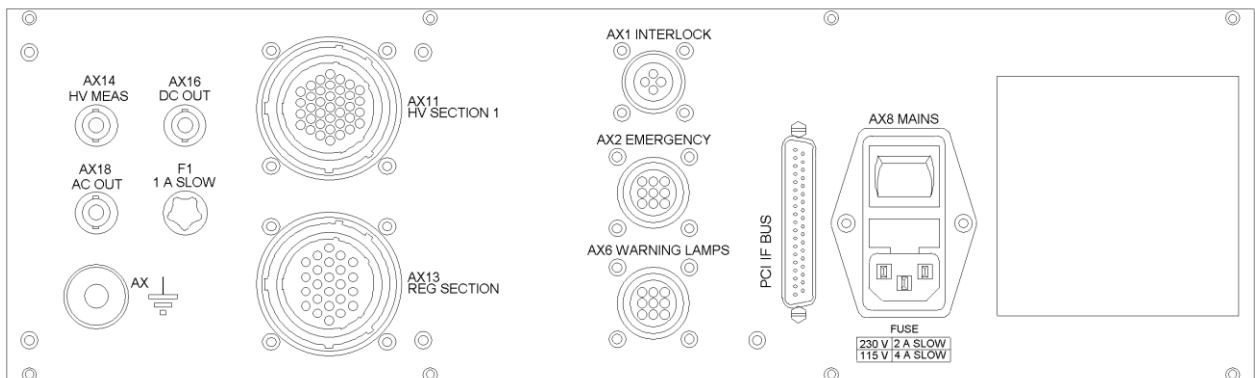
The Module GC96AC is normally mounted in the mini rack of the control system. It monitors and controls all warning, safety equipment and all other system parts. The input sockets are on the back side of the module.

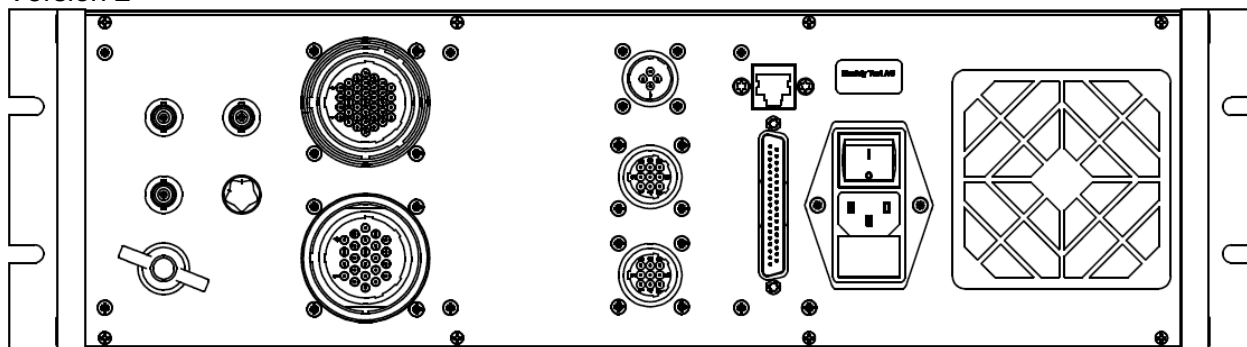
All analogue and digital signals from the AC System are connected to this module. It matches the internal and external signal levels. It also filters the signals and removes interference from them.

The optional A/I O module offers additional analogue and digital inputs and outputs for customer-specific applications. They can be activated through the software sequences only.

### 2.1.5.1 View on the Backpanel of the module

Version 1

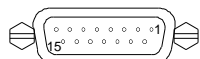




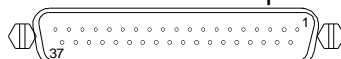
### 2.1.5.2 Used connectors

On the back panel of the module you find several connectors.

D Sub connector 15p.



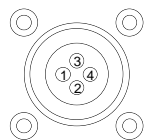
D Sub connector 37p.



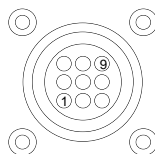
LAN connection



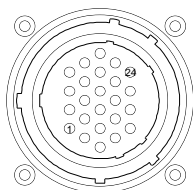
AMP series CPC 4p.



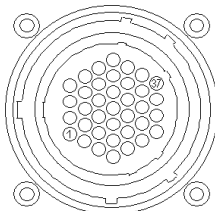
AMP series CPC 9p.



AMP series CPC 24p.



AMP series CPC 37p.



### 2.1.5.3 Connectors on the module

Connector	Designation	Type of connector	Description
A:X1	INTERLOCK	AMP Series CPC 4 poles male	Security circuit
A:X2	EMERGENCY	AMP Series CPC 9 poles male	Emergency switch
A:X6	WARNING LAMPS	AMP Series CPC 9 poles male	Warning lamps
A:X8	MAINS	IEC 3 poles male	Mains connector
A:X11	HV SECTION 1	AMP Series CPC 24 poles male	AC-Connection-Box
A:X13	REG SECTION	AMP Series CPC 24 poles male	Regulating transformer
A:X14	HV MEAS	BNC	High voltage measuring 0..150 V ~
A:X16	DC OUT	BNC	yt Plotter 0..10V DC proportional to high voltage
A:X18	AC OUT	BNC	Oscilloscope 0..7V AC RMS proportional to high voltage
	HMO KBD	D-Sub 15 poles female	Monitor HMO820
	PCI IF BUS	D-Sub 37 poles male	Connection to the PC
	PCI IF LAN	RJ 45 female	Connection to the PC

## 2.1.5.4 Pinning of the connectors

### Pinning connector A: X1

<b>A:X1 INTERLOCK</b>	
Pin	Signal
1	Interlock Cmd ( Command )
2	Interlock Status
3	Shield
4	Not connected

### Pinning connector A: X2

<b>A:X2 EMERGENCY</b>	
Pin	Signal
1	Not connected
2	Not connected
3	Not connected
4	Not connected
5	Not connected
6	Emergency Customer (GND)
7	Emergency EHB Cmd (System)
8	Emergency EHB Stat (System)
9	Emergency Customer

### Pinning connector A: X6

<b>A:X6 WARNING LAMPS</b>	
Pin	Signal
1	Warning Lamp (external Supply) Max. 250V AC / 3A
2	Warning Lamp Red
3	Warning Lamp Green
4	Not connected
5	Not connected
6	Emergency Customer
7	Not connected
8	Not connected
9	Emergency Customer (GND)

### Pinning connector A: X8

<b>A:X8 MAINS</b>	
Pin	Signal
L	Phase
N	Null
PE	Protective earth

### Pinning connector HMO KBD

<b>HMO KBD</b>	
Pin	Signal
1	Clock LED KBC 840
2	HV OFF CMD = 0V
3	+5V
4	Not connected
5	Not connected
6	Not connected
7	Not connected
8	Not connected
9	Data LED KBC 840
10	GND
11	Not connected
12	Not connected
13	Not connected
14	Not connected
15	Not connected

### Pinning connector A: X11

A:X11 HV SECTION 1	
Pin	Signal
1	Outp. Curr. H
2	Outp. Curr. L
3	Earth
4	Exc. Volt. H
5	Exc. Volt. L
6	Power On 24V DC Cmd
7	Ind. Mot. Speed H
8	Ind. Mot. Pos. H
9	Ind. Mot. Pos./Speed L
10	Gap Pos max
11	Gap Pos min
12	Trip HV section
13	Bit 1 R Taps
14	Bit 2 R Taps
15	Bit 3 R Taps
16	Gap Motor Decrease
17	Gap motor Increase
18	Tap Motor decrease
19	Tap Motor increase
20	GND switch Cmd
21	GND switch Status
22	Alarm HV Section
23	+24V
24	GND
25	Aux. DC In H
26	Aux. DC In L
27	Earth
28	Aux In 1
29	Aux In 2
30	Aux In 3
31	Bit 1 R Taps 2
32	Bit 2 R Taps 2
33	Bit 3 R Taps 2
34	Tap Motor decrease
35	Tap Motor increase
36	Aux Out 3
37	Aux Out 4

### Pinning connector A: X13

A:X13 REG SECTION	
Pin	Signal
1	Reg. Volt. H
2	Reg. Volt. L
3	Earth
4	Reg. Curr. H
5	Reg. Curr. L
6	Earth
7	SecuEndSwi
8	Reg. Mot. Speed H
9	Reg. Mot. Speed L
10	Flash
11	Emergency
12	Power Status
13	Power On
14	Power Off H=On/L=Off
15	Trip Regulator
16	Voltage Up
17	Voltage Down
18	Alarm Regulator
19	Reg Position Min
20	Reg Position Max
21	HV Switch On/Off
22	HV Status
23	+24V
24	GND

### Pinning connector PCI IF BUS

PCI IF BUS	
Pin	Signal
1	D0
2	D2
3	D4
4	D6
5	A0
6	A2
7	A4
8	A6
9	/IOR
10	RES
11	Not connected
12	Not connected
13	RDY IN
14	RTS6.5
15	Not connected
16	Not connected
17	GND
18	GND
19	GND

PCI IF BUS	
Pin	Signal
20	D1
21	D3
22	D5
23	D7
24	A1
25	A3
26	A5
27	A7
28	/IOW
29	Not connected
30	Not connected
31	Not connected
32	RST5.5
33	RST7.5
34	Not connected
35	Not connected
36	GND
37	GND

---

## 2.2 Technical Data

### 2.2.1 Mains Connection, Inputs and Outputs

#### Mains input

Voltage	230 V $\pm 10\%$	Optional: 115 V
Power	400 VA	
Frequency	50 / 60 Hz	
Fuses	6.3 A	Externally protected with 10 A
Isolation transformer	230 V / 230 V	1.5 kVA
Isolation voltage	4000 V	

#### Mains output

Voltage	As for input	
Power	Max. 10 A	Plug connections
Fuses	No internal fusing	

#### Internal supplies

+24 V	3.5 A
+15 V	1.2 A
-15 V	1.2 A
+5 V	4 A

### 2.2.2 Digital Inputs and Outputs

Inputs	24 V	
Outputs	24 V	Protected against shorts

### 2.2.3 Analogue Inputs and Outputs

Inputs	0 ... 7 V <sub>RMS</sub> , 0 ... 10 V <sub>Peak</sub>	AC
Inputs	0 ... 10 V	DC
Outputs	0 ... 10 V	DC

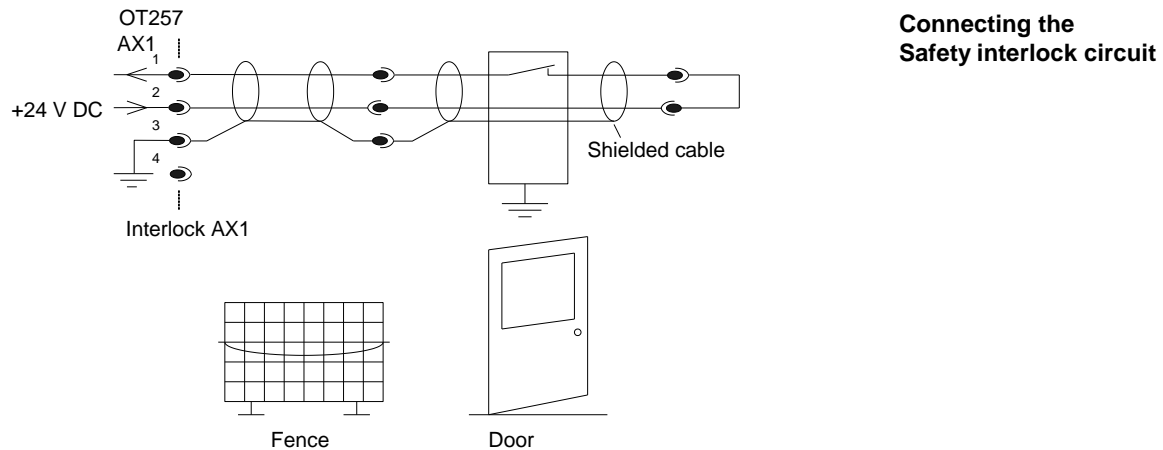
### 2.2.4 Safety interlock and Customer-Specific Inputs and Outputs

EMERGENCY off	9 poles male plug	AMP
Safety interlock	4 poles male plug	AMP
Warning lamps	9 poles male plug	AMP
High voltage measurement	BNC socket	
Auxiliary input	9 poles male plug	AMP

### 2.2.4.1 Safety interlock circuit

The interlock is the safety circuit that encloses the high-voltage zone. When entering this zone, you must open the safety circuit. The high voltage is automatically cut off when this happens, and the grounding switch (if available) grounds the high-voltage installation. Use suitable connectors and contacts for this purpose. To prevent the control system of interference, use shielded cables only.

Practical example:

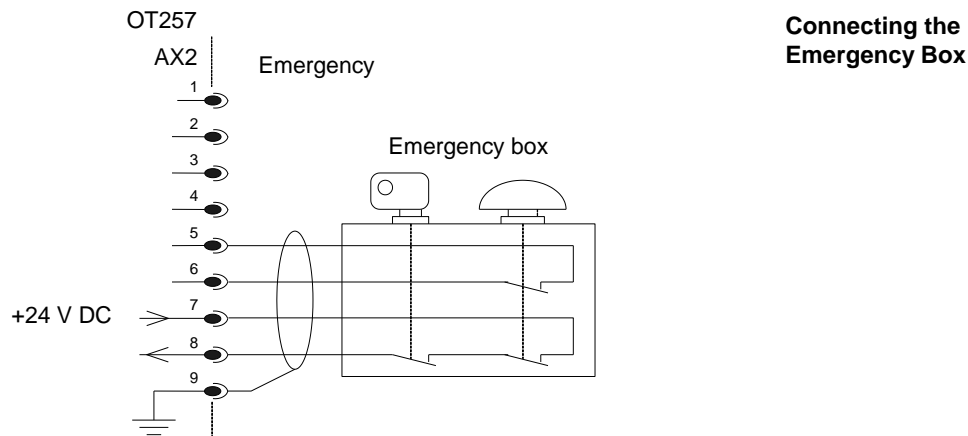


### 2.2.4.2 EMERGENCY Off box

The EMERGENCY OFF box is connected to the EMERGENCY socket. Pressing the EMERGENCY OFF button breaks the supply voltage, which disables the high voltage. A safety switch with keylock prevents operation by unauthorised people.

When the EMERGENCY switch is activated, the high voltage circuit is earthed through a built-in safety system. As an additional safety feature, the main supply to the equipment is deactivated. The EMERGENCY circuit operates independent of the control computer.

Practical example:



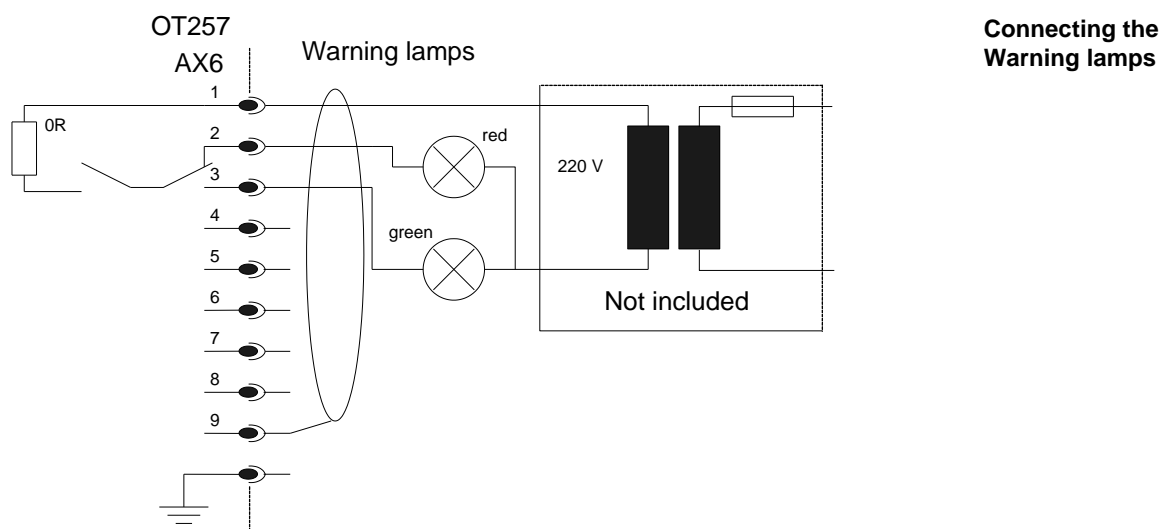
### 2.2.4.3 Warning lamps

Relay contacts switch the warning lamp from red to green or off. When the high-voltage installation is turned off, the green lamp is lighted. The warning lamp changes to red when the key switch is turned.



The warning lamps are externally powered through an isolating transformer. **Shielded cables** must be used. The fusing for the relay contact (3.15 A fuse) must be implemented externally.

Practical example:



### 2.2.5 Operating Conditions

Operating temperature	0 ... 40	°C	
Storage temperature	-20 ... +60	°C	
Humidity	20 ... 80	%	Non-condensing
Vibration	3	g	IEC 68-2-6 xyz axis 10-150Hz
Shock	10	g	IEC 68-2-27 11ms half sine


## 2.2.6 Dimensions

### Control Rack

Dimensions (L/H/D)	1740 x 1115 x 1120 mm
Working surface height	760 mm
Weight	approx. 250 kg
Transport width	700 mm

### Desk (mini rack)

Dimensions (L/H/D)	1170(table)+600(rack) x 760 x 700 mm
Weight	approx. 230 kg

 *We reserve the right for technical changes without notice.*





# 3 Installation Instructions

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## 3.1 Installing Software on the PC

### 3.1.1 Extent of Delivery

The control system for your AC system is normally supplied with installed software and the original disks with the software backup.

Using the original disks, you can return to the default condition of the control system at anytime.



Store the original disks separately from your installation, preferably in a safe where they are protected against fire, water and magnetic fields.

### 3.1.2 Installation

You can very easily install the software on a PC using the installation program on the original disk, even without computer knowledge. All control setups stored in the PC will be written over. Thus if you have created sequences, save them on disk before the installation. Do the same with protocol files.

Perform the following steps for a new installation:

1. Switch on the control desk.
2. Wait until Windows is started up completely.
3. Insert one of the original disks into the CD drive. The installation starts automatically. Just follow the instructions. In case the installation should not start automatically you can start it manually by executing the file Install.exe.

### 3.1.3 Software Options

There are software options available:

**/SIM**            The software will be executed in simulation mode.

### 3.1.4 Running the Software in Simulation Mode

All functions of the control system can be simulated in simulation mode. Neither your AC system nor the control system is needed for the simulation. This allows operating personnel to be trained in the use of the software, without, e.g., any loading on your test field. You can also demonstrate the test sequence to customers and quality inspectors in your office before the actual test. The manual test, sequences and remote functions perform in simulation mode exactly as they do on your AC system.

The software must be installed on your PC as explained in the previous section in order to use simulation mode.

The following steps are necessary in order to run the simulation:

1. Click on the Windows Start button and open the menu Execute.
2. Enter **OC257\_AC /SIM** in the Execute menu and verify with **ENTER** (don't forget the <space> before the **/SIM** extension).

# 4 User's Instructions

---

## 4.1 General

Controlling your AC system with the program involves several different modes (e.g., "Manual Test", "Sequence Test", etc.), that are always accessible via menu. You can select a menu item by pressing <F10> and the arrow keys or by mouse click or by function keys.

The test system can have the following states:

### **Power Off:**

The primary power breaker of the regulating transformer is off. Regulator, gap and tap changer drive are not energised and can not be operated.

### **Power On:**

The primary power breaker of the regulating transformer is on. Regulator, gap and tap changer drive are energised. Gap drive and tap changer can be operated. The regulator drive can not be operated. Only if the regulator is by any reason not in minimum position, it runs down to minimum position by self.

### **Ready:**

The primary power breaker in on, the regulator is in minimum position and the system is ready to switch on High Voltage.

### **HV On:**

High Voltage is on. The system can be operated at it's fully functionality.

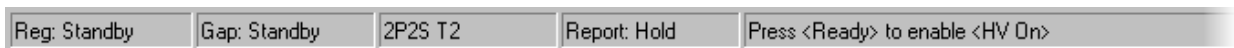
### **HV Off:**

High Voltage is off. Before the High Voltage can be switched on again the system has to be brought into Ready state again.

The actual (voltage related) status is always shown (by colour) and written in the top status bar.

The active input field often has a mark, the cursor. It indicates the location where the next character that you input on the keyboard will appear. The length of the input field does not limit the number of characters that you can enter into a field. If the number of characters exceeds the length of the input field, the entered string will be scrolled forward character by character.

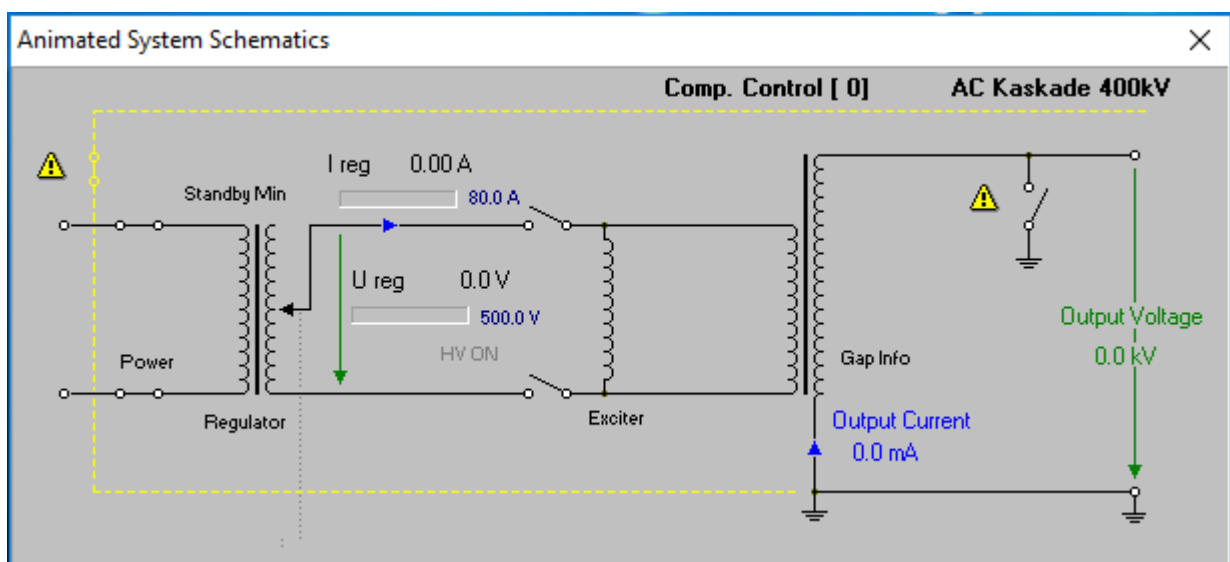
All inputs, insofar as possible, are subject to a plausibility check and rejected by the control system if the input is in error. So that you always know what values can be entered into a field, a short *help text* is given in a small hint window when you cross an input field by the mouse. The status footer in the lower part of the screen shows actual settings, status and specifies which keys you can currently press.



Some of the keys are always assigned the same function. For example, the <ALT><F2> function key always opens the set up menu. The information within the window that you wish to exit must always be plausible. In contrast, you can always exit a window having invalid data using the **ESC** key, but the entries you made will be ignored. The values existing before you made your changes will remain valid.

The contents of the individual windows can vary from control system to control system depending on the equipment used in the AC system and the configuration of the program.

## 4.2 System status Window

















Via the menu point *System/Show Diagram* a Window displaying the actual status of the system is available. It contains a simple sketch of the system with the most important components, switches, values, status and limits as well as located alarm information.

---

## 4.3 General

You can manually operate your AC system using the Manual Test operating mode. All information needed for manual operation, such as measurements, is summarised into groups, provided in overview in the main window and presented in some cases even as bars. You can edit the input areas by selecting individual fields with the mouse. Depending on the status of your AC system, some of the menu points of the function key bar may be hidden and not available, e.g., if the high voltage is switched on. In order to obtain a better impression about the course of the AC test, the course of the output voltage or other measurements are recorded in a graphic window.

### 4.3.1 Shortcut Buttons

	Access the System Setup
	Save the actual Setup
	Load a stored Setup
	Open the Report generate window
	Start continuous data log
	Stop continuous data log (can only be pressed, when the data log is active)
	Make a single data record
	Reset the alarms
	Show the diagram
	Minimize the control window
	Edit a sequence
	Run the sequence
	Help (open the user manual)
	Information (opens the About window, with Serial number, Software version and contact informations)

### 4.3.2 Switching High Voltage ON

To switch on High Voltage on the system the following procedure is necessary:



To energise the regulator drive, the connection box ACB 102 and with that the gap drive and, if available, the oil cooling system of the HV reactor you first have to close the primary power breaker (Q1) of the regulating transformer by pressing the *Power On* button.

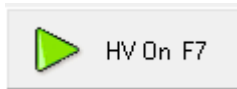
As long as the Power breaker is not closed the system shows a *Powerswitch* alarm. This alarm will be reset by itself as soon as the power breaker is closed.

- i** *The primary power breaker is not supposed to be switched on and off each time High Voltage is switched on or off. It should be switched on at the beginning of a test session and switched off at the end of it. During the test session it should only be switched off in an emergency case.*

With the power breaker closed it takes 2 actions to switch on High Voltage.



First you have to press the *Ready* button to bring the system into ready state. If this action succeeds and the system switches into ready state it indicates this by changing the colour of the digits in the output voltage and current display from grey to black. If the system can not switch to ready state please check the alarms.



When the system is in ready state High Voltage can be switched on by pressing the *HV On* button. This closes the secondary breaker (K2) of the regulating transformer. The secondary breaker of the regulating transformer is the HV relays.

- i** *If you do not switch on High Voltage immediately after switching the system into ready state, the system will go back to Not Ready state with a HV On failure alarm after 5 seconds. Then you have to reset the alarms and start with the Ready button again to switch on High Voltage.*

When High Voltage is on the system indicates this by changing the colour of the digits in the output voltage display from grey to green and the background of the top status bar to red. However the actual (voltage related) status is always shown (by colour) and written in the top status bar.

### 4.3.3 Switching High Voltage OFF



When the system is in the HV ON State this button can be pressed. Once pressed the system will drive the voltage down to 0V Source voltage and then open the secondary breaker (K2). Then the system will be in the Ready state.



When the system is in the HV ON State this button can be pressed. Once pressed the system will immediately open the secondary breaker (K2) without driving the Voltage to 0V. Then the system will be in the Ready state.

### 4.3.4 System Monitor

The screenshot shows the 'System Monitor' interface. At the top, a red status bar displays 'Status: HV ON'. Below this, the main display area shows 'Output Voltage : 0/sqrt(2)' and '1.2 kV' in large green digits. Below the voltage display, there are two input fields for setting limits: '378.0 kV' and '52.50 A', each with left and right arrow buttons. Further down, there are four rows of data: 'Exciter Voltage 1.0 kV' with a progress bar and '21.0 kV' limit; 'Regulator Voltage 13.6 V' with '6600.0 V' limit; 'Regulator Current 0.33 A' with '160.0 A' limit. Callout boxes provide additional information: one points to the voltage measurement mode (0/sqrt(2)), another to the top status bar, a third to the output current and voltage trip settings, and a fourth to the regulator and exciter values and limits.

Voltage measurement mode can be toggle by double-click. (RMS or Peak/sqrt2).

Top status bar. Shows the actual status of the system

Status: HV ON

System Monitor

Output Voltage : 0/sqrt(2) 1.2 kV

378.0 kV

Output Current : 103.8 mA 52.50 A

Exciter Voltage 1.0 kV 21.0 kV

Regulator Voltage 13.6 V 6600.0 V

Regulator Current 0.33 A 160.0 A

Display and setting of output current and voltage trip.

Display of Regulator and if available Exciter values and limits.

### 4.3.5 Limiters

Output voltage and output current can be limited for protection of the test object. The ratio between the actual value and the limit is displayed in a progress bar to give an easy to interpret information how close at the limit the actual value is. If one of the values reaches the limit the control tries first to reduce the output voltage. If this does not succeed the control switches off the high voltage with an output voltage or output current trip.

The limit value of the *output voltage* can be set between 0kV and the maximum possible voltage of the taps or the circuit variant.

The limit value of the *output current* can be set between 0A and the maximum possible current of the taps or the circuit variant.

All limit settings are also accessible over the menu *Setup/Controls setup/..*

### 4.3.6 Timer

A test durance can be limited with a timer. In manual test mode the timer can be set to a certain time in seconds, minutes or hours and started via *Start* pushbutton. After the set time is expired the control automatically reduces the voltage to 0 V and switches off the high voltage with a timer alarm. This alarm must be reset before the timer can be started another time.

In auto voltage mode the timer starts itself automatically, if its set time is not 0, as soon as the set output voltage is reached.

The *Hold* button stops the timer without switching of the high voltage.



**HV Timer**  
Automatic HV Off in : 000:00:00 [Start] [Hold]  
HV On Time: 000:02:47 [Reset]

Display and operation of the actual (down-counting) time-to-action. Time value is yellow when timer is active.

Starts as soon HV is on and resets when Voltage is above 1kV. It also can be reset with the **Reset** button

**Voltage Control**  
[Auto] [Set Output: 10.0 kV] [Rise speed: 2 kV /s] [Down] [Fast] [Up]

**Resonance Control (air gap)**  
Q-Value: 0.46 [Auto] [Dec] [Fast] [Inc] [Inductance: 94 %]

Toggle fast/slow voltage up or down

Manual voltage control buttons

Toggle fast/slow gap distance increase or decrease

Manual gap control buttons

Actual air gap distance information

Toggle automatic or manual voltage control

Setting of output voltage In auto voltage mode

Setting of voltage rise speed

Toggle automatic or manual tuning control

Display of actual tuning

### 4.3.7 Manual voltage buttons and manual speed

You can enter the *normal speed* of the regulating transformer within the range from 1 to 50. The *Up* and *Down* keys then cause the regulating transformer to increase or decrease the output voltage at a rate corresponding to the speed entered.

You can enter a high speed between 51 and 100. If you then press the *Fast* key along with *Up* or *Down*, the regulating transformer will move at a rate corresponding to the higher speed you entered.

Access to these settings over the menu *Setup/Regulator Speed* or by double click into the Voltage Control frame.

### 4.3.8 Manual tuning and tuning speed

You can enter the *normal speed* of the gap motor in the range from 1 to 50. The *Inc* and *Dec* keys increase or decrease the inductance with a speed corresponding to the value you entered.

You can enter the *high speed* between 51 and 100. If you then press *Fast* key along with *Inc* or *Dec*, the gap motor will move at a rate corresponding to the higher speed you entered.

Access to these settings over the menu *Setup/Gap Speed* or by double click into the Resonance Control frame.

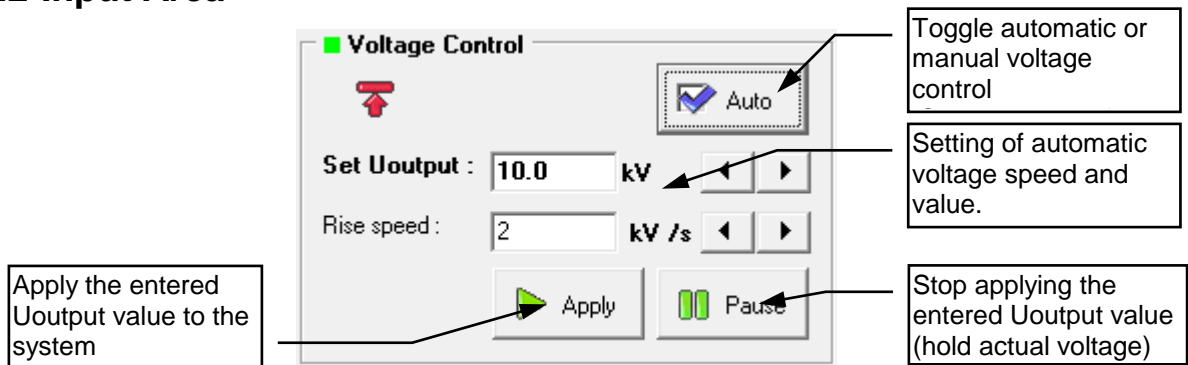
The inductance window is only displayed for RTS systems. The *Resonance Test System* can be adjusted using the bar indicators. When adjusted to resonance, the *pointer* is positioned in the centre of the bar and the regulating transformer current is at the lowest possible value for the connected load (test object). The function of resonance systems is described in detail in the associated handbooks.

## 4.4 Auto voltage

### 4.4.1 General

If the *Auto voltage* is on, the high voltage will be raised automatically to the *setpoint* specified in the **Set Uoutput** field.

### 4.4.2 Input Area



The rise speed can be entered in the unit kV/s or %/s related to the nominal voltage of the AC test system.

The *Pause* button stops the ramp at its actual value and keeps the voltage constant. To continue the ramp press *Apply* again

If the *automatic voltage regulation* is switched on, the timer will automatically start as soon as the *setpoint* is reached. You can, however, manually switch it off again anytime.

**i** On a *Parallel Resonant Test Set* the input current can rise to a very high value if the output voltage is raised while the test circuit is not tuned into resonance. The system is protected against regulator over current. But it switches off the high voltage in such a case.

*In case of a Parallel Resonant Test Set:*

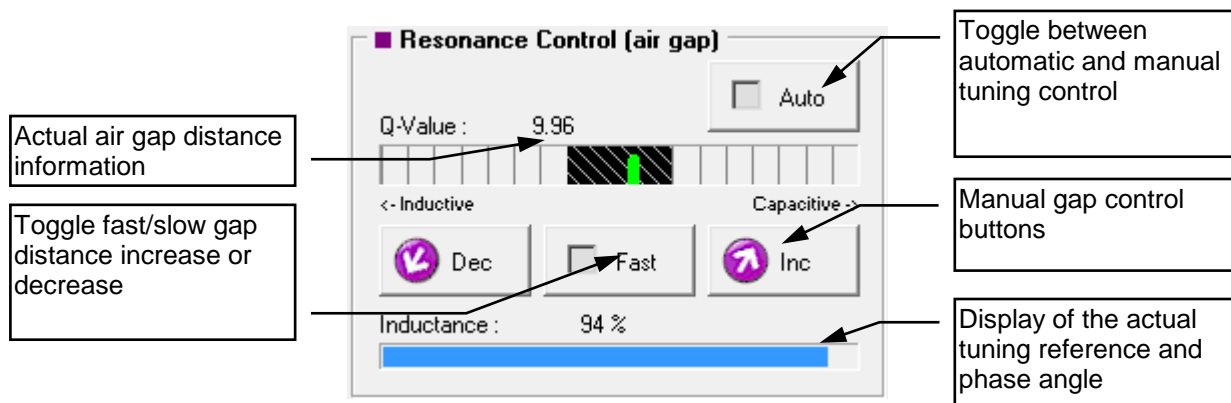
To avoid regulator current trips do not switch on Auto Voltage Mode unless the test circuit is tuned into resonance or Auto Tuning mode is activated already.

## 4.5 Auto Tuning

### 4.5.1 General

In Auto Tuning mode the control system automatically tunes the test circuit into resonance.

### 4.5.2 Input Area



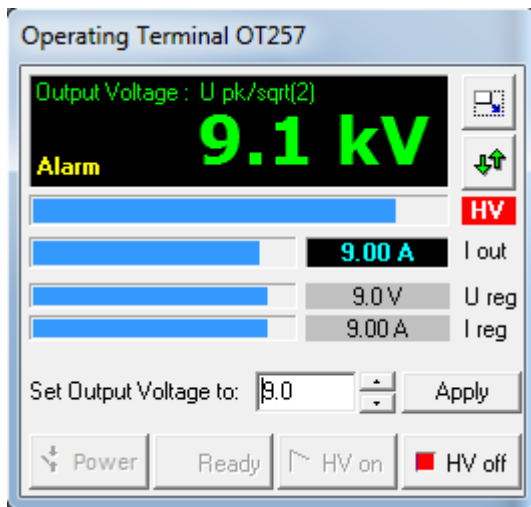
**i** On a Serial Resonant Test Set the output voltage can raise very fast, very much while approaching the resonance point.

*In case of a Serial Resonant Test Set:*

To protect the test object it is warmly recommended to switch on Auto Tuning Mode only if Auto Voltage Mode is already switched on to allow the control to regulate the output voltage while tuning.

---

## 4.6 Miniature panel



In case the standard main window is too large on the desktop it can be converted to a minimised panel.

To switch to the minimised panel use the menu item *System/Minimize Window* or use the shortcut button in the toolbar



Use the arrow button to further minimise the panel



Go back to the full screen by pressing the maximise button



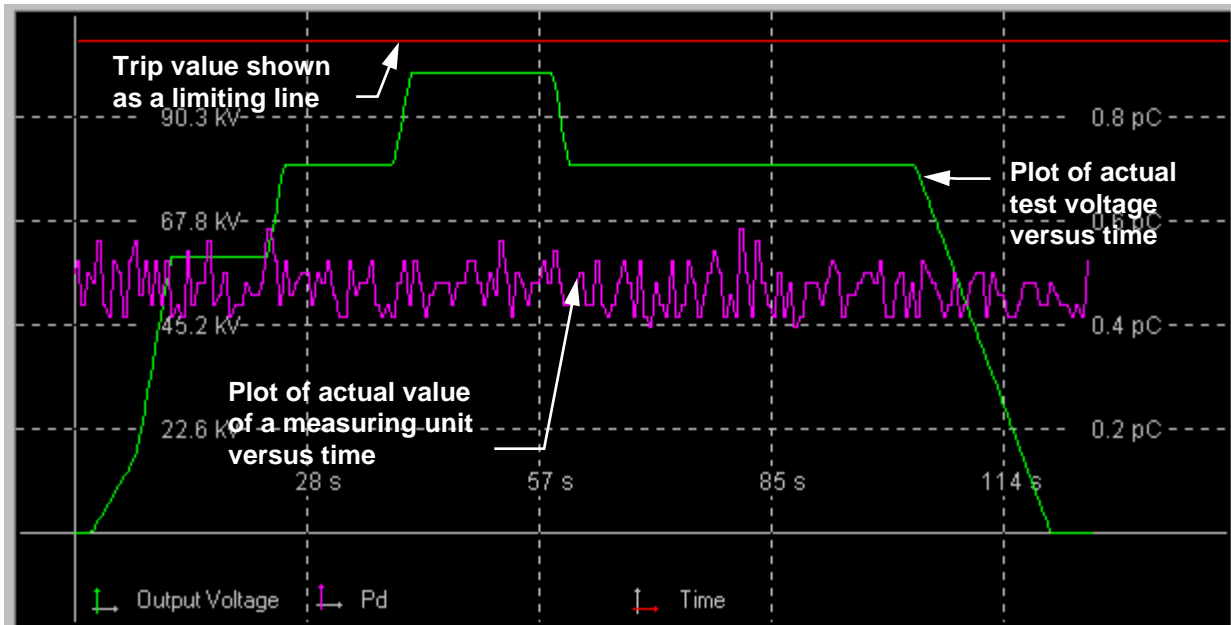
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## 4.7 Graphic window (scope)

The graphic window displays the desired measurement as graphical log. The following measurements can be displayed as a function of time or in relation to each other: That means one measurement on the X axis and the other on the Y axis.

- Output voltage
- Output current
- Measuring value

The settings can be changed by clicking with the right mouse button into the scope. The measuring curve is displayed by a green line and additionally, if available, the maximum (limiter) of the measured value is displayed by a red line.



The scope can display one or two graphs. If only one graph is displayed, it can be displayed in X/Y mode. So it is possible to display the value of a measuring unit versus the actual output voltage. The setting of one or two graphs can be done in the menu *setup/system* *setup/measuring*. In the same menu the timeout after which a new value is added to the graph. For longtime testing this timeout should be set to a reasonable value (for each value of the graph 10 Bytes of data are generated by the software. At the shortest timeout the software records 3 values per second or generates 1.8 kBytes of data per minute). For a test longer than one hour the timeout should be set to 1 second. For longer tests it should be increased appropriate.

Following values can be displayed:

1. Output voltage
2. Output current
3. Measuring value of a measuring unit

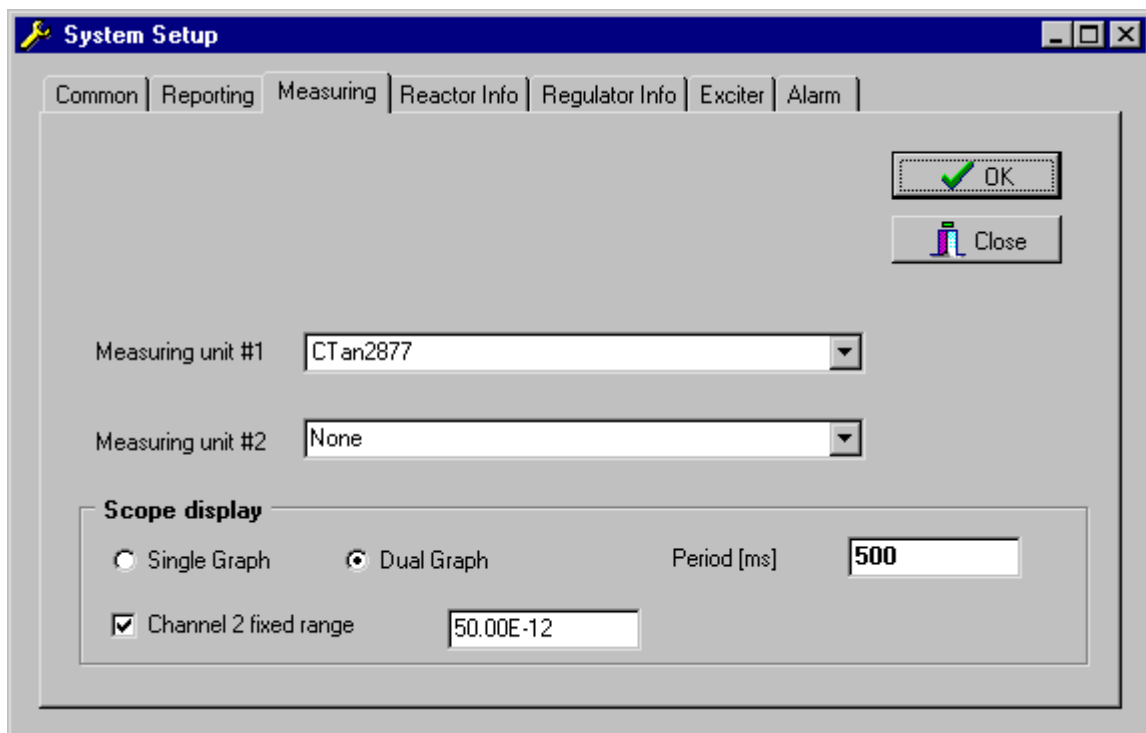
#### 4.7.1 Context menu to Scope

Reset zoom	<i>Reset zoom</i>	Reset the used zoom function.
Reset scope	<i>Reset scope</i>	Reset the Scope to its initial state and range setting.
Inc Y scale	<i>Inc Y scale</i>	Increase the range of the y-Scale by 10 %.
Dec Y Scale	<i>Dec Y scale</i>	Decrease the Y-Scale by 10 %.
Save to WMF	<i>Save to WMF</i>	Save current curve into a .WMF picture file.
Print Scope	<i>Print Scope</i>	Print current curve on the default printer of
Unit X-Scale ▶		
Unit Y1-Scale ▶		
Quit		

	the system.
<i>Unit X-Scale</i>	Set measurement value for the X axis.
<i>Unit Y-Scale</i>	Set measurement value for the Y axis.
<i>Quit</i>	

## 4.7.2 Settings

The settings for the scope can be made in the system setup/measuring



### 4.7.2.1 Single Graph / Dual Graph

The scope can display one or two measured values.

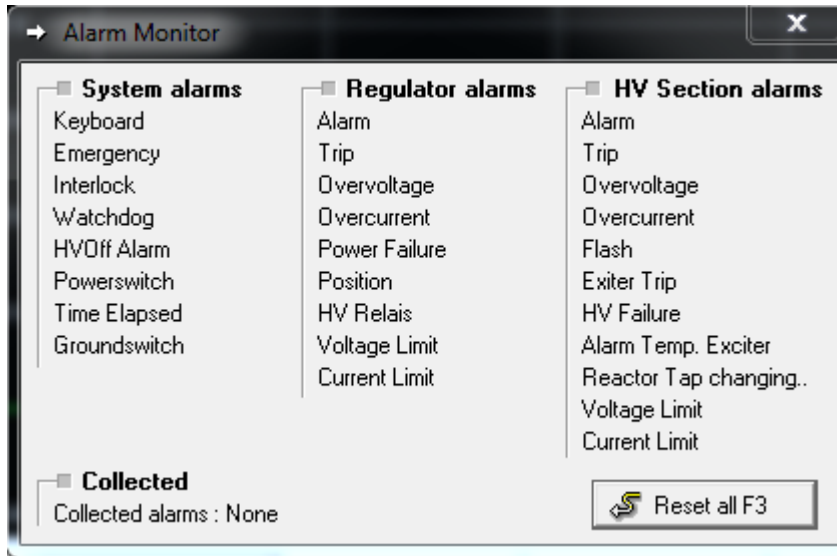
### 4.7.2.2 Period

Period specifies the time between two measurements.

### 4.7.2.3 Channel 2 fixed range

Channel two can be displayed with a fixed range. In normal mode the scale for both channels is ranged in order to have all measured values within the visible area of the scope. If channel two is set to fixed range it will not be ranged. The range can be entered absolutely and without unit.

## 4.8 Alarms



Alarm signals and system status are shown in this window. If the *Ready for high voltage* operating status cannot be reached, you can often find the difficulty in this window at a glance. Some of the status signals can be reset by pressing the "*Reset all*" button. The remaining status signals indicate the state of the system. They are automatically reset when the associated fault is eliminated.

### 4.8.1 System alarms

#### 4.8.1.1 Keyboard

This alarm indicates that no Keyboard is connected.

#### 4.8.1.2 Emergency

This signal is active as long as one or more emergency buttons are pressed. The main switch of the system is switched off. The then missing voltage supply can initiate other error signals. All emergency switches of the system must be deactivated before the system can be started up. You can switch on the main switch by pressing the *Ready* key for approximately five seconds.

#### 4.8.1.3 Interlock (Safety interlock)

This signal indicates an open interlock connection. The interlock connection loop must be closed to be able to switch on the high voltage.

#### Watchdog

This signal indicates software errors. The control system switches the high voltage off and sets the alarm signal to red. You can reset the signal with *Reset all F3*.



#### 4.8.1.5 HV Off Alarm

There is a collected alarm inside the GC96AC interface which can be set by any card (PCB) of this device. Try to reset the signal with *Reset all F3*. If this alarm does not reset please contact the supplier.

#### 4.8.1.6 Powerswitch

This alarm shows the main power switch status. This item shows normally yellow after starting up the software before having closed the power switch.

#### 4.8.1.7 Time Elapsed

The timer was started and has reached its time-out value. This signal indicates that the timer has carried out its function and that the control system has switched off the high voltage in the prescribed manner.

#### 4.8.1.8 Earth Switch

If the earth switch is closed with switched-on high voltage or opened for a switched off high voltage, then this alarm occurs. Due to the fact that the earth switch is an important safety element, the reason for this alarm indication should be investigated.

This alarm is only displayed if an earth switch is installed.

### 4.8.2 Regulator Alarms

#### 4.8.2.1 Alarm

This alarm is activated if the programmed maximum temperature (limit) of the regulating transformer is exceeded. If this happens, the high voltage is brought down to its minimum value and then switched off (Down & Off).

#### 4.8.2.2 Trip

As soon as this optional alarm (Buchholz relay) appears, the high voltage is immediately switched off. Gas in the regulation transformer resulting from heat or flashover causes this.

#### 4.8.2.3 Overvoltage

The regulation transformer voltage exceeded the *limit value*. The alarm can be reset with "F3".

#### 4.8.2.4 Overcurrent

The regulation transformer current exceeded the *limit value*. The alarm can be reset with "F3".

#### 4.8.2.5 Power Failure

*Power failure* is activated if the power switch is not switched on following a command from the control system.

#### 4.8.2.6 Position

A yellow condition indicates that the regulation transformer has reached one of the following states:

The regulation transformer is not at the lower limit stop, although the high voltage has been switched off or the regulation transformer is positioned at the upper limit stop.

As soon as a valid position has been reached or a possibly existing fault has been eliminated, the signal resets. This alarm cannot be reset with "F3".

#### **4.8.2.7 HV Relais**

If the high voltage is switched off by the control system, and the high voltage relay still signals high voltage, this alarm occurs.

#### **4.8.2.8 Voltage Limit**

The defined Voltage Limit of the Regulator is reached.

#### **4.8.2.9 Current Limit**

The defined Current Limit of the Regulator is reached.

### **4.8.3 High Voltage Section**

#### **4.8.3.1 Alarm**

This optional alarm is activated if the temperature in the high voltage transformer exceeds a programmed maximum limit. If this occurs, the high voltage will be brought to the minimal value and then switched off.

#### **4.8.3.2 Trip**

As soon as this optional alarm (Buchholz relay) appears, the high voltage is immediately switched off. Excessive gas pressure in the high voltage transformer resulting from heat or flashover causes this.

#### **4.8.3.3 Overvoltage**

The high voltage has exceeded the *limit value*. The signal can be reset with "F3".

#### **4.8.3.4 Overcurrent**

The output current exceeded the *limit value*. The alarm can be reset with "F3".

#### **4.8.3.5 Flash**

A high voltage flashover was electronically recognised by the measuring card and indicated with this signal. The signal can be reset with "F3". Before attempting to switch on the high voltage again, you should discover for the cause of the signal at the test object, system configuration or in the high voltage area.

#### **4.8.3.6 Exciter Trip**

The exciter voltage exceeded the *limit value*. The alarm can be reset with "F3".

#### **4.8.3.7 HV Failure**

This alarm occurs if you press the *Ready for high voltage* key and then you do not switch on the high voltage within 5 seconds. Alternately, the high voltage was not switched on, although the command was issued.

#### **4.8.3.8 Alarm Temp. Exciter**

This alarm is activated if the programmed maximum temperature (limit) of the exciter transformer is exceeded. If this happens, the high voltage is brought down to its minimum value and then switched off (Down & Off).

#### **4.8.3.9 Compensation changing**

While the compensation is changing this alarm will be show.

#### **4.8.3.10 Voltage Limit**

Defined voltage Limit of the HV section had been reached.

#### **4.8.3.11 Current Limit**

Defined current Limit of the HV section had been reached.

### **4.8.4 Collected Alarms**

This item is used for a collection of different alarms that are not clearly assigned to a section or are options; e.g. SoftHVOff, Limiters, Emergency, etc.

## 4.9 Setup

### 4.9.1 System setup

In the system setup window reachable over menu-point *Setup/System setup* the configuration is made and the data can be obtained there.

Reporting

#### System configuration

The screenshot shows the 'System Setup' window with the following callouts:

- Selection of the actual used connection.** Points to the 'Connection' dropdown menu.
- Information about the rated data of the actual connection.** Points to the 'Rated U = 10.00 kV Rated I = 10.00 A' text.
- Setting of the resonance mode for a RTS, if available.** Points to the 'Mode' section with radio buttons for 'Parallel' and 'Serial'.
- User interface language can be chosen here.** Points to the 'Language' dropdown menu.
- If Exciter Tap is available it can be switched here.** Points to the 'Exciter Tap' dropdown menu.
- Activate a beep signal on system alarms.** Points to the 'Warning Horn' section with radio buttons for 'On' and 'Off'.
- Flash detection can be switched permanent off.** Points to the 'Flash detection' section with radio buttons for 'Yes' and 'No'.

#### Connection (circuit variation)

Depending on the type of system, circuit variations can refer to the various reactor taps or connecting of individual modules.

*Modules* normally have to be switched manually. The momentary circuit variation of the system has to be selected from this display line.

*Tank versions* have taps that are mechanically set using motors. For such systems, the selected *circuit variation* is automatically set with the motors. If the tap is between positions, a message *changing* appears under the circuit variation.

## Exciter Tap

If there is a motor operated Exciter here the Tap can be chosen. In the case of a Compensated system here the Capacity level can be chosen,

## Error bell

Alarm or error messages are supported acoustic if *Error bell* is activated. This function allows you to do other work while long tests are in progress. You will hear a signal as soon as the high voltage is switched off.

## Language

Here various languages for the user interface can be selected online.

## Mode

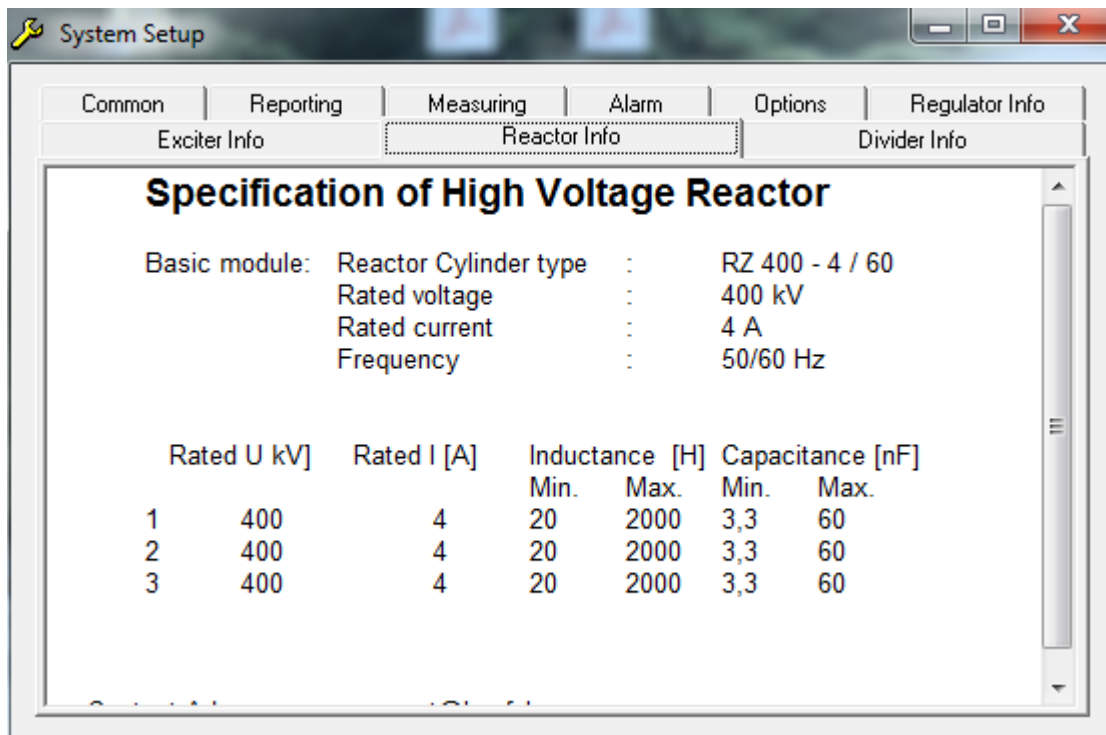
Select *Serial* or *Parallel* for the used resonant circuit mode. If your system does not offer both variations, this field cannot be changed. This line does not exist for AC systems.

## Flash Detection

Here the Flashdetection can be switched permanent On or Off. This is just an Option, which is not always available.

## 4.9.2 System data

### Reactor Info



**Specification of High Voltage Reactor**

Basic module: Reactor Cylinder type : RZ 400 - 4 / 60  
Rated voltage : 400 kV  
Rated current : 4 A  
Frequency : 50/60 Hz

	Rated U [kV]	Rated I [A]	Inductance [H]		Capacitance [nF]	
			Min.	Max.	Min.	Max.
1	400	4	20	2000	3,3	60
2	400	4	20	2000	3,3	60
3	400	4	20	2000	3,3	60

## Exciter Info

**Specification of Exciter Transformer**

Exciter type : EK 80 - 200  
 Frequency : 50/60 Hz  
 Primary Voltage : 2 x 380 V  
 Primary Current : 2 x 330 A  
 Rated Power : 200 kVA  
 Duty at rated current ONAN : continuous  
 Duty at 1.5 \* rated current ONAN: 30 min On / 60 min Off  
 4 times / day

	Rated U [kV]	Rated I [A]	Rated Power [kVA]
Tap 1	75	4	200
Tap 2	38	8	200
Tap 3	5	8	42

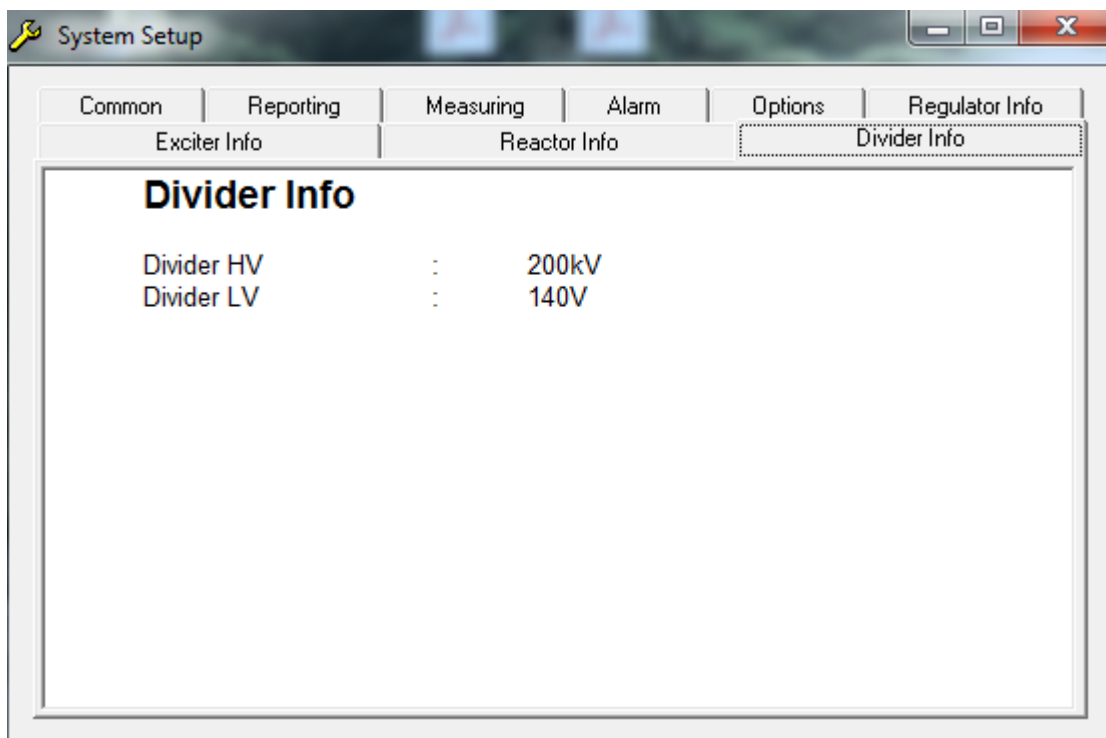
## Regulating Transformer Info

**Specification of Regulating Transformer**

Regulator type : STO 200  
 Rated Power : 0 - 200 kVA  
 Primary voltage : 400 V  
 Primary current : 500 A  
 Secondary voltage : 0 - 1000 V  
 Secondary current : 200 A  
 Frequency : 50/60 Hz  
 Rate of rise : 60 .. 300 s

Duty at rated power ONAN : continuous  
 Duty at 250 kVA ONAN : 30 min On / 60 min Off  
 4 times/day

## Divider Info



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## 4.10 Calibration

### 4.10.1 General

The measured values output voltage, output current, exciter voltage, current (if available), regulating transformer voltage, current and gap distance (if available) are transduced to a voltage 0 - 10 V (0 - 150 V for the output voltage). The control software recalculates the actual value by multiplying this voltage by a calibration factor. In order to get a correct measurement and display of the values this calibration factors have to be set initially.

This initial setup is done by HAEFELY during the system tests. In normal lifetime of the test equipment there is no modification of these factors required. A re-calibration becomes necessary if one of the transducing units (measuring divider, Regulating transformer voltage divider...) is changed.

For security the calibration dialog is protected by a password.

The screenshot shows a software window titled "Calibration Values". It contains several input fields and a table:

- Regulator voltage: 78.1474 V/V
- Regulator current: 244.9732 A/V
- Exciter Voltage: 1.0000 kV/V
- Output current: 0.3456 A/V
- Out. volt. divider table:
 

Conn.	Div.	Cal. (OT257) [kV/V]
1	0.0053	0.0047
2	0.0053	0.0047
- Gap distance reference voltage section:
  - Maximum distance: 0.3149 V
  - Minimum distance: 9.9976 V
  - Gap voltage: 10.00 V

## 4.10.2 Calibration procedure

For a new calibration an external measuring device to measure the calibration value is needed. (A calibrated voltage divider with a voltage measuring unit or a calibrated current measuring unit or something equivalent).

Execute a new measurement of the desired calibration value. You get a „Measured Value“ and a value from the system „OT257 Value“


To get the new calibration factor, the old calibration factor is multiplied by the measured value and divided by the OT257 value.

$$New\_Factor = \frac{Old\_Factor * Measured\_Value}{OT257\_Value}$$

To recalibrate the gap distance measurement on a Resonant Test System - run the gap drive into its minimum position and push the *Mark* button for the minimum voltage, then run the drive into its maximum position and push the *Mark* button for the maximum voltage.

The control then calculates the new calibration factor by itself.

**After a successful re-calibration - Save the new setup!**

 *A wrong calibration results in a wrong measurement of the corresponding value. In case of the output voltage that can cause damage to your test object.*



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## 4.11 Measurement

### 4.11.1 Measurement Values

The top left part of the window displays the various measurements. Only those measurements available from the system are displayed. Which values are displayed vary depending on the configuration.

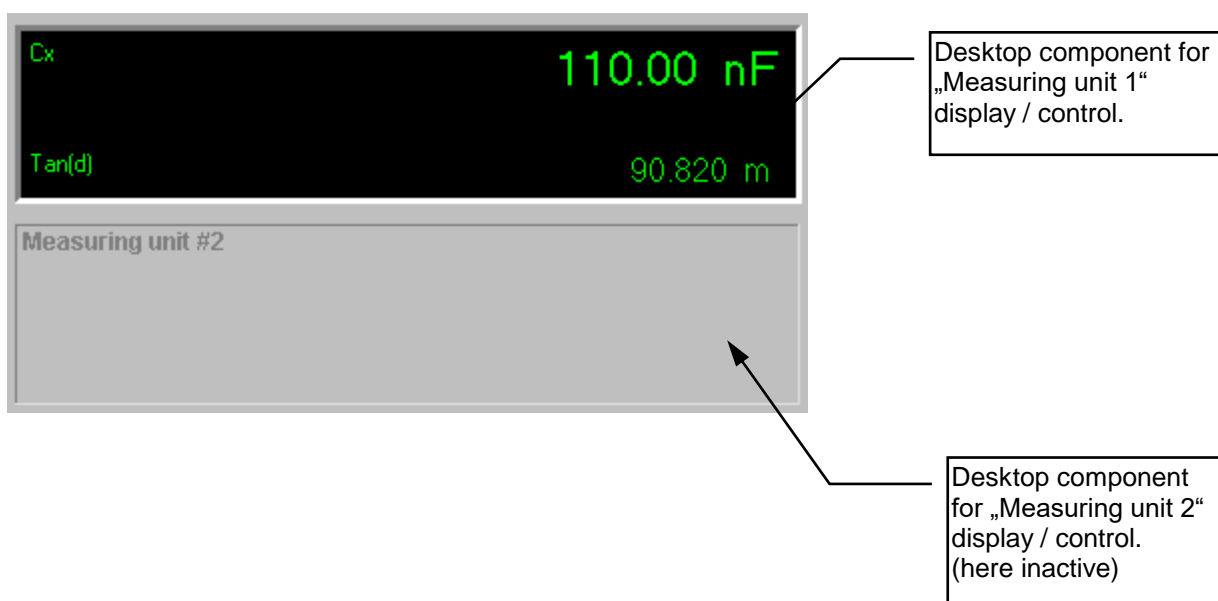
The *output voltage* or *high voltage* field is always shown. It displays the current value of the output voltage [kV], the measuring mode [RMS or Peak/Sqrt2] and the maximum possible high voltage [kV]. The maximum high voltage corresponds to the *output limit* value. A double click onto the mode display changes the measuring mode.

The inductance window is only displayed for RTS systems. The *Resonance Test System* can be adjusted using the bar indicators. When adjusted to resonance, the *pointer* is positioned in the centre of the bar and the regulating transformer current is at the lowest possible value for the connected load (test object). The function of resonance systems is described in detail in the associated handbooks.

Other fields display the output current, the exciter voltage, the regulating transformer voltage and the regulating transformer current.

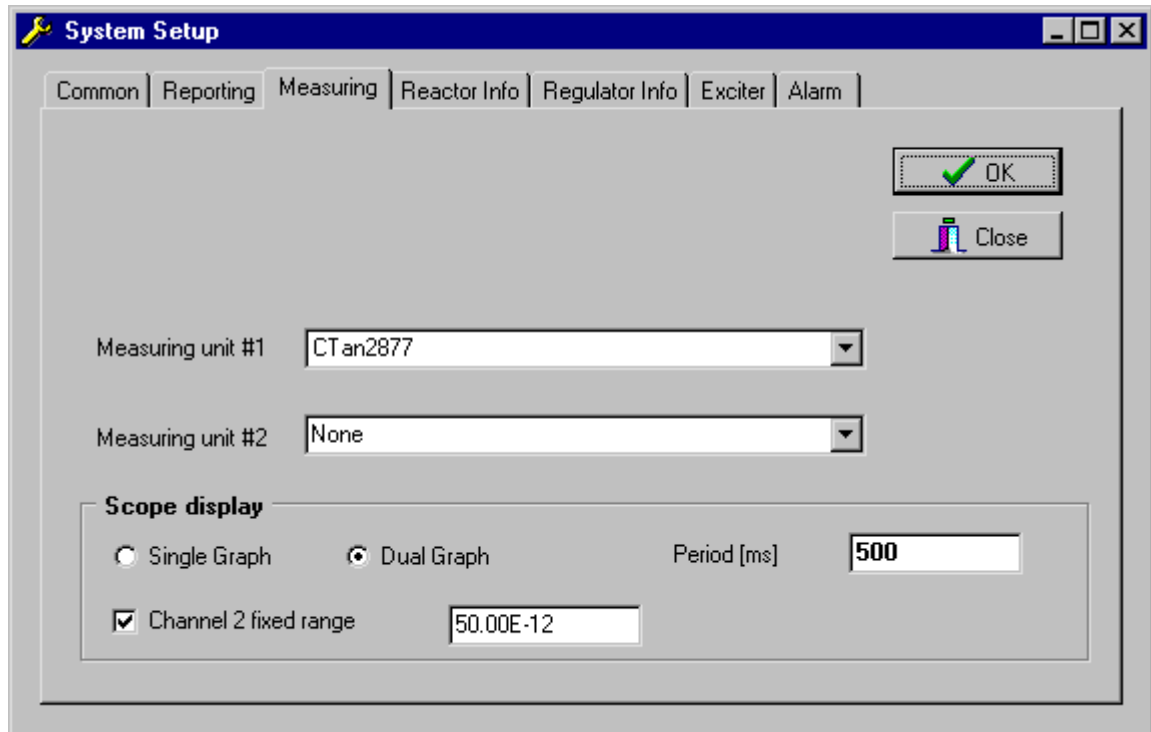
### 4.11.2 External measuring units

To connect external measuring units the OT257 provides an interface to a device implemented as ActiveX or a Visual Basic Script component. Two devices can be supported and they can be implemented independent on each other.



### 4.11.3 Configuring external measuring units

To configure and activate an external measuring unit you have to enter the .Vbs file name or the ActiveX library- and component name of the unit in the set up menu “Measuring”.



The supported measuring units are listed in the file ACPVMDData.ini in the Windows directory. There the software looks up the name of the unit and its VBS file name or ActiveX component name. To add a new measuring unit it has to be specified in the file ACPVMDData.ini. Then it can be selected in the dropdown list of the setup menu.

 *The name of the component is written in the Readme.txt file of each component.*

### 4.11.4 Measuring unit as ActiveX

The ActiveX interface contains a desktop place holder to display the unit and its surface and several function calls to control the unit. The component has its own surface it and can display what ever it wants.

To control the measuring unit the following function calls are provided and required:

**SetSize([in] int Left, [in] int Top, [in] int Width, [in] int Height)**

The function SetSize is required to match the ActiveX component into its place holder. At program start the component is allocated dynamically and its size and parent is set.

**SetParent( [in] OLE\_HANDLE ParentHandle)**

When the component is allocated, its parent must be set.

**OnUpdate**

Update is called periodically to read the measuring value from the unit and update the display of the desktop component. It should send the request for the measured data to the unit and receive its answer. The received value is then sent to the control via Com-interface.

**OnAlarm**

In case of an alarm the control calls the function OnAlarm. Here the measuring unit can handle an alarm. If necessary the exact reason for the alarm can be got via Com-interface.

**OnReady**

When the system is brought into ready state, it calls OnReady. Here the measuring unit can be started or it can get a notification for any purpose.

**OnHVOn**

OnHVOn is called when high voltage is switched on.

**OnHVOff**

OnHVOff is called when high voltage is switched off.

**OnPowerOn**

OnPowerOn is called when the primary power breaker of the regulator is closed.

**OnPowerOff**

OnPowerOff is called when the primary power breaker is opened.

**OnTrip**

OnTrip is called in case of a voltage or current trip.

**MeasVal( [in] int Count, [out] double\* Value)**

A measuring unit can provide more than one measuring value (C,  $\tan(\delta)$ , U, I..). Therefore the variable Count is required. The unit provides a list of its measurement values, units and names. The control itself only needs the first value (Count = 1). The values should be scaled and the scale factor (m,u,n,p..) should be in the unit.

**MeasUnit( [in] int Count, [out] BSTR\* Value)**

The measuring unit contains the measuring unit (F for Farad, V for Volt...) and the scale factor (m for Millie, n for Nano...)

**MeasText( [in] int Count, [out] BSTR\* Value)**

The measuring text is the title of the measurement („Capacitance“, „Resistance“, „Voltage“..)

**CtrlCmd([in] int Command, [in, out] double \* Argument );**

Carry out a control command depending on the individual Measuring Unit.

---

## 4.12 Reporting

### 4.12.1 General

There are several possibilities to create reports of a performed measurement.

Together with the Control Software a reporting tool is provided. This reporting tool creates a report from a .CSV (comma separated values) file created by the control software.

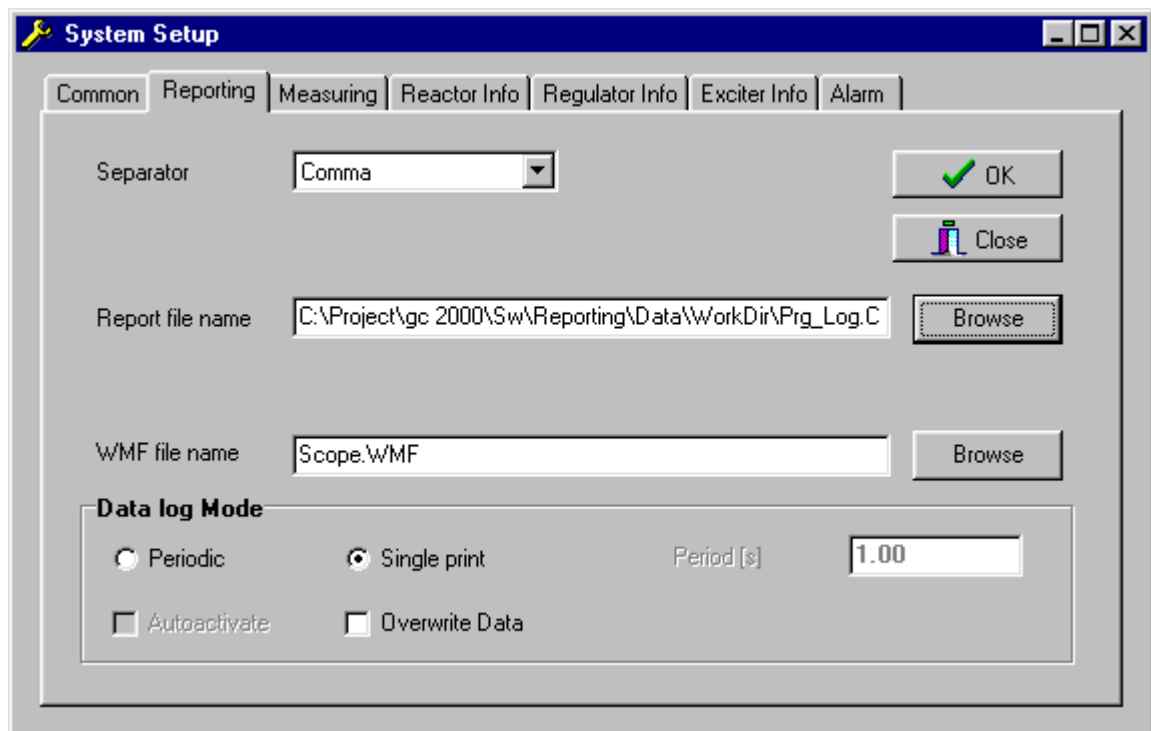
An Excel or Word application can use the COM interface to read data direct from the control software and enter it into a report.

You can import the .CSV file created by the control software into an Excel or Word application and fill the data from there into your report.

### 4.12.2 Storing test data into a .CSV file


In order to save data during a test you can store all the significant values of the system into a .CSV file (comma-separated-values).

In the reporting setup window (menu *Setup/System setup*, folder *Reporting*) all settings related to the data storage and reporting can be set.



#### 4.12.2.1.1 Separator

The separator sign in the .CSV file separates the single values from each other.

 *The reporting tool requires a comma as separator. An English MSOffice requires a comma, but a German MSOffice a semicolon to import data from a .CSV file.*

#### 4.12.2.1.2 Report file name

Enter the file name of the .CSV file for the reporting here. By the usage of the Browse button a file open dialog will open to browse through the work space.

#### 4.12.2.1.3 WMF file name

Enter the file name of the windows-meta-file (.wmf) for the reporting here. By the usage of the Browse button a file open dialog will open to browse through the work space.

#### 4.12.2.1.4 Overwrite Data

If overwrite Data is active the Data File will be destroyed a new file will be created. In this mode Test Data is always written in the same File. Please note: You have to save the Data of the last Test before starting a new one. Otherwise Data gets lost.

If overwrite Data is not active then new Data will be appended to the Data file if it exists already.

#### 4.12.2.1.5 Data log mode

Select the printing mode *Periodic* or *Single print* here. If *Period* is selected the log period in [s] can be entered.

If *Autoactivate* is selected, the periodic data logging is started automatic at program start.

For short term routine testing it is convenient to take only one or a few single shots at certain



Test conditions. Select data log mode *Single print* and take one single shot by pressing the *single shot button* in the toolbar.

For long time testing it might be more convenient to let the system store data by itself. In this case select data log mode *Periodic* to let the control automatically take a shot each *Time periode*. To prevent the .CSV file from becoming too big you can limit its *maximum file size*. If the actual .CSV file exceeds the maximum file size it will be saved under a name *OldRepX.csv* with X as a number increased each time a new file is created.

The periodic reporting is active only if HV is on. To start the reporting automatically at program start select *Autoactivate*.

After pressing the OK button in the setup dialog the reporting is activated immediately.



To pause the automatic reporting, press the *stop data log button* in the toolbar.



To activate the automatic reporting, press the *start data log button* in the toolbar.

#### 4.12.2.1.6 Content CSV file

In the .CSV file the following data is stored:

- The actual date
- The actual time
- Output voltage
- Output current
- Regulator voltage
- Regulator current
- Exciter voltage (0 if not available)
- Value of Measuring unit 1 (0 if not available)
- Value of Measuring unit 2 (0 if not available)

(The first two identifiers „FileNr“ and „ReportFlag“ in the first row are for internal use only)



To start the reporting tool press the generate report button or over menu  
*Report/Generate Report*



*For description of the reporting tool please refer to its manual.*


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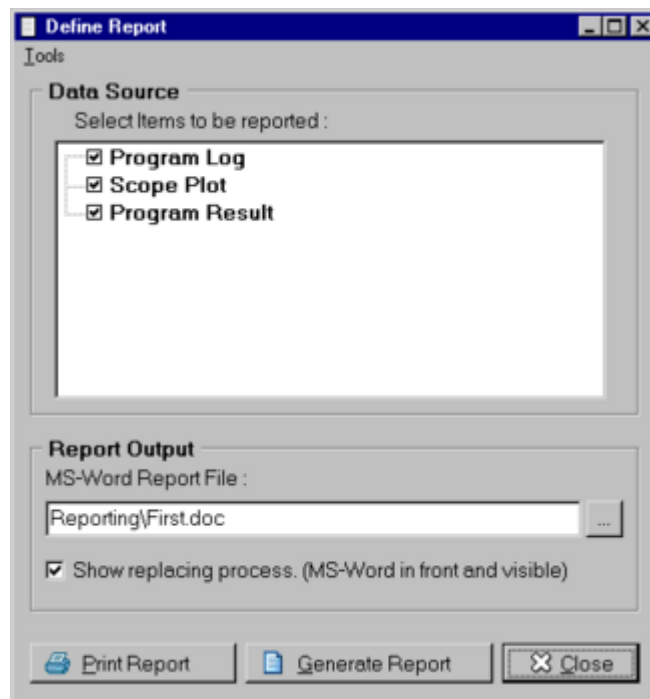
## 4.13 Report generator

### 4.13.1 General

The OT257AC software supports reporting with Microsoft Word. The logged data can be printed in a Word document in a data table. The design of the report can be defined in Word templates located in the folder `\Reporting\TemplateWorkDir` in the program directory of the OT257AC software.

### 4.13.2 Report generation

In the menu *Report/Generate Report* or **Ctrl+C** or  a Dialogue for the generation of the report is opened.



#### 4.13.2.1.1 Data source

A report consists of 4 templates: The main template `Main1.dot` that contains the company logo, the program log template `ProgLog.dot` with the measuring data in a data table, the Scope Plot `Scope.dot` and the program result template `ProgResult.dot` with test results and the name of the tester. The main template is always active. The other tree's can be activated or deactivated by a single click into the check box.

#### 4.13.2.1.2 Report Output

In this field the folder and the name of the report can be defined.

## 4.14 Sequences and Macros

### 4.14.1 General

The sequence tool of the OT257 allows the control to perform complicate test procedures fully automatic. Test procedures can be programmed, stored and recalled at a later moment again. The basic functions of the system are already built-in in the sequence tool. Other sophisticated functions can be programmed in Visual Basic Script and executed by the sequence tool.

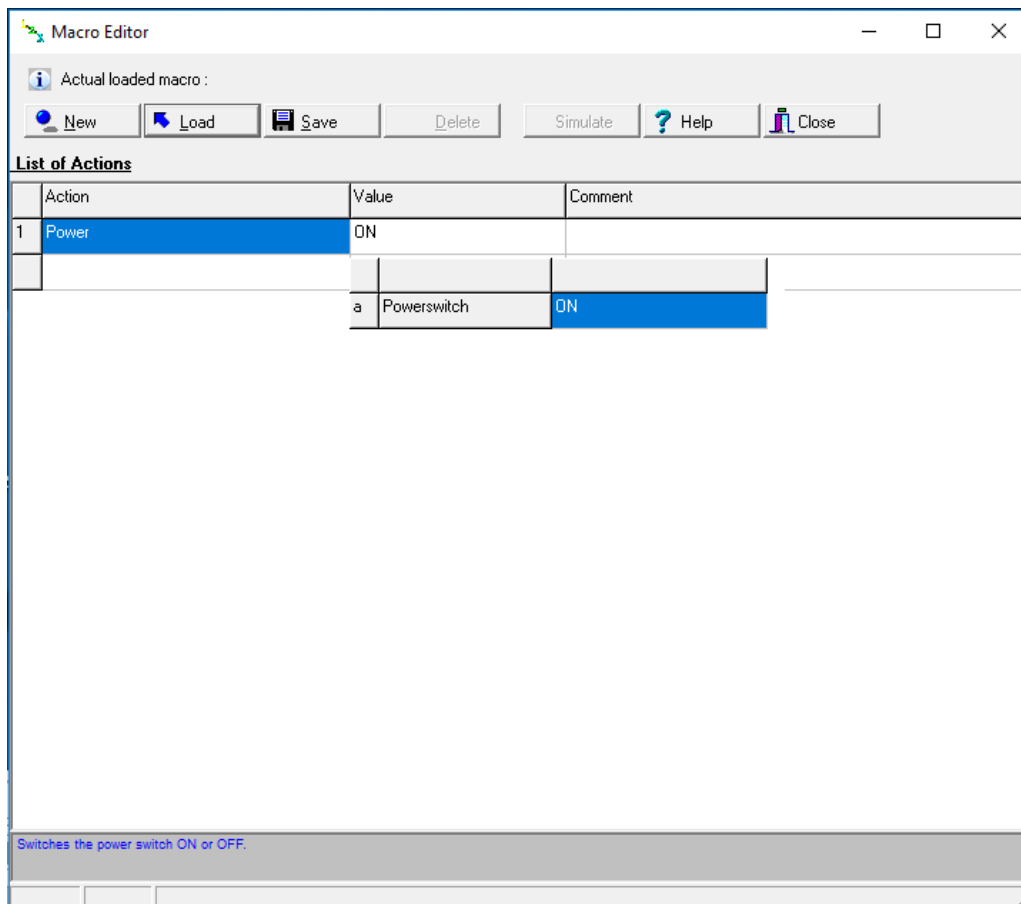
### 4.14.2 Editing macros

Use the macro editor in the menu *Automation / Edit Macro*. The macro editor contains an easy to use table with one editable command per line.








Each line contains:

- Step number
- Command
- Parameter to the command
- Comment

A popup menu shows the possible parameters to the command



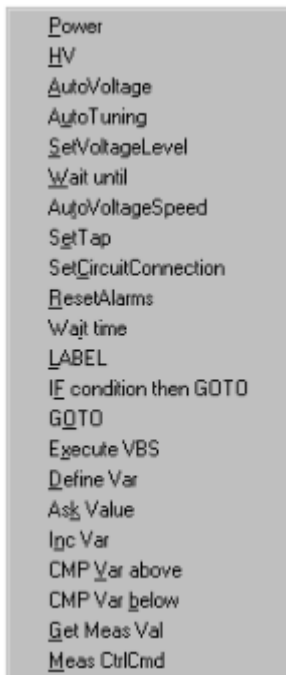


 New	New clears the table contents
 Load	Load opens a file open dialog to load a new macro
 Save	Opens a file save dialog to save the current macro
 Delete	Deletes the actual macro file
 Simulate	Simulates the macro without affecting the hardware
 Help	Opens the Help
 Close	Closes the Window


### 4.14.2.1 Creating a macro

To create a macro, proceed as follows:

1. Open the macro editor.
2. Click on the small arrow button in the command field of the first line in the command table. That opens a popup menu with all possible commands.



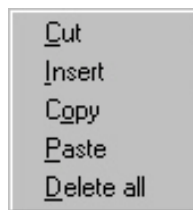
3. Choose one of the commands. That opens the popup menu with the possible parameters for this command.

	Argument name	Value
a	Unit for rising speed	kV/s 
b	Value for rising speed	

4. If there is a predefined parameter required for the command that is shown by a small arrow button in the value field of the parameter. Enter all the required parameters.
5. To add a next command just click in the command field of the next line and restart at point 2

#### 4.14.2.2 Modifying a macro

To modify an existing macro, just click with the left mouse button on the line. That opens a popup menu:



##### **Cut**

deletes the current line, but saves the contents in a buffer.

##### **Insert**

creates a new line and inserts it at the current point.

##### **Copy**

saves the contents of the current line in a buffer

##### **Paste**

inserts the contents of the buffer into the current line.

##### **Delete all**

deletes the complete table.

#### 4.14.2.3 Saving a macro

Press the *save* button. That opens a file save dialog where you can browse the workspace and save the macro under an own name. It will be stored with the extension *.mac*.

#### 4.14.2.4 Load a macro

Press the *load* button. That opens a file open dialog where you can browse the workspace to find the desired macro.

#### 4.14.2.5 Deleting a macro

To delete the current sequence press the *delete* button.



**Caution! The macro file on the hard disk will be deleted**

#### 4.14.2.6 Simulating a macro

Before you run a new macro on your test system you should check whether it does what it is supposed to do or not. To check the macro it can be simulated without affecting the hardware. Clicking the *simulate* button simulates the current macro. That means the commands of the macro are interpreted regarding timing and output values. But no command is carried out on the hardware.

#### 4.14.3 System functions

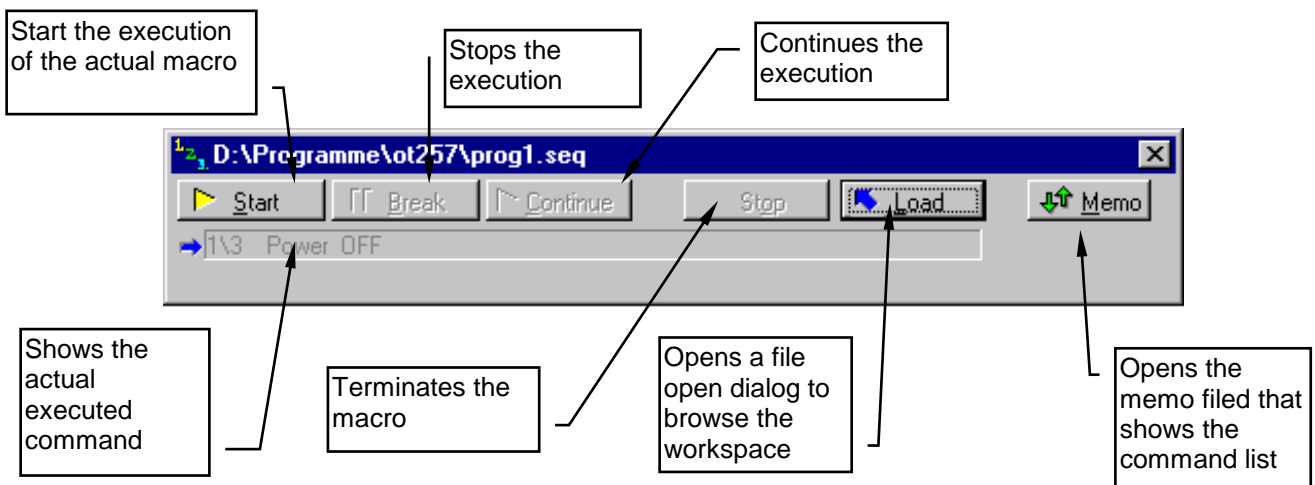
System functions are control related built in functions which can be used directly in a makro.

Function	Parameter	Parameter Value	Description
Power	A	Off On	Switches the power breaker off or on
HV	A	Off Ready On	Sets the system into High Voltage Off, Ready or On mode
AutoVoltage	A	Off On	Switches auto voltage off or on
AutoTuning		Off On	Switches auto tuning off or on
Set Voltage Level	A	Value	Sets the reference voltage for auto voltage
Wait until	A	Tuned Stabilised	Waits until the system is tuned into resonance or has reached the reference voltage in auto voltage mode
Set Auto Voltage Speed	A B	Value %/s kV/s	Set the rising speed for auto voltage
Set Tap	A	Value	
Set Cricuit Connection	A	Value	
Reset Alarms			Resets all alarms
Wait time	A	Value	Waits for the pre-set time
Label	A	String	
Goto	A	String	
If .. then goto ..	A  B	Flash Trip Out Volt Trip Exc Volt Trip Reg Volt Trip Reg Curr Jump Flag Label	Jumps to Label if the relating event has occurred Jump Flag is set according to the function CMP Below Var or CMP Above Var
Execute VBS	A B	Filename Routine	Loads a VBS file and executes the routine in it
Define Var.	A B	Variable. Name Initial Value	Defines a floating point Variable
Ask Value	A B	Dialog Text Variable. Name	Shows a dialog box that allows for the input of a value. Dialog Text is displayed in the dialog box

Inc. Var.	A B	Variable Name Value	Increases a defined Variable by Value. Value can be negative to decrease the Variable.
CMP Var above.	A B	Variable Name Value	Compares a Variable with a given Value and sets the jump flag if Variable > Value
CMP Var.below	A B	Variable Name Value	Compares a Variable with a given Value and sets the jump flag if Variable < Value
Get Meas Val.	A B	Meas. Unit Nb. Variable Name	Reads the measured Value from the Measuring Unit Number
Meas. CtrlCmd	A B C	Maes. Unit Nb. Command Argument	Carries out a specific command in the Measuring Unit Number. The command depends on the individual Measuring Unit.

## 4.14.4 Executing a macro

To run a macro, select the menu *Automation/Run Macro*.



### 4.14.4.1 Loading a macro

To load a macro, press the *Load* button. That opens a file open dialog to browse the workspace.

### 4.14.4.2 Executing a macro

To execute a loaded macro press the *Start* button. The macro will be executed command by command and the actual executed command will be displayed in the status bar of the window.

### 4.14.4.3 Pausing a macro

To pause a macro while executing press the *Break* button. That stops the execution temporary and enables the *Continue* button.

### 4.14.4.4 Continuing a paused macro

To continue the execution of a paused macro, press the *Continue* button. That continues the execution at the command where the macro had been paused.

### 4.14.4.5 Stop a macro

To stop the execution of a macro, press the *Stop* button. That stops the execution of the macro, switches of High Voltage and resets the macro.

### 4.14.4.6 Show the commands of a macro

To show all commands of the actual loaded macro press the *Memo* button.

---

## 4.15 OLE

### 4.15.1 General

In order to provide certain flexibility in case of reporting or remote control functionality the control supports Object Linking and Embedding according to the Microsoft Component Object Model (COM). The interface IUnknown as well as IDispatch are supported and implement the same functions.

The library name is „ACS“, the coclass for the IUnknown interface is „CACControl“ and the coclass for the IDispatch interface is „ACControl“

#### 4.15.1.1 Functions

Via COM interface the control provides the following functions:

##### **Save([in] BSTR FileName )**

Save the current setup under FileName

##### **Load([in] BSTR FileName )**

Load a new setup from FileName.

##### **StartTimer( void )**

Starts the timer.

##### **StopTimer( void )**

Stops the timer.

##### **Timer([out, retval] int \* Value )**

Returns the state of the timer: 1 = running, 0 = stopped.

##### **TimerTime([in, out] int \* Hour, [in, out] int \* Minute, [in, out] int \* Second )**

Sets or returns the timer time. If all values are < 0 then the actual setting is returned in the parameters Hour, Minute and Second..

##### **SetHVOn( void )**

Switches High Voltage On.

##### **SetHVOff( void )**

Switches High Voltage Off

##### **SetReady( void )**

Brings the system into Ready state.

##### **SetPowerOn( void )**

Switches Power On: Closes the primary power breaker.

##### **SetPowerOff( void )**

Switches Power Off: Opens the primary power breaker.

**ResetAlarms( void )**

Resets all Alarms.

**RS232Open([in] int DevNr, [in] int Port, [in] int Baudrate, [in] int Databits, [in] int Stopbits, [in] BSTR Parity, [in] BSTR Protokol, [in] BSTR Eos, [in] int Timeout )**

Opens a RS232 Port. The control handles 4 devices which can be RS232 or IEEE488 Ports. They are handled by their Device number DevNr. The function RS232Open opens a new device with the number DevNr on Com1 if Port = 1 to Com4 if Port = 4 with Baudrate, Databits, Stopbits as integer parameters, Parity as string („ODD“, „EVEN“, „NONE“), Protokol as string („XONXOFF“, „RTSCTS“, „NONE“), Eos as string („CRLF“, „CR“, „LF“) for the end of sequence sign and Timeout as integer in Millie Seconds.

**IEEEOpen([in] int DevNr, [in] int Address, [in] BSTR Eos, [in] int Timeout )**

Opens a IEEE488 Port with DevNr as integer, Address as integer for the IEEE device address, Eos as string („EOILF“, „EOI“) and Timeout as integer in Millie Seconds.

**PortSend([in] int DevNr, [in] BSTR Value )**

Sends a string via port DevNr.

**PortReceive([in] int DevNr, [out, retval] BSTR \* Value )**

Receives a string from port DevNr.

**GetMeasVal([in] int DevNr, [out, retval] double \* Value )**

Read the measuring value of the measuring device DevNr and returns it in Value.

**SetMeasStr([in] int DevNr, [in] BSTR Value )**

Sets the measuring value for measuring device DevNr. The Value is a string. This function is required only for a measuring unit implemented in Visual Basic Script. Visual Basic Script seems to have its problems handling double values.

**SetMeasName([in] int DevNr, [in] BSTR Value )**

Sets the measurement name of the measuring device DevNr. This function is required only for a measuring unit implemented in Visual Basic Script.

**SetMeasUnit([in] int DevNr, [in] BSTR Value )**

Sets the measuring unit of the measuring device DevNr. This function is required only for a measuring unit implemented in Visual Basic Script.

**SingleShot( void )**

Writes one single line in the report file.

**StartReporting( void )**

Starts the permanent reporting. Each Timeout one line is written into the report file

**StopReporting( void )**

Stops the permanent reporting.

**ReportTimeout([in] int Value )**

Sets the timeout for the permanent reporting.

**RunRegDriveUp([in] int HighSpd );**

Starts the Regulator drive to increase the voltage. Is HighSpd = 1 the drive runs fast, is HighSpd = 0 the drive runs slow.

**RunRegDriveDown([in] int HighSpd );**

Starts the Regulator drive to decrease the voltage. Is HighSpd = 1 the drive runs fast, is HighSpd = 0 the drive runs slow.

**RunGapDriveInc([in] int HighSpd );**

Starts the Gap drive to increase the inductance. Is HighSpd = 1 the drive runs fast, is HighSpd = 0 the drive runs slow.

**RunGapDriveDec([in] int HighSpd );**

Starts the Gap drive to decrease the inductance. Is HighSpd = 1 the drive runs fast, is HighSpd = 0 the drive runs slow.

**StopRegDrive( void );**

Stops the Regulator drive.

**StopGapDrive( void );**

Stops the Gap drive.

**IncComp( void );**

Switches the compensation (if available) of an AC test set to the next higher step. This command is active only with HV off.

**DecComp( void );**

Switches the compensation (if available) of an AC test set to the next lower step. This command is active only with HV off.

**SetComp([in] int Value );**

Sets the compensation (if available) of an AC test set to the in Value specified step. This command is active only with HV off.



## 4.15.2 Properties

### Visible([in] int Value)

Shows or hides the main Window.

### OutVoltageRMS([out, retval] double \* Value )

Returns the RMS output Voltage.

### OutCurrent([out, retval] double \* Value )

Returns the output Current.

### RegVoltage([out, retval] double \* Value )

Returns the output Voltage of the regulating transformer.

### RegCurrent([out, retval] double \* Value )

Returns the output Current of the regulating transformer.

### ExcVolt([out, retval] double \* Value )

Returns the output voltage of the Exciter Transformer (if available).

### OutVoltagePeak([out, retval] double \* Value )

Returns the output Peak Voltage.

### HV([out, retval] int \* Value )

Returns the High Voltage state: 1 = HV On, 0 = HV Off.

### Power([out, retval] int \* Value )

Returns the Power On state: 1 = Power is On, 0 = Power is Off.

### Alarm([out, retval] int \* Value )

Returns the Alarm state bit coded:

Bit	Value		Alarm
0	1	=	HV On
1	2	=	Emergency
2	4	=	Power On failure
3	8	=	Output Voltage trip
4	16	=	Output Current trip
5	32	=	Regulator Voltage trip
6	64	=	Regulator Current trip
7	128	=	Flash
8	256	=	Timer elapsed
9	512	=	Watchdog
10	1024	=	Interlock

### Ready([out, retval] int \* Value )

Returns the Ready state: 1 = Ready, 0 = not ready.for High Voltage On

### OutVoltTripVal([out, retval] double \* Value )

### OutVoltTripVal([in] double Value )

Sets or returns the output Voltage trip value.

**OutCurrTripVal([out, retval] double \* Value )**

**OutCurrTripVal([in] double Value )**

Sets or returns the output current trip value.

**ExcVoltTripVal([out, retval] double \* Value )**

**ExcVoltTripVal([in] double Value )**

Sets or returns the exciter voltage trip value. This function is required only on systems equipped with an exciter transformer.

**SetTime([out, retval] double \* Value )**

**SetTime([in] double Value )**

Sets or returns the timer time.

**TimeScale([out, retval] BSTR \* Value )**

**TimeScale([in] BSTR Value )**

Setr or returns the timer scale as string („Sec“,“Min“,“Hour“);

**Emergency([out, retval] int \* Value )**

Returns the state of the Emergency switch, Alarm:1 = Emergency Alarm, 0 = No Emergency Alarm.

**Interlock([out, retval] int \* Value )**

Returns the state of the interlock: 1 = Interlock is open, 0 = Interlock is closed.

**PowerFail([out, retval] int \* Value )**

Returns the state of the Power switch, Alarm: 1 = Power is Off, 0 = Power is On.

**HVFail([out, retval] int \* Value )**

Returns the state of the HV On failure Alarm: 1 = HV On failure, 0 = HV On succeeded.

**RegPosition([out, retval] int \* Value )**

Returns the state of the Regulator position. If HV is Off: 1 = Regulatur not in minimum position, 0 = Regulator in minimum position.

**OutVoltTrip([out, retval] int \* Value )**

Returns the state of the output Voltage trip Alarm. 1 = output Voltage tripped, 0 = output Voltage not tripped.

**OutCurrTrip([out, retval] int \* Value )**

Returns the state of the output Current trip Alarm. 1 = output Current tripped, 0 = output Current not tripped.

**ExcVoltTrip([out, retval] int \* Value )**

Returns the state of the exciter Voltage trip Alarm. 1 = exciter Voltage tripped, 0 = exciter Voltage not tripped.

**RegVoltTrip([out, retval] int \* Value )**

Returns the state of the regulator Voltage trip Alarm. 1 = regulator Voltage tripped, 0 = regulator Voltage not tripped.

**RegCurrTrip([out, retval] int \* Value )**

Returns the state of the regulator Current trip Alarm. 1 = regulator Current tripped, 0 = regulator Current not tripped.

**ReactorTapChanging([out, retval] int \* Value )**

Returns the state of the HV reactor tap changer if available: 1 = reactor is tap changing, 0 = reactor tap changer is in position.

**ExcTapChanging([out, retval] int \* Value )**

Returns the state of the Exciter tap changer if available. 1 = exciter is tap changing, 0 = exciter tap changer is in position.

**TimerElapsed([out, retval] int \* Value )**

Returns the state of the of the timer elapsed Alarm: 1 = timer elapsed, 0 = timer not elapsed.

**TimerValue([out, retval] int \* Value );**

Returns the actual value of the count down timer in seconds.

**Flash([out, retval] int \* Value )**

Returns the state of the Flash detector: 1 = Flash detected, 0 = no Flash.

**AutoVoltage([out, retval] int \* Value )****AutoVoltage([in] int Value )**

Sets or returns the state the Auto Voltage mode: 1 = Auto Voltage is on, 0 = Auto Voltage is off.

**RefVoltage([out, retval] double \* Value )****RefVoltage([in] double Value )**

Sets or returns the Auto Voltage set Voltage.

**AutoTuning([out, retval] int \* Value )****AutoTuning([in] int Value )**

Sets or returns the state of the Auto Tuning mode: 1 = Auto Tuning is on, 0 = Auto Tuning is off.

**AutospeedUnit([out, retval] int \* Value )****AutospeedUnit([in] int Value )**

Sets or returns the unit of the rise speed for the Auto Voltage mode: 1 = kV/s, 2 = %/s.

**AutoSpeed([out, retval] double \* Value )****AutoSpeed([in] double Value )**

Sets or returns the value of the rise speed for the Auto Voltage mode

**Stabilized([out, retval] int \* Value )**

Returns the state of the Auto Voltage stabilise function: 1 = set voltage has been reached, system is stabilised, 0 = set voltage has not yet been reached.

**Tuned([out, retval] int \* Value )**

Returns the state of the tuning in Auto Tuning mode. 1 = System is tuned in resonance, 0 = system is not yet tuned in resonance.

**Tuning([out, retval] double \* Value );**

Returns the state of the tuning in degrees as Phase angle. 0° equals tuned.

**MeasMode([out, retval] BSTR \* Value )**

**MeasMode([in] BSTR Value )**

MeasMode sets or returns the voltage measuring mode. Possible values are RMS and PEAK.

**Tap([out, retval] int \* Value )**

**Tap([in] int Value )**

Sets or returns the set tap on a parallel resonant test set. This function has no effect if HV is On or Power is Off.

**Connection([out, retval] int \* Value )**

**Connection([in] int Value )**

Sets or returns the set connection on a serial resonant test set. This function has no effect if HV is On or Power is Off.

**RegSpeedLow([out, retval] int \* Value )**

**RegSpeedLow([in] int Value )**

Sets or returns the set regulator low manual speed.

**RegSpeedHigh([out, retval] int \* Value )**

**RegSpeedHigh([in] int Value )**

Sets or returns the set regulator high manual speed.

**GapSpeedLow([out, retval] int \* Value )**

**GapSpeedLow([in] int Value )**

Sets or returns the set gap drive low manual speed.

**GapSpeedHigh([out, retval] int \* Value )**

**GapSpeedHigh([in] int Value )**

Sets or returns the set gap drive high manual speed.

**GapMotor([out, retval] BSTR \* Value )**

Returns the state of the gap drive motor as string: („GapStop“, „GapDec“, „GapInc“).

**GapPos([out, retval] byte \* Value )**

Returns the actual inductance in relation to the gap distance in %. 100 % = minimum air gap, Maimum Inductance. 0 % = maximum air gap, minimum Inductance.

**SysType([out, retval] BSTR \* Value );**

Returns the System type as String.

RZ :                   Zylinder type resonance test set.  
RK :                   Tank type resonance test set.  
ACComp :             AC test set with or without compensating reactor.

---

## 4.16 Remote control operation

### 4.16.1 General

Using the remote control option, you can fully operate the OT257 by remote control via Windows socket on the LAN (local area network) interface.

This section first describes the basic characteristics of the built-in interfaces, the command syntax and the data format. Then detailed information is given about the registers and commands made available for remotely controlling the OT257

### 4.16.2 Command Syntax

The command syntax corresponds to that of the IEEE 488.2 standards. The following is an explanation of the terms, special characters and rules of syntax.

Terms, Characters	Explanation	Example
<EOS>	End character, sent as conclusion of a transmissions or serves to recognise the end of a transmission	Depends on the interface settings
Command header	Specifies the command to be executed.	
Argument	Contains the value to be input; can be transferred in various formats (also see the "Data Format" section.	
<SPACE>	Separates the command header from the argument.	
Command	Command header and argument together.	
:	Separates command headers from one another.	
,	Separates arguments from one another.	
?	Attached to the command header for interrogating an argument	
;	Separates individual commands from one another.	
Command sequence	Several commands one after another.	
' or "	Marks the beginning and the end of a string argument.	

" or ""	Immediate repetition of the ' or " character in a string argument. Accepts the character in the string without the argument being taken as closed.	
---------	--	--

The OT257 AC can process command sequences, whereby only one query is allowed per sequence which must be positioned at the end of the sequence.

You can transmit upper and lower case letters when transmitting command headers and arguments.

### 4.16.3 Data Format

All numerical input and outputs are in SI units (volts, amperes, ohms, V/V etc.). The following summary shows the formats used:

Format	Description	Examples
<NR1>	Whole numbers	1, -8
<NR2>	Real numbers	1.4, -3.64
<NR3>	Real numbers with exponents	1.56E+1, -1.67E-12
<String>	Character sequences without CR (ASCII 13)d LF (ASCII 10). Also see the "Command Syntax" section	'Test character sequence'
<ARBITRARY ASCII RESPONSE DATA>	Character sequences of indefinite length, closed by the end character.	abcdefg.....zzzzzz and even more<EOS>
<DEFINITE LENGTH ARBITRARY BLOCK RESPONSE DATA>	Data byte sequence with definite length, closed with the end character	#10 0123456789<EOS>

### 4.16.4 Command Set

The commands available for remotely controlling the OT257 AC are summarised in the following sections.

Most of the commands have a short form and a long form. These are made clear by the selection of upper or lower case letters. The part of the command header written in upper case has to be transmitted so that the OT257 AC can recognise the command. The part of the command written in lower case letters can also be transmitted, but need not be. It serves to enhance understanding.

In general, queries can take place locally. However, most of the set operations have to be carried out using remote control operation.

The command tables give information about the allowable operations. An 'x' marked in a column means:

- LS setting or executing is allowed in local state operation,
- LA querying in local state operation is allowed,
- RS setting or executing in remote control operation is allowed,
- RA querying in remote control operation is allowed.

#### 4.16.4.1 General Commands

This section describes the “common commands” defined in the IEEE 488 standard as well as register queries and miscellaneous memory and loading commands.

			L S	L A	R S	R A	Commentary.
*IDN?	<ARBITRARY ASCII RESPONSE DATA>			x		x	Return of device identification in the format: <Companyname>, <Model>, 0, <Software-Version>, i.e., HAEFELY TEST AG, GC257 AC, 0, X.XX
*TST?	<NR1>			x		x	GC257 AC returns a '1' for unavailable or defective hardware, otherwise a '0'
*OPC?	<NR1>			x		x	If all pending operations have been carried out, then the answered returned is ASCII 31 ('1'). The GC257 AC always returns a '1' because all commands are processed strictly one after another.
*OPC			x			x	Sets the OPC bit in the ESR status register to True. Has no further effect on the GC257 AC
*CLS			x			x	Clears all registers
*STB?	<NR1>			x		x	Calls up and then deletes, with exception of the MAV bit, the contents of the status register masked by the service request enable.
*SRE	<NR1>					x	Sets the Service Request Enable Register and determines which events initiate an RQS/MSS when using the interface.
*SRE?	<NR1>			x		x	Returns the contents of the Service Request Enable Register.
*ESR?	<NR1>			x		x	Returns and then clears the contents of the Event Status Register.



ISR?	<NR1>			x		x	Returns and then clears the contents of the Internal Status Register
ISE	<NR1>					x	Sets the Internal Status Enable Register and determines which internal sequence should initiate a collective error.
ISE?	<NR1>			x		x	Returns the contents of the internal Status Enable Register.
CMR?	<NR1>			x		x	Returns and then clears the contents of the Command Error Register.
EXR?	<NR1>			x		x	Returns and then clears the contents of the Execution Error Register.
DDR?	<NR1>			x		x	Returns and then clears the contents of the Device Dependent Register.
QYR?	<NR1>			x		x	Returns and then clears the contents of the Query Error Register.
REN	Password			x		x	Switchover to remote control. If the remote password is defined it must be sent with this command.
GTL				x		x	Switchover automatic control.
SET?	<ARBITRARY ASCII RESPONSE DATA>				x	x	Returns the current settings of the GC257 AC.
HELP?	<ARBITRARY ASCII RESPONSE DATA>				x	x	Returns the available command headers.

#### 4.16.4.2 Commands for Controlling the System

There are commands that can be activated only for a switched on or switched off high voltage. The RHE (Remote High Voltage ON) and RHA (Remote HV OFF) columns give information about the necessary states of the system. If a command is executed in an incorrect state, bit 0 in the DDR Register is set.

Remark:

LA = Local Answer

RA = Remote Answer

LS = Local Set

RHE = Remote HV ON Set RHA = Remote HV OFF Set

Command header 1	Command header 2 or Arg.	Command header 3 or Argument	Arg.	L A	R A	L S	R H E	R H A	Commentary
HV HV?	OFF ON READY			x	x		x x x	x x x	Switches the high voltage on or off. Before switching on the system, the power switch must be switched on. In order to switch on the high voltage, the system must be in the READY state. The READY state may not last more than 5 seconds, otherwise the High Voltage Missing alarm is initiated. You can interrogate the state of the alarm with 'HV?' .
POWER POWER?	OFF ON			x	x		x	x	Switches the power switch on or off.
REFVoltage REFVoltage?	<Nx>			x	x		x	x	Sets or returns the target value of the voltage.
AUTO	VOLTage	OFF ON		x	x		x		Switches the automatic voltage selection on or off.
	TUNing TUNing	OFF ON		x	x		x	x	Switches the AutoTuning on or off.
	SPeeD	MODE MODE?	KVS PERC	x	x		x	x	KVS means kV/s, PERC percent /sec. relative to the selected voltage value.
		VALue VALue?	<nr1>	x	x		x	x	Sets the voltage speed of the automatic voltage selection.
STABilized?	NO YES			x	x				Voltage state. Indicates whether the voltage specified by REFVoltage has stabilised. AUTO:VOLT must be switched on.
TUNed?	NO YES			x	x				Indicates whether the system is tuned or if the resonance point has been reached. Only meaningful with AUTO:TUNing ON.
MEasMOde MEasMOde?	RMS PEAK			x	x		x	x	Switches the measurement mode to RMS or Peak/2

TAP TAP?	<N1>			x	x		x		Sets or returns the current voltage tap. This command is only available for RK types and must only be executed if the high voltage is switched off. The returned number corresponds to the possible taps of the System settings menu. If a value of 0 is returned, a tap position change is momentarily underway.
CONNECTION CONNECTION?	<N1>			x	x		x		Sets or returns the current switching variation. This command exists for RZ and AC system types only.
REGULATOR	PARAMS	Low Low?	<Nr1>	x	x		x	x	Sets the slow manual regulating transformer speed. Corresponds to the values that can be set in the 'Regulation Transformer Parameter' menu.
		High High?	<Nr1>	x	x		x	x	Sets the fast manual regulating transformer speed.
GAP	PARAMS	Low Low?	<Nr1>	x	x		x	x	Sets the slow manual inductance speed. Corresponds to the values that can be set in the 'Gap Parameter' menu.
		High High?	<Nr1>	x	x		x	x	Sets the fast manual inductance speed. Corresponds to the values that can be set in the 'Gap Parameter' menu.
	MOTOR MOTOR?	Stop Inc Dec		x	x		x	x	Sets or indicates the state of the air gap setting. INC increases the air gap; DEC decreases it. Stop generates no action.
	MANspeed	Low High		x	x		x	x	Sets the speed to operate the gap drive to low or high
	POSITION?	Min Mid Max		x	x		x	x	Indicates the current position of the air gap setting. MIN: minimum air gap MAX maximum air gap MID somewhere between.
TIMER	TIME TIME?	<N1>, <N1>, <N1>		x	x		x	x	Sets or returns the timer setting in the format <Hours>, <Minutes>, < Seconds>. Call TIMER

	STATus STATus?	OFF ON		x	x		x	x	Activates or deactivates Timer. The Timer automatically starts counting down upon reaching the voltage. It can be stopped with this command or restarted.
COMPensation	Inc Dec			x	x		x		On a AC Test system with static switchable compensation reactor this command increases or decreases the compensation by one step.
	POSition?			x	x		x		Returns the actual compensation step.

#### 4.16.4.3 Trips and Measurements

All values are in IS units ([A] [V], etc.)

Command header1	Command header f2 or Arg.	Command header f3 or Argument	Arg	L S	L A	R S	R A	Commentary
OUTput	VOLTage	RMS?	<Nx>		x		x	Current RMS value of the output voltage
		PEAK?	<Nx>		x		x	Current Peak/2 value of the output voltage
		LIMIT LIMIT?	<Nx>		x	x	x	Sets or returns the current limit value.
	CURRent	VALue?	<Nx>		x		x	Current output current
		LIMIT LIMIT?			x		x	Output current trip
FLASH	VALue?	<Nx>			x		x	Last measured value for a flashover. If no flashover has occurred, a 0 is returned.
REGulator	VOLTage?	VALue?	<Nx>		x		x	Regulating transformer voltage
	CURRent?	VALue?	<Nx>		x		x	Regulating transformer current
	PARams	LOW LOW?			x		x	Sets or returns the low speed parameter of the regulator drive
		HIGH HIGH?			x		x	Sets or returns the high speed parameter of the regulator drive

	MOTor MOTor?	STOP UP DOWN			x		x	Sets or indicates the actual state of the regulator drive. Up increases the voltage, down decreases the voltage and stop stops the drive.
	MANspeed	LOW HIGH			x		x	Sets the speed for the operation of the regulator drive to low or high
	POSition?	Mid Min Max			x		x	Returns the actual position of the regulator drive. Mid means an illegal position has been reached. Min: The regulator is in minimum position. Max: The regulator is in maximum position.
EXCiter	VOLTage?	VALue?	<Nx>		x		x	Exciter voltage, if available
		LIMIT LIMIT?	<Nx>		x		x	Exciter voltage limit, if available
	TAP TAP?	<Nx>			x	x	x	Sets or returns the actual exciter tap if available
TUNING?	VALue?	<Nx>			x		x	Tuning signal
INDuctance?	VALue?	<Nx>			x			Inductance [0..100%]
MEASuring1	VALue?				x	x		Messwert des 1. Messgerätes, als SI Einheit (z.B 2.3E-11)
	TEXT?				x	x		Wie in der Anzeige (z.B 23 pC)
MEASuring2	VALue?				x	x		Messwert für das 2. Messgerät
	TEXT?				x	x		

#### 4.16.4.4 Alarms

Command header1	Command header2 or Arg.	Command header3 or Argument	L	L	R	R	Commentary
			S	A	S	A	
ALarMs	RESet				x		Deletes all existing alarms if this is possible.
	EMerGency?	NO YES		x		x	Emergency off button is pressed [YES], or not pressed [NO].
	INterLock?	NO YES		x		x	Safety interlock is open[YES], or closed [NO].
	RegVoltTRIP?	NO YES		x		x	Voltage trip for regulating transformer [YES]

	RegCurrTRIP?	NO YES		x	x	Current trip for regulating transformer [YES]
	PoWeRFAIL?	NO YES		x	x	Power switch cannot be switched on. Power is not connected.
	HVFAIL?	NO YES		x	x	High voltage missing. The time between the state READY and the state HVON may not be longer than 5 seconds.
	REGPOSition?	NO YES		x	x	The regulating transformer has not yet reached the minimum position. Switch on is not possible.
	OutVoltTRIP?	NO YES		x	x	Output voltage trip
	OutCurrTRIP?	NO YES		x	x	Output current trip
	ExcVoltTRIP?	NO YES		x	x	Exciter voltage trip
	REACtorTAPCHanging?	NO YES		x	x	Reactor tap is changing. System switch on is not possible.
	EXCiterTAPCHanging?	NO YES		x	x	Exciter tap is changing. System switch on is not possible.
	TIMer?	NO YES		x	x	Automatic timer has expired.
	FLASH?	NO POS NEG		x	x	A flashover has occurred.
	IFSection?	<Nr1>		x	x	Bit coded integer value crrying following alarms. Bit 0 IF Section alarm Bit 1 Emergency off button. Bit 2 Safety interlock (closed [0]open [1]) Bit 3 AIF Bit 4 Watchdog

	REGSection?	<Nr1>		x	x	<p>Bit coded integer value carrying following alarms.</p> <p>Bit 0 Alarm</p> <p>Bit 1 Trip</p> <p>Bit 2 Voltage trip</p> <p>Bit 3 Current trip</p> <p>Bit 4 Power missing</p> <p>Bit 5 High voltage missing</p> <p>Bit 6 Regulating transformer position</p> <p>Bit 7 HV relay</p>
	HVSection?	<Nr1>		x	x	<p>Bit 0 High voltage collective alarm</p> <p>Bit 1 Alarm</p> <p>Bit 2 Trip</p> <p>Bit 3 Voltage trip</p> <p>Bit 4 Current trip</p> <p>Bit 5 Exciter voltage trip</p> <p>Bit 6 Earth switch</p> <p>Bit 7 Exciter tap changing</p> <p>Bit 8 Reactor tap changing</p> <p>Bit 9 Timer</p> <p>Bit 10 Flashover</p>

# 5 Dangers and Safety Notes (English)

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## 5.1 General Notes

In general, a high voltage system is a large danger source for accidents. Thus please observe the following notes and safety regulations.



The AC Control System may only be operated by **trained** personnel.



The high voltage can only be switched on if all safety requirements are fulfilled. Thus no safety devices of the system or the control desk are to be bridged.



The safety interlock is not to be shorted under any circumstances. The safety interlock must be led around the system and any entry to the system should open the safety interlock (e.g., connecting into door contacts, etc.).

---

## 5.2 Dangers when Working on the Control Desk

The desk / rack of the AC Control System is a unit enclosed within itself, which normally hides no dangers from the user. The following points must nevertheless be observed:



The control system may only be used in a high voltage system if the earthing bolt at the rear of the control desk is connected to the earth of the entire system.



The mains lines of the control desk are no longer covered following dismantling of the rear or front plates. Thus the mains connection for the control system must be removed before carrying out any dismantling work. The voltage feed lines are inside the desk and the individual devices no longer specially marked.





Since the high voltage can normally be switched on only from the control desk, the user of the control system is thus responsible that no personnel are within the safety screening.

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## 5.3 Safety Precautions when Working with High Voltage



Owing to safety considerations, all work within the high voltage area should always be supervised by a second person. Installation and operating personnel must know the procedures following a high voltage accident.



All emergency off switches must always be accessible. One of the switches must be fixed on the control desk. This switch is supplied and can be magnetically fastened to the desk.



The safety interlock should only be opened after the high voltage has been switched off.



The safety interlock and safety screening must never be surmounted.

---

## 5.4 Dangers of the High Voltage System



High voltage components, in particular capacitors, can be electrically charged even if the high voltage is switched off. These components must thus be discharged with an earth rod without fail whenever anyone enters the high voltage area. The tools required for this (e.g., earth rod) must always be available in the system.



The earthing rod must be connected to the system earth. The earthing cable may not be touched or stepped on during the discharge.

# 6 Gefahren- und Sicherheitshinweise (German)

## 6.1 Allgemeine Hinweise

Eine Hochspannungsanlage ist im Allgemeinen eine grosse Gefahrenquelle für Unfälle. Darum beachten Sie die nachfolgenden Hinweise und Sicherheitsvorschriften.



Die Steuerung OT257 AC darf nur von **geschultem** Personal bedient werden.



Die Hochspannung kann nur eingeschaltet werden, wenn alle Sicherheitsbedingungen erfüllt sind. Darum dürfen keine Sicherheitsvorrichtungen der Anlage und des Steuerungspultes überbrückt werden.



Der Sicherheitskreis darf unter keinen Umständen kurzgeschlossen werden. Der Sicherheitskreis muss um die Anlage herumgeführt sein und jegliches Betreten der Anlage sollte den Sicherheitskreis öffnen. (z.B. Einschleifen in Türkontakte usw.).

## 6.2 Gefahren beim Arbeiten am Steuerpult

Das Pult / Rack der Steuerung OT257 AC ist eine in sich geschlossene Einheit, die normalerweise für den Anwender keine Gefahren birgt. Folgende Punkte müssen jedoch beachtet werden:



Die Steuerung darf nur in einem Hochspannungsprüfsystem verwendet werden, wenn die Erdschraube auf der Rückseite des Steuerpultes mit der Erdung der gesamten Anlage verbunden ist.



Beim Steuerpult sind die Netzleitungen nach der Demontage von Rück- oder Frontplatten nicht mehr abgedeckt. Darum muss vor allen Demontearbeiten der Netzanschluss der Steuerung entfernt werden. Die spannungsführenden Leitungen sind im Innern des Pultes und der einzelnen Geräte nicht mehr speziell gekennzeichnet.



Da die Hochspannung normalerweise nur über das Steuerpult eingeschaltet werden kann, ist der Anwender der Steuerung dafür verantwortlich, dass sich beim Einschalten der Hochspannung kein Personal mehr innerhalb der Sicherheitsabschränkungen befindet.

---

## 6.3 Sicherheitsvorkehrungen beim Arbeiten mit Hochspannung



Aus Sicherheitsgründen sollten Arbeiten innerhalb des Hochspannungsbereichs immer durch eine zweite Person überwacht werden. Das Montage und Bedienungspersonal muss die Verhaltensregeln für Hochspannungsunfälle kennen.



Alle Notausschalter müssen immer zugänglich sein, wobei einer der Schalter am Steuerpult befestigt sein muss. Dieser Schalter wird mitgeliefert und haftet magnetisch am Pult.



Der Sicherheitskreis soll nur bei ausgeschalteter Hochspannung geöffnet werden.



Der Sicherheitskreis und Abschränkungen dürfen nicht überstiegen werden.

---

## 6.4 Gefahren der Hochspannungsanlage



Bauelemente für Hochspannung, im speziellen Kondensatoren, können auch bei ausgeschalteter Hochspannung elektrisch geladen sein. Darum müssen sie bei jedem Betreten des Hochspannungsbereichs unbedingt mit der Erdstange entladen werden. Die dafür notwendigen Hilfsmittel (z.B. die Erdstange) müssen immer bei der Anlage deponiert sein.



Die Erdstange muss mit der Anlagenerdung verbunden sein. Das Erdungskabel darf bei Entladungen nicht berührt oder betreten werden.

# 7 Dangers et indications de sécurité (French)

## 7.1 Indications générales

Une installation haute tension représente en général une source de dangers non négligeable pouvant causer des accidents. Veuillez donc observer en général les indications et les prescriptions de sécurité suivantes.



Le système de commande OT257 AC doit être manipulé exclusivement par du personnel dûment **instruit**.



La haute tension ne doit être activée que si toutes les conditions de sécurité sont remplies. Voilà pourquoi, le pontage des dispositifs de sécurité de l'installation et du pupitre de commande est interdit.



Le circuit de sécurité ne doit en aucun cas être court-circuité. Le circuit de sécurité doit être conduit autour de l'installation, et tout accès à l'installation devrait interrompre le circuit de sécurité (par ex. rodage des contacts de porte, etc.) .

## 7.2 Dangers lors de travaux au niveau du pupitre de commande

Le pupitre / rack du système de commande OT257 AC est une unité complète qui ne recèle normalement aucun danger pour l'utilisateur. Les points suivants doivent néanmoins être observés



Le système de commande ne doit être utilisé dans un système de test haute tension que si la vis de mise à la terre sur la face arrière du pupitre de commande est reliée à la prise de terre globale de l'installation.



Sur le pupitre de commande, les lignes de raccordement au secteur ne sont plus couvertes lors d'un démontage des panneaux arrière et frontaux. Voilà pourquoi, le raccordement au secteur du système de commande doit être enlevé avant l'exécution de tout travail de démontage. Les lignes sous tension ne sont plus marquées spécialement à l'intérieur du pupitre et des différents appareils.



Comme la haute tension ne peut, normalement, être activée que sur le pupitre de commande, il incombe à l'utilisateur du système de commande de veiller à ce que la présence de personnel dans la zone de sécurité soit évitée lorsque la haute tension est activée.

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## 7.3 Précautions de sécurité lors de travaux sous haute tension



Pour des raisons de sécurité, les travaux sous haute tension devraient toujours être surveillés par une deuxième personne. Le personnel de montage et de service doit connaître les règles de conduite en cas d'accidents causés par la haute tension.



Tous les commutateurs d'arrêt d'urgence doivent être accessibles en permanence, l'un des commutateurs devant être fixé au pupitre de commande. Ce commutateur est livré avec l'installation et peut être fixé par aimant au pupitre.



Le circuit de sécurité ne doit être interrompu que lorsque la haute tension est désactivée.



Il est interdit de franchir le circuit de sécurité et les barrières.

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## 7.4 Dangers de l'installation à haute tension



Il est possible que les éléments de construction pour la haute tension, notamment les condensateurs, soient chargés même lorsque la haute tension est désactivée. Voilà pourquoi, ils devront être déchargés dans tous les cas à l'aide de la perche de mise à la terre. Les outils requis pour cela (par ex. perche de mise à la terre) doivent toujours être déposés près de l'installation.



La perche de mise à la terre doit être reliée à la prise de terre de l'installation. Lors de décharges, il est interdit de toucher ou de marcher sur le câble de mise à la terre.

# 8 Maintenance

The OT257 AC control system is almost maintenance free. The following points should nevertheless be observed:

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## 8.1 Cleaning the Desk and the Screen

The desk can be cleaned with a moist cloth. Do not use chemicals or abrasives.

Special cleaners for screens are available in the larger department stores and computer shops. In an emergency, a moist cloth can be used.

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## 8.2 PCI 811 Computer Battery

The lithium battery of the PCI 811 computer must be replaced approximately every 10 years. This battery drives the internal clock of the computer that ensures that the time as well as the date is always correct. Each file is automatically stored together with the current date and system time. These two parameters are aids in determining which the latest files are.

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## 8.3 Fan

The PCI 811 fan is equipped with a filter. This filter must be cleaned or exchanged at regular intervals. Otherwise the computer can become damaged as a result of insufficient heat exchange. Haefely will not accept any guarantee damage claims in such cases.

# 9 Glossar

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## 9.1 Tuning

Tuning means to adjust the inductance of the High Voltage source to get resonance between the HV source and the capacitive test object

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## 9.2 ActiveX

An ActiveX is a control element that can be loaded and inserted dynamically into a Windows application. ActiveX relies on the OLE, COM standard released by Microsoft.

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## 9.3 Visual Basic Script

Visual Basic Script is an easy to use scripting language provided by Microsoft. It is designed to control Windows and ActiveX Applications.

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## 9.4 Serial Resonant Test Set

Serial Resonant Test Set means that the excitation power is brought in serial connection into the resonant circuit. The system is excited by current. Therefore the ratio between input and output current is almost fixed. But the output voltage depends on how well the system is tuned into resonance and how high the quality factor of the resonant circuit is. That means how low the real power losses in the resonant circuit caused by serial and parallel resistances are.

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## 9.5 Parallel Resonant Test Set

Parallel Resonant Test Set means the excitation power is brought in a parallel connection into the resonant circuit. The circuit is excited by voltage. Such a system has an almost fixed ratio between input and output voltage and therefore the output voltage is relatively easy to be controlled.

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## 9.6 Uout

Output Voltage

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## 9.7 Warning lamp

One red and one green lamp are possible. The green lamp lights as long as the control software is running and High Voltage is off. The red lamp lights as soon as the HV Relays is closed. That means High Voltage is on and the Voltage can be raised immediately.

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## 9.8 RTS

Resonant Test System

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## 9.9 Resonant Test System

On a Resonant Test System the inductance of the High Voltage source is dynamically matched to the capacitance of the test object to get resonance between them. When High Voltage source and test object are in resonance, the capacitive power oscillates between the HV source and test object and the feeding power only has to cover the real power consumed by the HV source.