Operating Instructions

HAEFELY TEST AG

OT 248

Operating Terminal for AC Systems

Version 1.7

Operating Instructions OT248

Date	*03/2006*
Authors	*HPM*
Layout	*HPM*

Revision History

V1.0	*03/2006*	*HPM*	*Initial release of the document*
V1.1	*11/2006*	*HPM*	*Added description for software update*
V1.2	*1/2007*	*HPM*	*Added additional functions fo file browser*
V1.3	*9/2009*	*HPM*	*Support of exciter tap changer added*
V1.4	*2.2010*	*HPM*	*Add Relais output*
V1.5	*4.2012*	*HPM*	*New ratio input for voltage divider*
V 1.6	*5.2012*	*HPM*	*Frequency converter support added*
V 1.7	*6.2012*	*LWA*	*CE document addaed*

WARNING

Before operating the instrument, be sure to read and understand fully the operating instructions. This instrument controls hazardous voltages. It is the responsibility of the user to ensure that the system is operated in a safe manner.

This equipment contains exposed terminals carrying hazardous voltages. There are no user serviceable components in the unit. All repairs and upgrades that require the unit to be opened must be referred to HAEFELY TEST AG or one of their nominated agents.

Unauthorized opening of the unit may damage the EMI protection of the system and will reduce its resistance to interference and transients. It may also cause the individual unit to be no longer compliant with the relevant EMC emission and susceptibility requirements. If the unit has been opened, the calibration will be rendered invalid.

In all correspondence, please quote the exact type number and serial number of the instrument and the version of software that is currently installed on it. The software version is reported at power-up.

Note

HAEFELY TEST AG has a policy of continuing improvement on all their products. The design of this instrument will be subject to review and modification over its life. There may be small discrepancies between the manual and the operation of the instrument, particularly where software has been upgraded in the field. Although all efforts are made to ensure that there are no errors in the manuals, HAEFELY TEST AG accepts no responsibility for the accuracy of this manual.

HAEFELY TEST AG accepts no responsibility for damage or loss that may result from errors within this manual. We retain the right to modify the functionality, specification or operation of the instrument without prior notice.

Contents

Introduction

The *OT248 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. 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 *OT248 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 5 **Dangers and Safety Directives** before switching on your system.

The system must be operated by trained personnel only.

Functional Description of the Control System

General

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.

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
- 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.

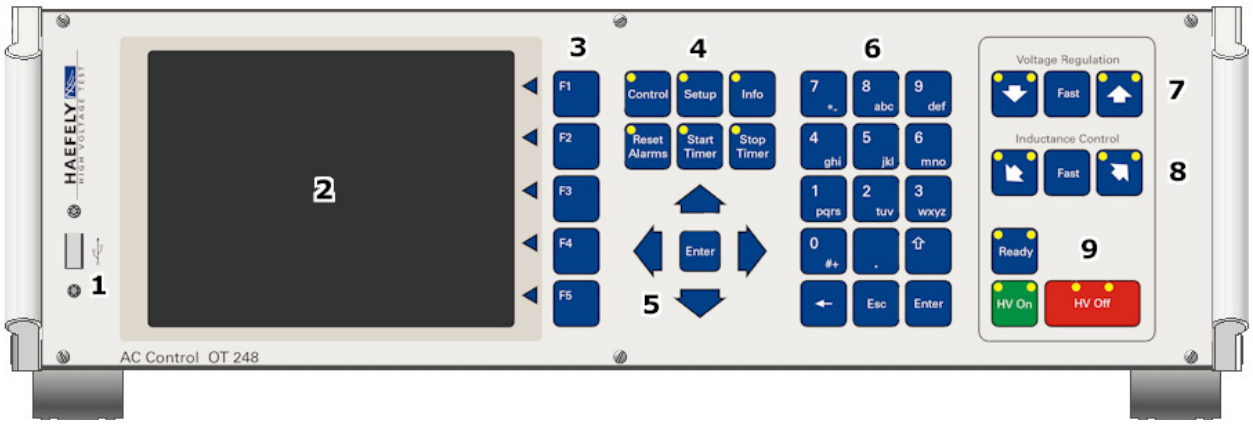
ACB 102 Connection Box

The *Connection box* is the interface between the Control System 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.

Operation Elements

Front panel



There are different interfacing respectively operation blocks on the module front panel:

1 USB interface, used for data exchange with memory stick or keyboard/mouse

2 Display

3 Softkeys

4 Menus block

5 Cursor block

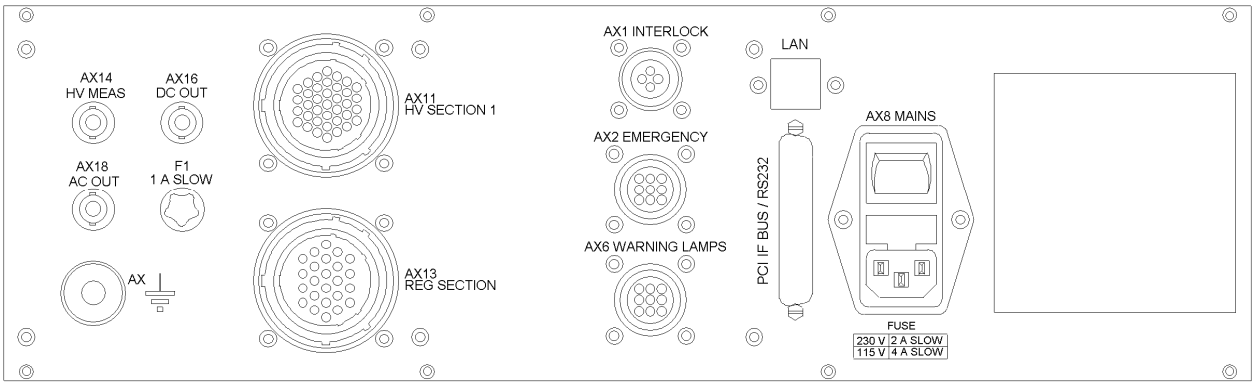
6 Numeric / alphabetic block

7 Voltage control block

8 Inductance control block

9 High Voltage control block

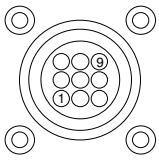
Back panel



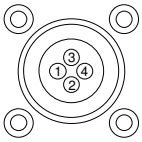
Used connector types

There are different system connector types mounted on the module back panel:

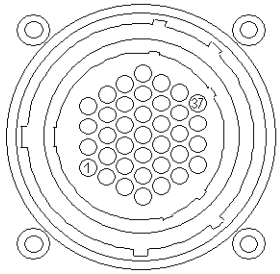
AMP series CPC 9p..



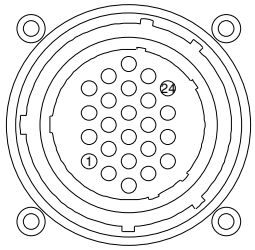
AMP series CPC 4p.



AMP series CPC 37p.



AMP series CPC 24p.



Connector assignement

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 37 poles male	ACB 102 connnection box
A:X13	REG SECTION	AMP Series CPC 24 poles male	Regulating transformer
A:X14	HV MEAS	BNC	High voltage measuring input 0 .. 150 V AC
A:X16	DC OUT	BNC	y-t plotter signal 0 .. 10V DC, proportional to high voltage
A:X18	AC OUT	BNC	Oscilloscope signal 0 .. 7V AC, proportional to high voltage
	PCI IF BUS / RS232	Not mounted / D-Sub 37 poles male / D-Sub 9 poles male	 Process computer PCI811 option RS232 interface option
	LAN	Ethernet 10/100	Remote access to OT 248

Pinning of the connectors

Pinning connector A:X1

A:X1	INTERLOCK
Pin	Signal
1	Interlock Stat (Status) ←
2	Interlock Cmd (Command) → 24V DC
3	Shield
4	Not connected

Pinning connector A:X2

A:X2	EMERGENCY
Pin	Signal
1	Not connected
2	Not connected
3	Not connected
4	Not connected
5	Emergency Cmd (Customer)
6	Emergency Stat (Customer)
7	Emergency Cmd (System) →
8	Emergency Stat (System) ←
9	Shield

Pinning connector A:X6

A:X6	WARNING LAMPS
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	Not connected
7	Not connected
8	Not connected
9	Not connected

Pinning connector A:X8

A:X8	MAINS
Pin	Signal
L	Phase
N	Null
PE	Protective earth

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	+24V
7	Ind. Mot. Speed H
8	Ind. Mot. Pos. H
9	Ind. Mot. Pos./Speed L
10	Digital Input 1
11	Digital Input 2
12	Digital Input 3
13	Digital Input 4
14	Digital Input 5
15	Digital Input 6
16	Digital Output 1
17	Digital Output 2
18	Digital Output 3
19	Digital Output 4
20	Digital Output 5
21	Digital Input 7
22	Digital Input 8
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	Aux In 4
32	Aux In 5
33	Aux In 6
34	Aux Out 1
35	Aux Out 2
36	Aux Relais output
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	Digital Input 9
8	Reg. Mot. Speed H
9	Reg. Mot. Speed L
10	Flash
11	Power On
12	Digital Input 10
13	Digital Output 10
14	Digital Output 11
15	Digital Input 11
16	Digital Output 12
17	Digital Output 13
18	Digital Input 12
19	Digital Input 13
20	Digital Input 14
21	HV On
22	Digital Input 15
23	+24V
24	GND

Technical Data

Mains Connection, Inputs and Outputs

Mains input

Voltage	230 V ±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

Digital Inputs and Outputs

Inputs	24 V	
Outputs	24 V	Protected against shorts

Analogue Inputs and Outputs

Inputs	0 ... 7 V_{RMS}, 0 ... 10 V_P	AC
Inputs	0 ... 10 V	DC
Outputs	0 ... 10 V	DC

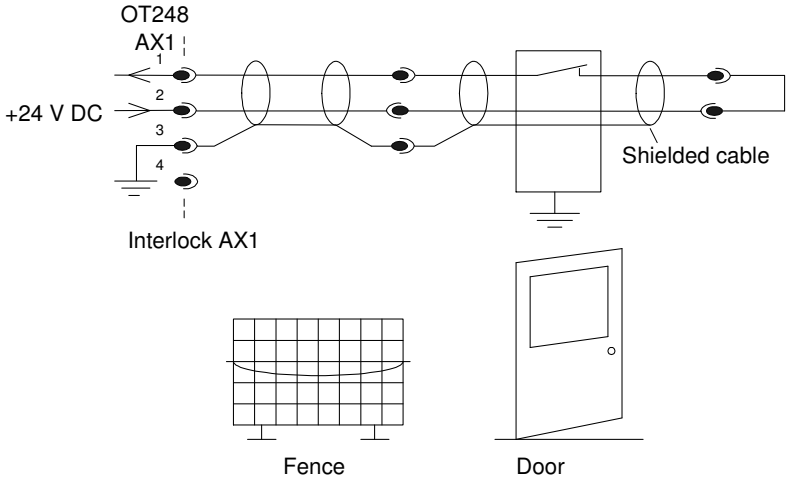
Safety interlock and Customer-Specific Inputs and Outputs

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

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:



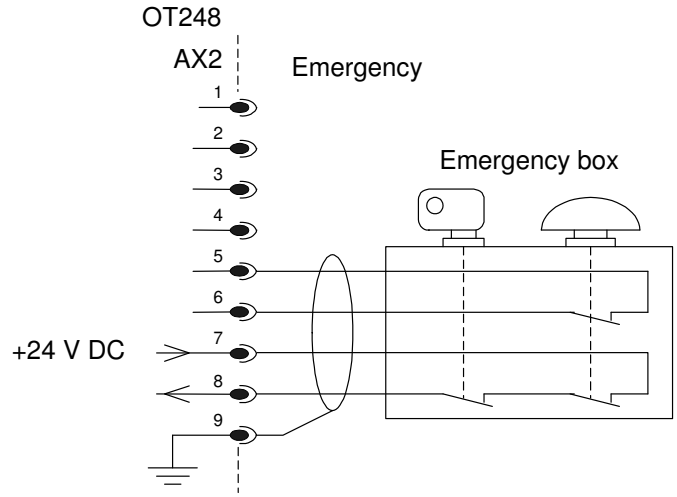
Connecting the Safety interlock circuit

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 main supply to the equipment is deactivated.The EMERGENCY circuit operates independent of the control computer.

Practical example:



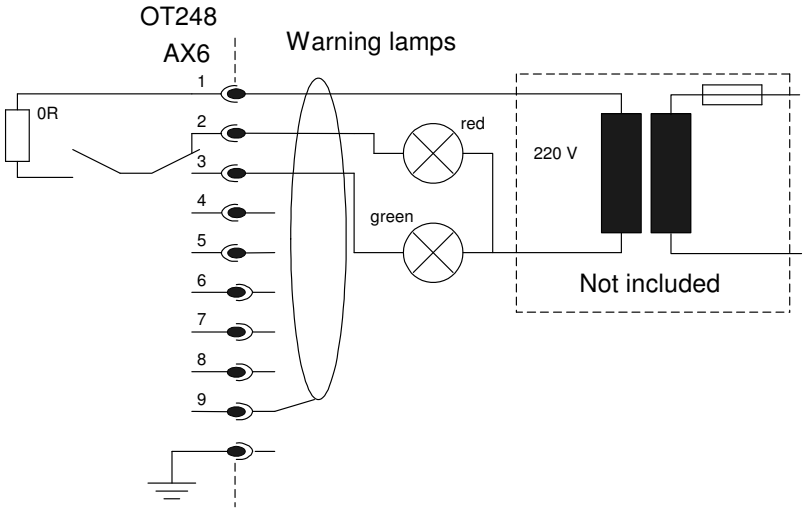
Connecting the Emergency Box

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:



Connecting the Warning lamps

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

Dimensions

Control Rack

Dimensions (L/H/D)	1740 x 1115 x 1120 mm
Weight	approx. 14 kg
Transport width	700 mm
Dimensions (L/H/D)	490 x 130 x 500 mm
Weight	approx. 14 kg (control unit only)

Operating Instructions

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 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 its 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 are rejected by the control system if the input is in error.

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.

Help System

The integrated help system offers you context oriented information anytime concerning the current entry field or window. The information is displayed context sensitive in a separate window when you press the <Info> key.

The marked positions in the help text indicate key-words explained by the help system. They can be selected using the arrow keys. Press the <Enter> key to access the help text associated with the key-word you selected and <BackSpace> to get back to the last topic..

If the help text is too long to completely fit in a window, the text can be scrolled up or down using the <Up> and <Down> arrow keys, respectively.

Press the <ESC> key to quit the help system.

Manual test

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 by the arrow keys. In order to obtain a better impression about the course of the AC test, the course of the output voltage is recorded in a graphic window.

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 for approx. 5 sec.

As long as the Power breaker is not closed the system shows a *Powerswitch* alarm and the yellow LED on the Ready key are blinking. The alarm will be reset by self as soon as the power breaker is closed.
When the power breaker is closed the yellow LED on the Ready key stop blinking and light permanently.

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 a emergency case.

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

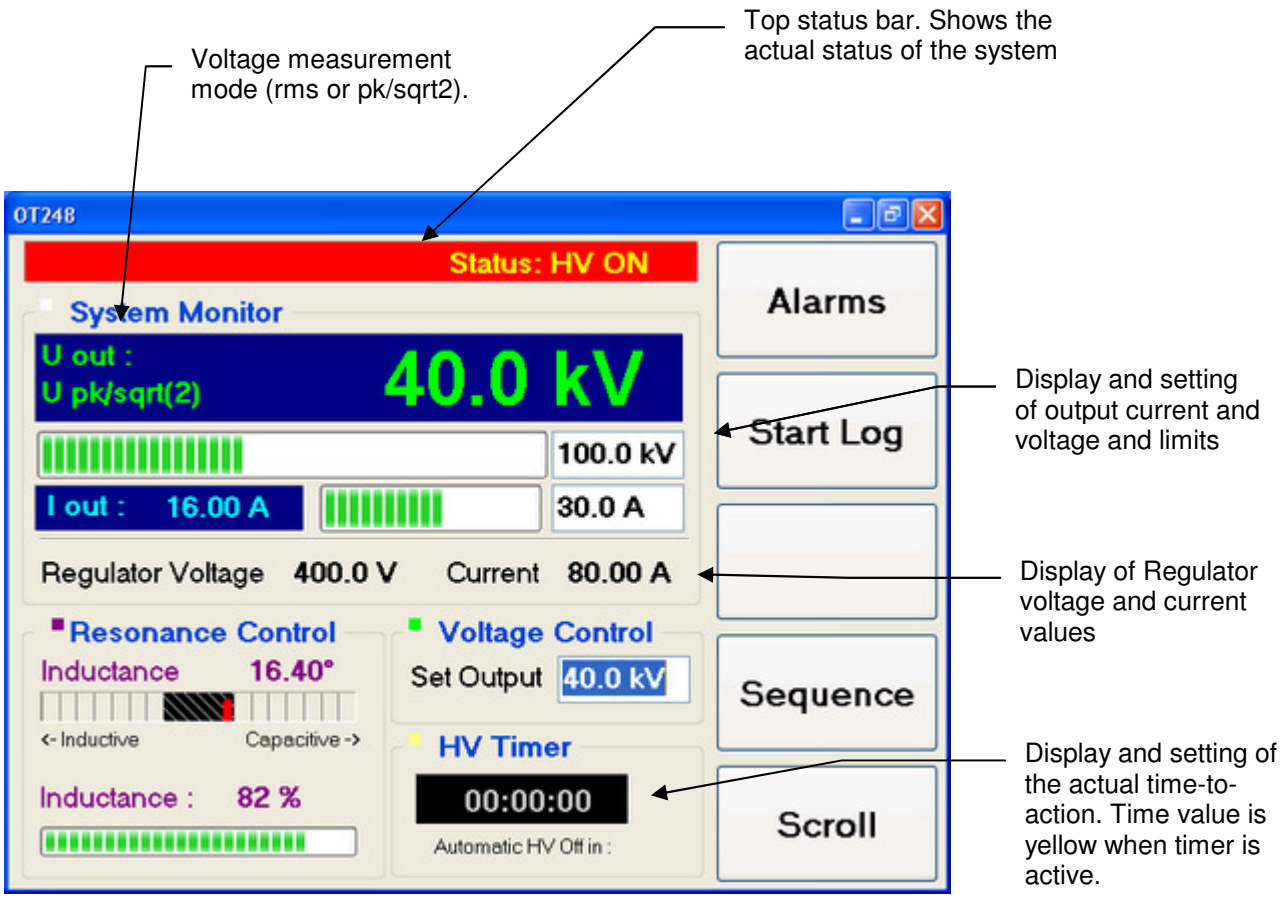
First you have to press the *Ready* button to bring the system into ready state. If this action succeeds and the system switches into ready state it indicates this by changing the colour of the digits in the output voltage and current display from grey to black. If the system can not switch to ready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

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.

Input Area



Operating elements

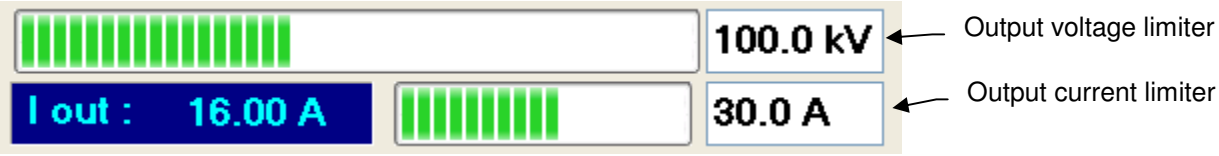
The main window provides following operating elements:

Edit boxes for output voltage limiter, output current limiter, output reference voltage for auto voltage mode and timer. These edit boxes can be reached by pressing the arrow buttons <Up> or <Down> and can be edited by the numeric keys. In the timer edit box the different fields can be reached by pressing the arrow keys <left> or <right>

Functional keys <F1> .. <F5>: These keys have multiple functionality. Pressing <F5> scrolls the function of each key from one to the next.

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 to 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 0 kV and the maximum possible voltage of the taps or the circuit variant.

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

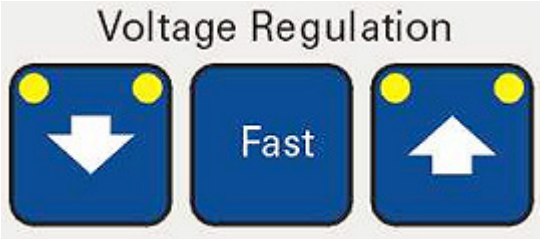
Timer

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 *StartTimer* 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 *StopTimer* button stops and resets the timer without switching of the high voltage.

Additional display

In the additional display the exciter voltage (if available) or the regulator voltage and current can be displayed. Select the display in the Settings

Manual voltage buttons and manual speed

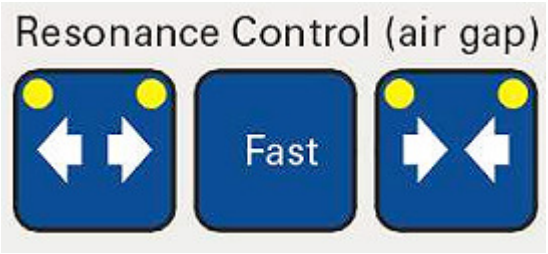


You can enter the n*ormal speed* of the regulating transformer within the range from 1 to 50 in the regulator speed dialogue. The *Up* and *Down* keys then cause the regulating transformer to increase or decrease the output voltage at a rate corresponding to the speed entered.

You can enter a high speed between 51 and 100 in the regulator speed dialogue. 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 *"Scroll", "Reg speed"* menu buttons.

Manual tuning and tuning speed



You can enter the *normal speed* of the gap motor in the range from 1 to 50 in the regulator speed dialogue. 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 in the regulator speed dialogue. 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.

The inductance window is only displayed for RTS systems or AC test systems equipped with a automated compensating reactor. 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.

Auto voltage

General

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

After switching on the high voltage, activate the automatic operating mode by simultaneously pressing the UP and DOWN key for 2 seconds. The green LED on the UP and DOWN key will go dark now and the regulating transformer will move to the values preset in the field Set Uoutput.

If the *automatic voltage regulation* is switched on, the timer will automatically start as soon as the *setpoint* is reached if the timer value is not 0. You can, however, manually switch it off again anytime by.

ⓘ *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 of 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.

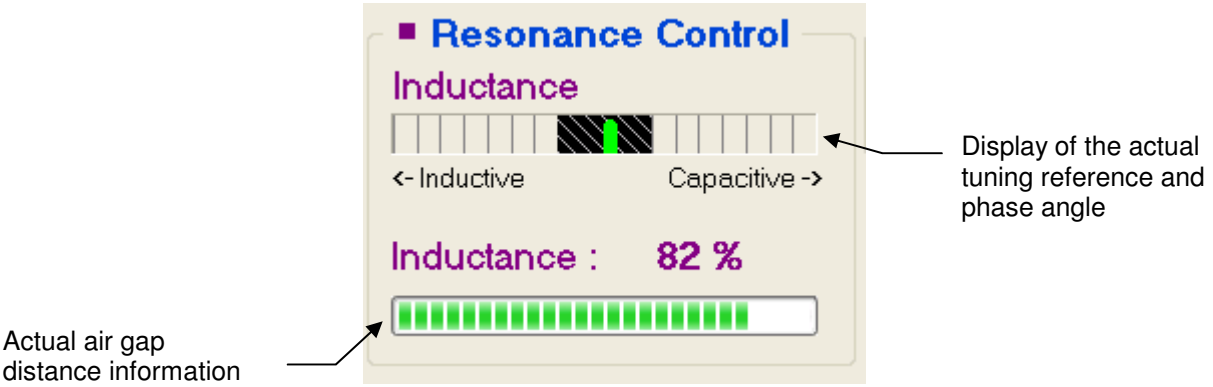
To switch the Automatic Voltage mode off again just press the UP or the DOWN key.

Auto Tuning

General

In Auto Tuning mode the control system automatically tunes the test circuit into resonance. Activate the high voltage system and then the automatic tuning mode by pressing the GAP INC and GAP DEC keys simultaneously for 2 seconds. The green LED on the GAP INC and DEC key will go dark now and as soon as there is a tuning signal available the system will tune into resonance by self.

Display area



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

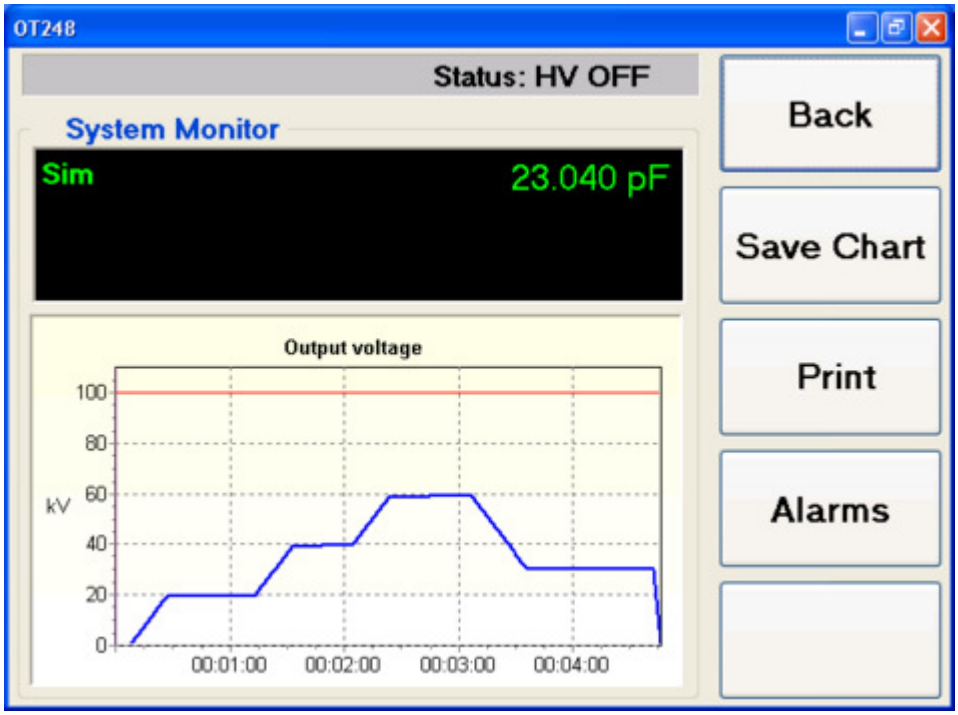
In case of a Serial Resonant Test Set:

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.

To switch the automatic Tuning Mode off again just press the GAP INC or the DEC key.

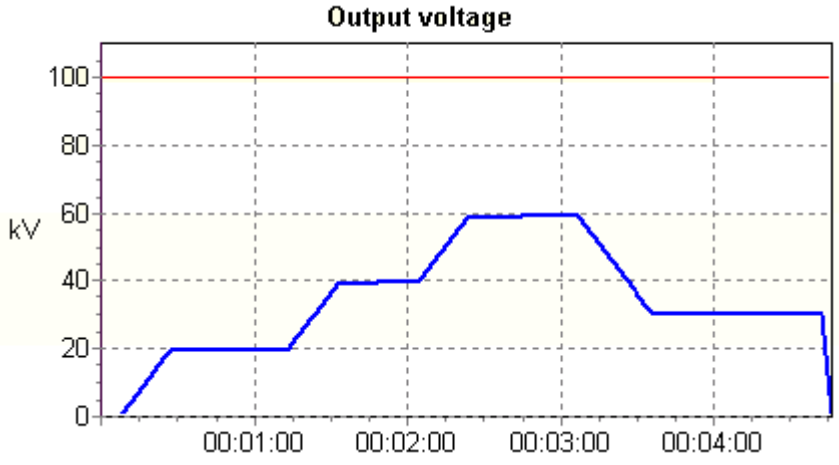
Graphic window (scope)

The graphic window displays the actual measurement as graphical log.
The measuring curve is displayed by a blue line and additionally, if available, the maximum (limiter) of the measured value is displayed by a red line.



Save Chart

Save Chart saves the graphic chart into a bitmap file that can be used in a report. The bitmap looks like this:

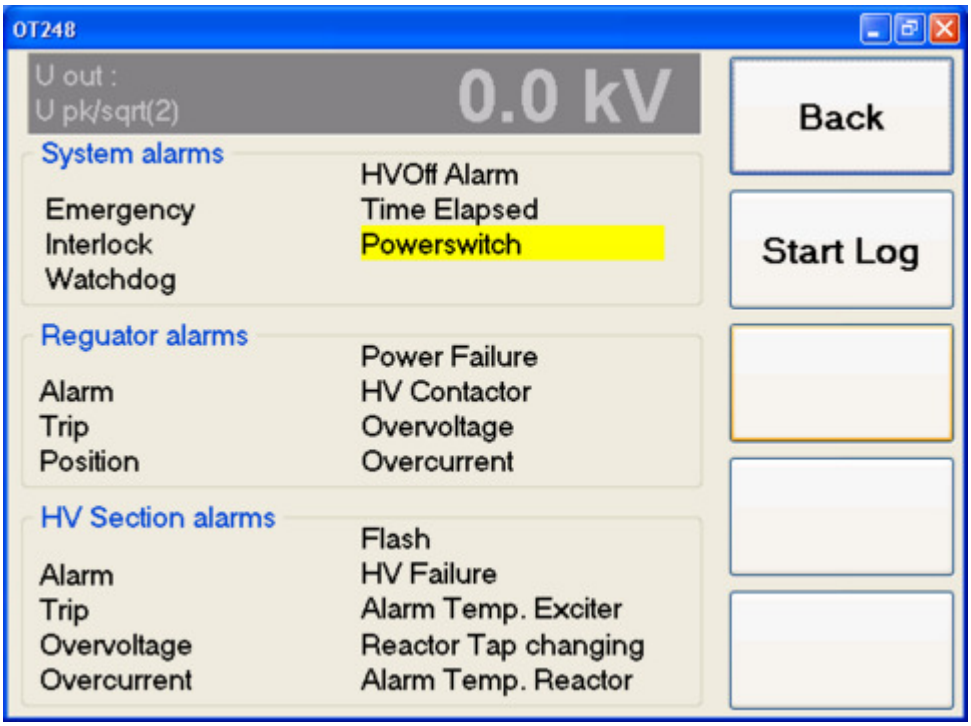


Print

Print sends a hardcopy of the graphic chart to the standard printer. This function only works if a printer is installed.

ⓘ *It is not recommended to install a printer direct to this control. Install a network printer and connect LAN by optical whires to the control.*

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 Alarms* button. The remaining status signals indicate the state of the system. They are automatically reset when the associated fault is eliminated.

System alarms

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.

Interlock (Safety interlock)

This signal indicates an open interlock connection. The interlock connection loop must be closed to enable high voltage being switched on.

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*.

HV Off Alarm

There is a collected alarm inside the OT 248 AC interface which can be set by any card (PCB) of this device. Try to reset the signal with *Reset Alarms*. If this alarm does not reset please contact the supplier.

Powerswitch

Shows the status of the primary power switch. This item shows normally yellow after starting up before having closed the power switch.

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.

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.

Regulating Transformer Area

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).

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.

Overvoltage

The regulation transformer voltage exceeded the *limit value.* The alarm can be reset with *Reset Alarms*..

Overcurrent

The regulation transformer current exceeded the *limit value.* The alarm can be reset with *Reset Alarms*..

Power Failure

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

Position

A yellow condition indicates that the regulating transformer has reached one of the following states:
The regulating transformer is not at the lower limit stop, although the high voltage has been switched off or the regulating 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 *Reset Alarms*.

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.

High Voltage Section

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.

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.

Overvoltage

The high voltage has exceeded the *limit value*. The signal can be reset with *Reset Alarms*.

Overcurrent

The output current exceeded the *limit value.* The alarm can be reset with *Reset Alarms*.

Flash

A high voltage flashover was electronically recognised by the measuring card and indicated with this signal. The signal can be reset with *Reset Alarms*. 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.

Exiter Trip

The exiter current exceeded the *limit value.* The alarm can be reset with *Reset Alarms*.

HV Failure

This alarm occurs if you press the *Ready* 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.

Alarm Temp. Exiter

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

Reactor tap changing

The HV reactor tap is not set. Tap changer still moving. High voltage can not be switched on as long as the tap changer is moving.

Exciter tap changing

The exciter trasformer tap is not set. Tap changer still moving. High voltage can not be switched on as long as the tap changer is moving.

Collected Alarms

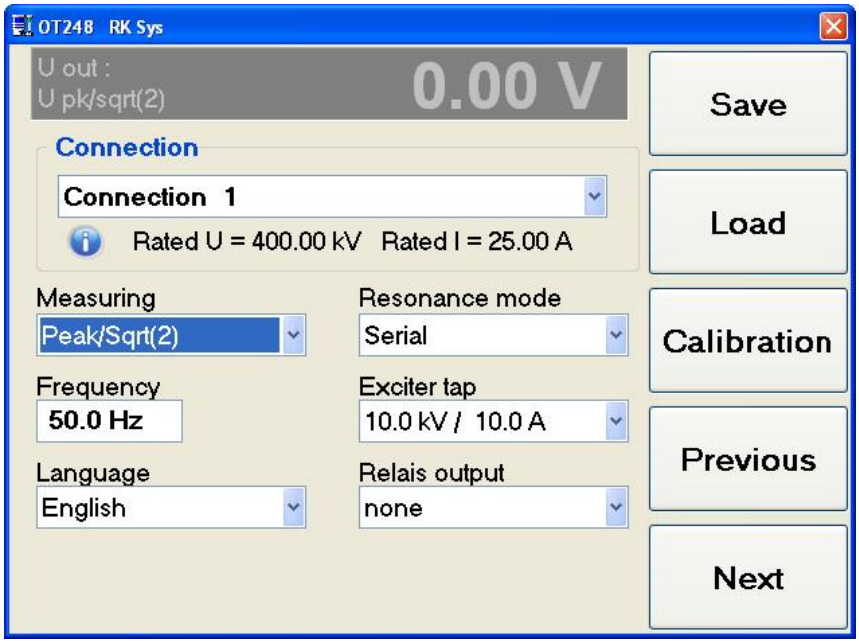
This item is used for a collection of different alarms that are not clearly assigned to a section or are options; e.g. SoftHVOff, Limiters, Emergency, etc.

Setup

System setup

In the system setup window reachable over "Setup" Button the configuration is made and the data can be obtained there.

System configuration



Operating elements

The setup window provides following operating elements:

Here you find drop down lists for selection of the desired test connection, the HV measuring mode, compensation or exciter tap (if available) and the language. To move from one to another press the arrow keys <Up> or <Down> and to drop down the list press the arrow key <Right>. Then select by pressing the arrow keys <Up> or <Down> and confirm by pressing <Enter>. Please note: The test connection and exciter tap can only be changed when the primary power breaker is closed and HV is off.

If the system is able to run serial and parallel resonance mode, a radio button box for setting the resonance mode is available here. Change the mode by pressing the arrow keys <Left> or <Right>.

Connection (circuit variation)

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

Measuring

The measuring mode specifies the output voltage measusing. You can select between RMS and Peak/√2

Frequency

If the system is equipped with a frequency converter for voltage regulation the output frequency can be set here.

Language

The OT248 supports various languages for the user interface and they can be selected online.

Resonance mode

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

Exciter tap

If the system is equipped with an exciter transformer with automatic tap changer then the exciter voltage tap can be selected here.

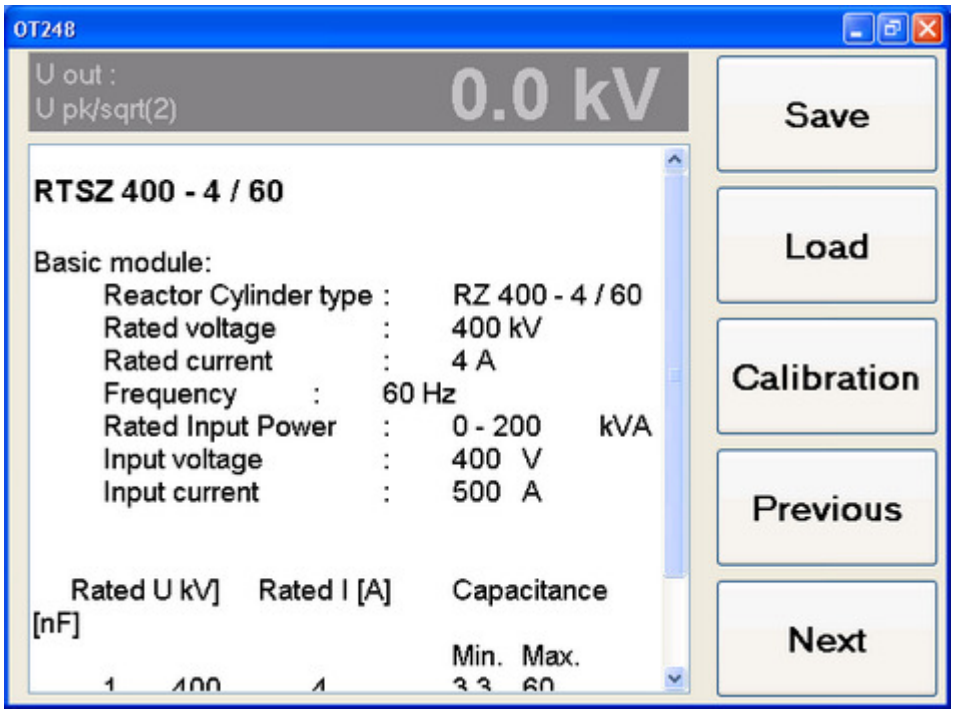
Relais output

On pin AX11:36 you can set a 24 V signal on a selectable event. The event can be set here:

Possible events are: None, On alarm, On HV On, On HV Off.

System data

Important system data can be found here.



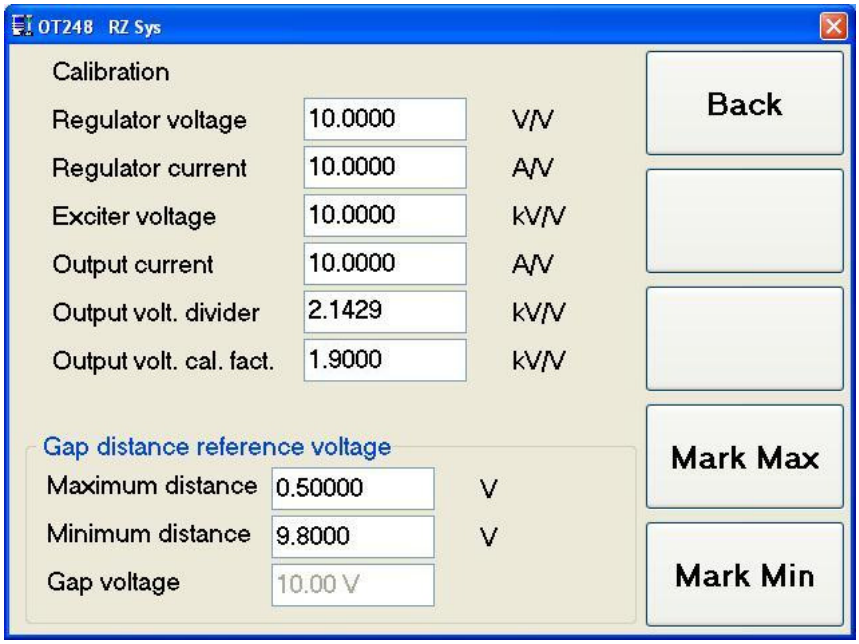
Calibration

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.



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 „OT248 Value“

To get the new calibration factor, the old calibration factor is multiplied by the measured value and divided by the OT248 value.

$$New\_Factor = \frac{Old\_Factor \quad Measured\_Value}{OT248\_Value}$$

In case of the replacement of the voltage divider, the divider ratio of the new divider can be entered in the field “Output volt. Divider”. With this factor the OT248 automatically calculates its “Output voltage calibration factor”.

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

Measurement

Measurement Values

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

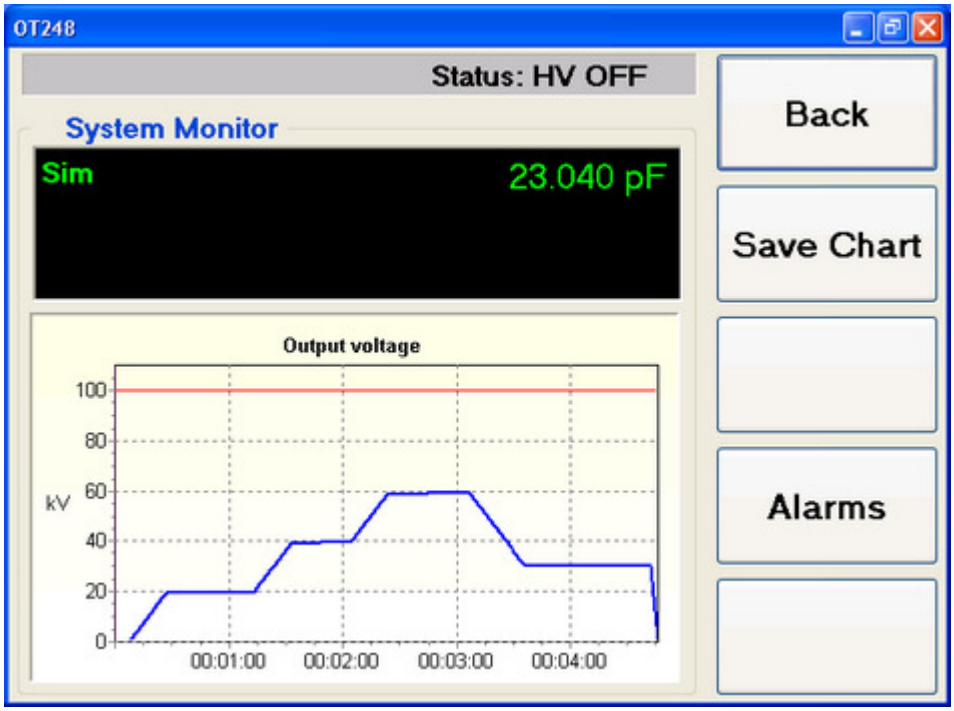
The *output voltage* or *high voltage* field is always shown. It displays the current value of the output voltage [kV], the measuring mode [RMS or Peak/Sqrt2] and the maximum possible high voltage [kV]. The maximum high voltage corresponds to the *output limit* value. Use the radio buttons to select the measuring mode.

The inductance window is only displayed for RTS systems or AC test systems with automated compensating reactor. 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.

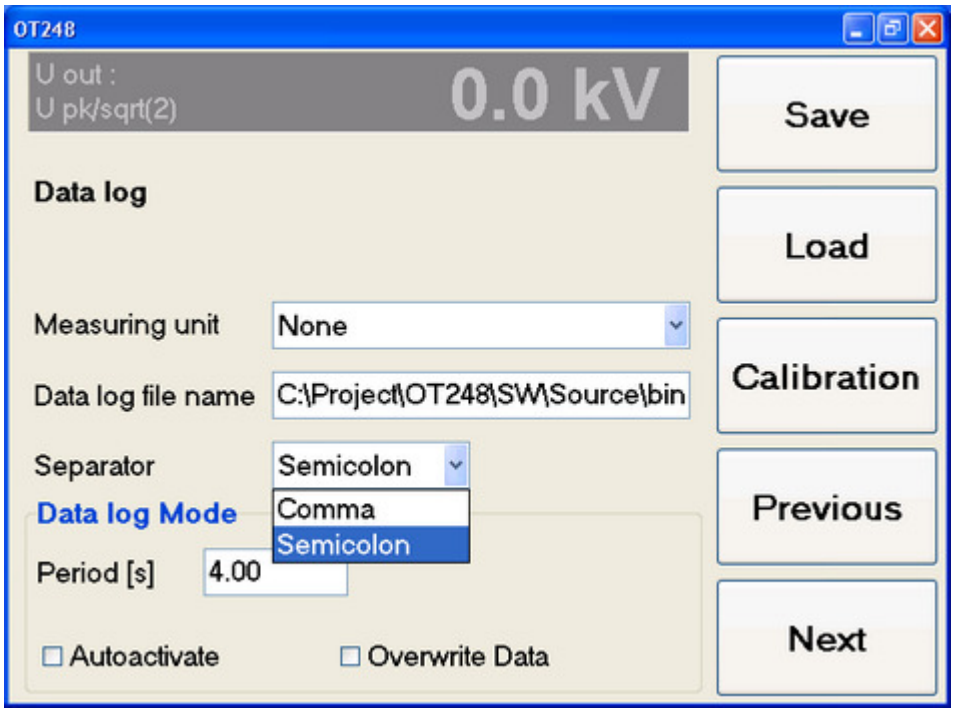
External measuring units

To connect external measuring units the OT248 provides an interface to a device implemented as ActiveX component. One device can be supported.



Configuring external measuring units

To configure and activate an external measuring unit you have to enter the ActiveX component name of the unit in the set up menu.



Data logging

General

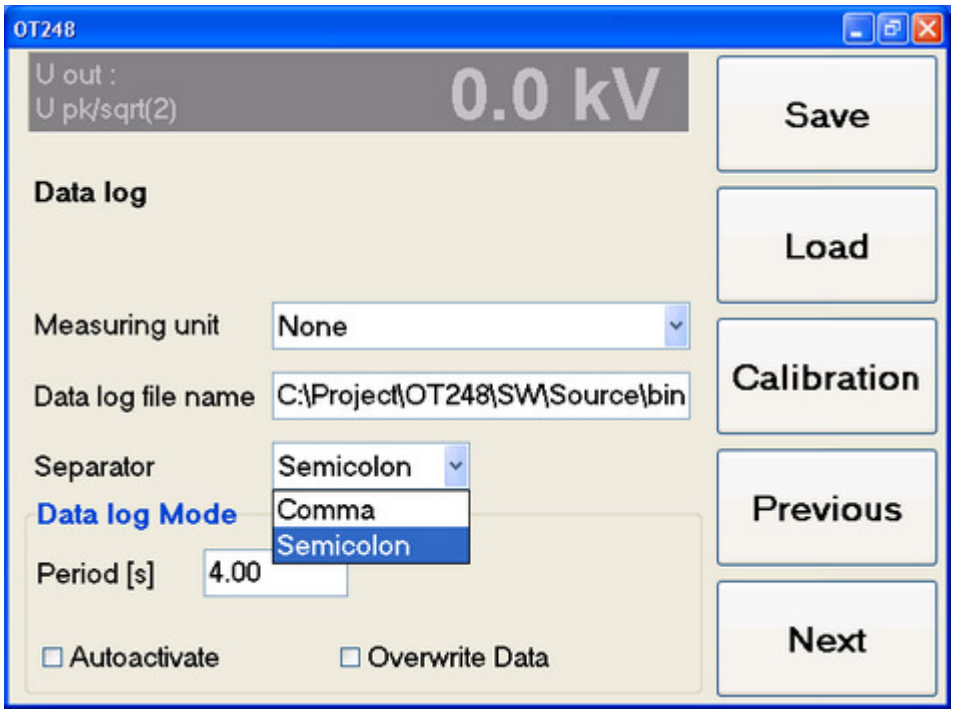
There are several possibilities to create reports of a performed measurement.

With the remote option an Excel or Word application can use the DCOM 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.

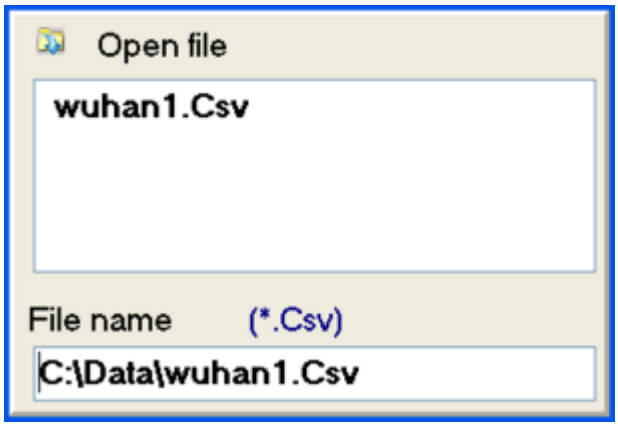
Storing test data into a .CSV file

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.



Data log file name

Enter the file name of the .CSV file for the reporting here. Pressing one of the number buttons opens a file open dialog to browse through the data directory and enter a new file name.



In the upper field available files are listed. Move from one to another file by pressing the arrow key <Up> or <Down>. To select one file press <Enter>. That moves the cursor to the lower field where you can edit the file name. To move to the upper field again press the arrow key <Up>. To apply the file name press <Enter>. The file name can be edited by the numder keys.

If there is no file listed in the upper area, just press <Enter> to jump to the lower area, enter a new name and apply it by pressing <Enter>

To cancel the input press <Escape>. That closes the dialogue.

Separator

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

A English MSOffice requires a comma, but a German MSOffice a semicolon to import data from a .CSV file.

Period

As soon as the data logging is started and High Voltage is on the control writes the actual test data into the data log file each period time.

Autostart

If Autostart is set on the data logging is started automatically at program start. If not, you have to start it manually by pressing the "Start data log" menu button.

Overwrite Data

If overwrite Data is active the Data File will be destroyed and created new if it exists allready at Data log start. 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. Otherwhise Data gets lost.
If overwrite Data is not active then new Data will be appended to the Data file if it exists allready.

Content of the 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 (0 if not available)

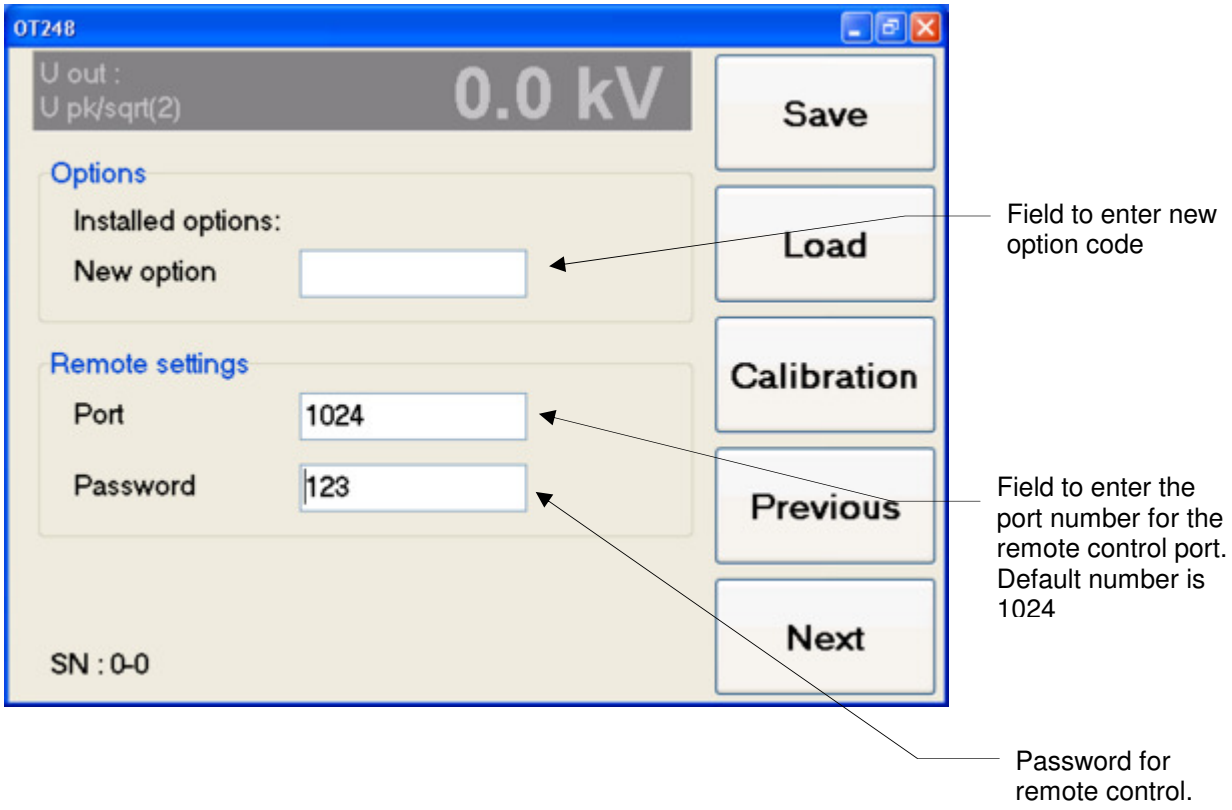
Options

General

The OT248 provides the following options:

- Sequences
- Remote

Both can be enabled by entering the suitable options code in the options menu.



Installed options

Installed and enabled options are displayed here.

New options

The code to enable a new option can be entered here. The code can be obtained at HAEFELY. The options are not included in the standard scope of supply. They must be bought separately.

Remote port

The port number for the remote control port must be specified here. The default port number is 1024.

Remote password

The remote access can be protected by a password. If this password is defined the system does not accept any remote command unless the remote controller sends this password together with the "REN" command.

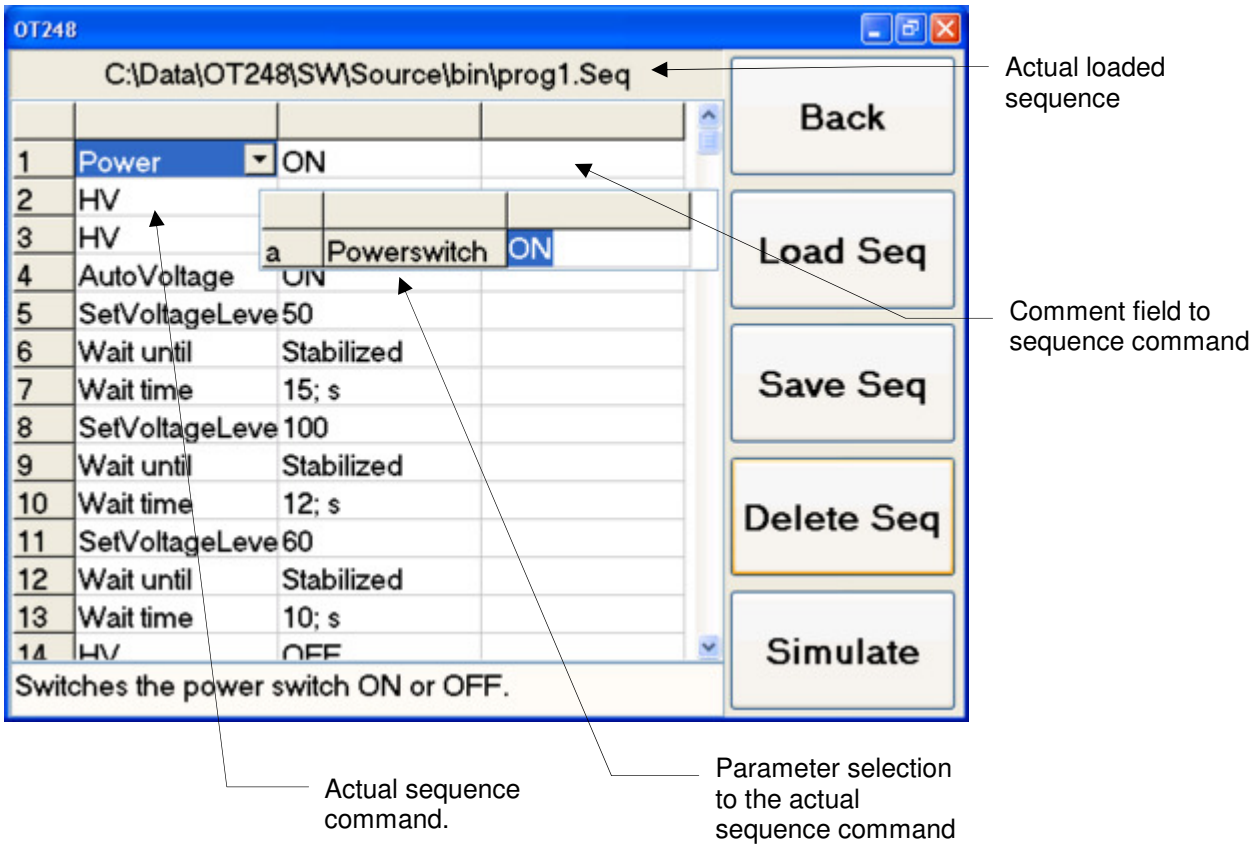
Sequences

General

The sequence tool of the OT248 allows the control to perform simple test procedures fully automatic. Test procedures can be programmed, stored and recalled at a later moment again.

Editing sequences

The sequence editor contains an easy to use table with one editable command per line.



Creating a sequence

To create a sequence proceed as follows:

1. Open the sequence editor.
2. Move the cursor to the command to be edited by <Up> or <Down>.
3. Pressing <Enter> opens a popup menu with all possible commands.

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

5. 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. Press <Enter> to get drop down list with all parameters. Pressing the <Left> arrow button closes the list.
6. To add a next command just edit the field of the next line and restart at point 2

Modifying a sequence

To modify an existing sequence just move the cursor to the line by the <Up> or <Down> button and press <Enter>. That opens the popup menu again. The last two commands are to insert a new line or to deleter a existing line of the sequence.

To modify an existing command press the <Right> arrow key to reopen the Parameter list to the command.

Saving a sequence

Press the "save" button. That opens a file save dialog where you can select a file name and save the sequence under an this name. It will be stored with the extension .seq.

Load a sequence

Press the "load" button. That opens a file open dialog where you can find the desired sequence.

Deleting a sequence

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

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

Simulating a sequence

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

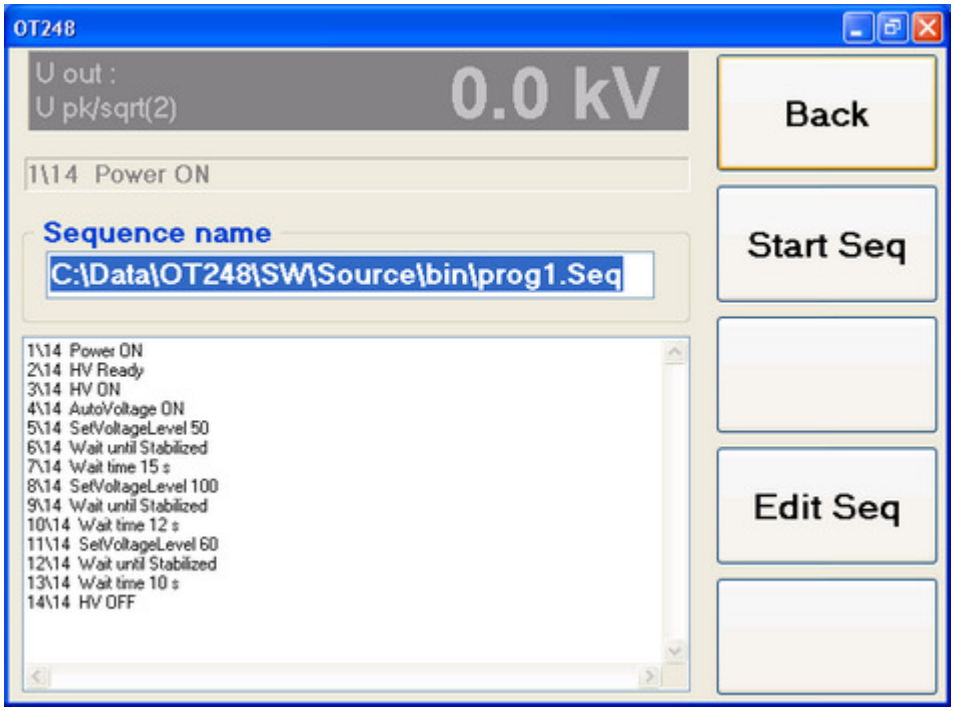
System functions

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

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 stab			Waits until the system 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	Defines a label
Goto	A	String	Jumps to a defined label
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
Define Var.	A B	Variable. Name Initial Value	Defines a floating point Variable with the initial value
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

Executing a sequence



Loading a sequence

To load a sequence press the "Load" button. That opens a file open dialog to select the Sequence File.

Executing a sequence

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

Pausing a sequence

To pause a sequence while executing press the "Stop" button. That stops the execution temporary and enables the "Continue" button.

Continuing a paused sequence

To continue the execution of a paused sequence press the "Continue" button. That continues the execution at the command where the sequence had been paused.

Quit a sequence

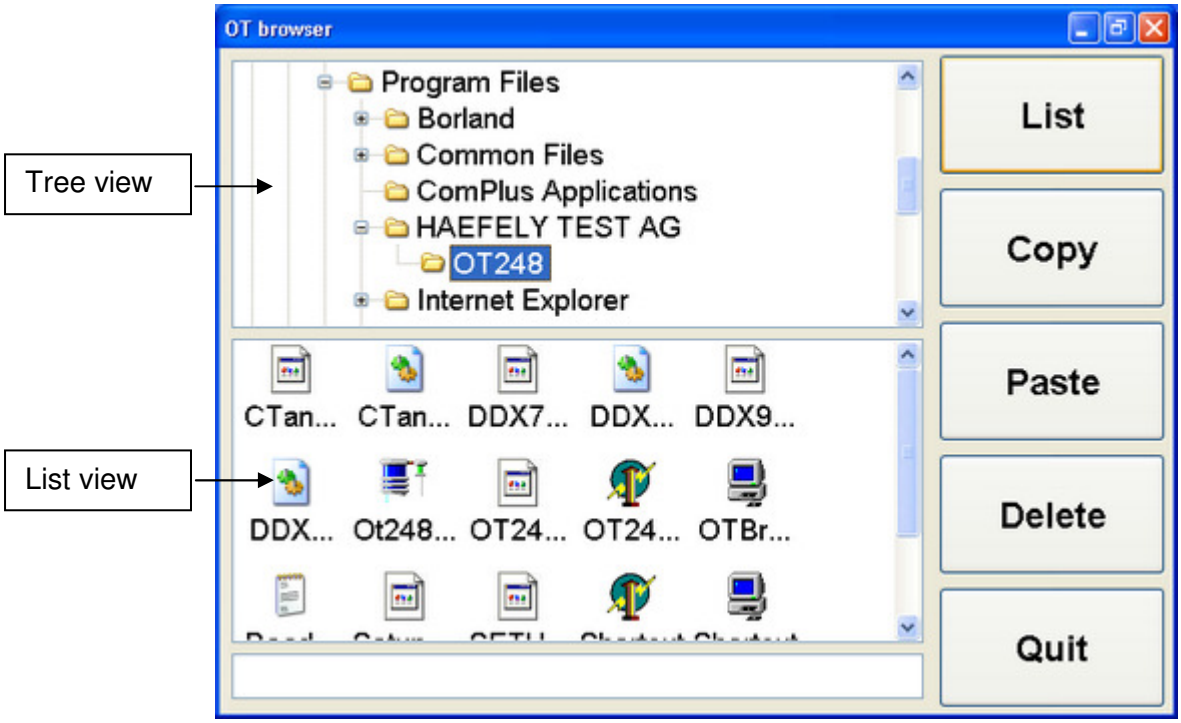
To stop the execution of a sequence first press the "Stop" button and then the "Quit" Button. That stops the execution of the sequence, switches of High Voltage and resets the sequence.

File browser

General

The file browser provides access to the measured data. Files can be copied or deleted there. It consists of one single window that displays the system in tree view in the upper part and the actual directory listed in the lower part. Change from the upper to the lower part and vice versa by pressing <F1>

Caution! Changing to the file browser switches off high voltage.



Operation

In the tree view you can move between the directories by pressing the arrow keys. <Up> and <Down> move from one to another directory on the same level. <Left> moves from one directory to the next upper one. <Right> moves down into the actual directory and expands its sup directories in the tree.

In the list view move to select the desired file by using the arrow keys.

To copy a file first move to the directory in the tree view. Then change to the list view and select the desired file by the cursor. Now press <F2> (Copy) to mark the file to copy. Change back to the tree view and move to the target directory. Now change to the list view again. To insert the file in this directory without changing the file name just press <F3> (Paste). To change the file name edit the name displayed in the edit box on the bottom of the window using the numeric

keys and the arrow keys. After entering the file name and confirmation by pressing <Enter> press <F3> (Paste) to insert the file with this name.

Please note: Only single files can be copied.

Software update

A software update can be performed in the file browser too. The update must be copied onto a USB stick. From there it can be started as follows:

In the tree view move to the directory where the setup.exe file is located. Then move the cursor onto the setup.exe file in the list view and press <Enter>. That starts the installation and shuts down the OT248 application.

In the welcome screen of the installation press <Enter> to go to the next step.

At the end of the set up procedure press <Enter> again to finish the installation. That will reboot the OT248 computer and start the new software.

Additional functions

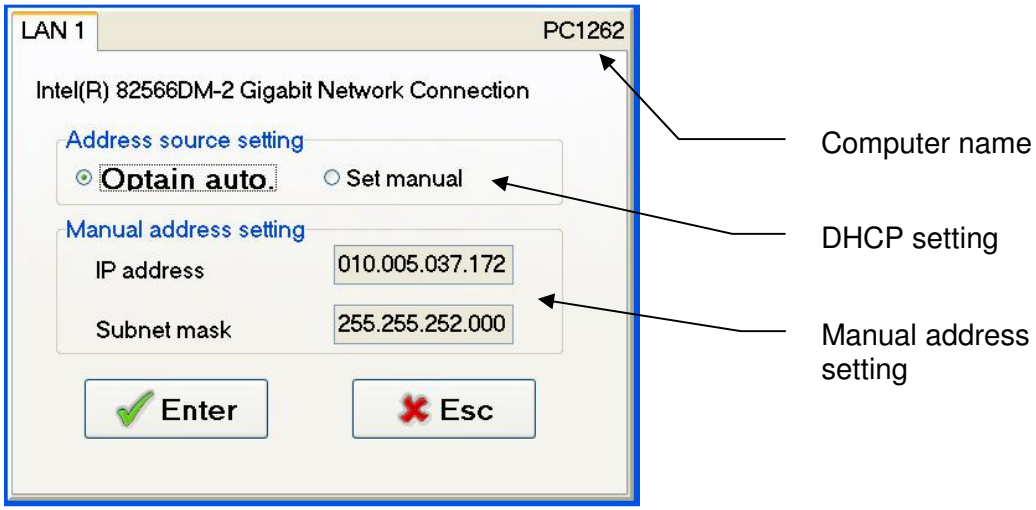
Pressing the <Setup> key shifts the function keys to a second level.

Setting date and time

To set the date and time press <Setup> and <F1> that opens a corresponding dialogue.

IP address

Pressing <Setup> and <F2> opens a dialogue that displays the IP address and the computer name of the OT248.



Here you can edit the network address, subnet mast and DHCP setting. In the upper right corner the computer name of the OT248 is displayed. If the OT248 is installed in a network with DHCP service and the IP address is obtained automatically, this name identifies the OT. If there is no DHCP service the fixed IP address must be used.

The settings can be stored by moving the input mark to the <Enter> button and pressing <Enter>. After saving the IP address data the OT248 will reboot to activate the new settings. To close the dialogue without saving press <Escape>

Creating directories

To create a new directory first select the location where the new directory should be created in the tree view. Then change to the list view and enter the name of the new directory. Then press <Setup> and <F4> that creates the new directory.

Remote control operation

General

Using the remote control option, you can fully operate the OT248 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 OT248.

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 OT248 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.

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>

Command Set

The commands available for remotely controlling the OT248 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 OT248 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.

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.

			LS	LA	RS	RA	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, OT248, 0, X.XX
*TST?	<NR1>			x		x	OT248 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 OT248 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 OT248
*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 OT248.
HELP?	<ARBITRARY ASCII RESPONSE DATA>			x		x	Returns the available command headers.

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.	LA	RA	LS	RHE	RHA	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.

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	LS	LA	RS	RA	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 flashhover. 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%]

4.8.5.4. Alarms

Command header1	Command header2 or Arg.	Command header3 or Argument	LS	LA	RS	RA	Commentary
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 change. System switch on is not possible.

	EXCiterTAPCHanging?	NO YES		x		x	Exciter tap change. 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 carrying 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	Bit coded integer value carrying following alarms. Bit 0 Regulator collective alarm Bit 1 Alarm Bit 2 Trip Bit 3 Voltage trip Bit 4 Current trip Bit 5 Power missing Bit 6 High voltage missing Bit 7 Regulating transformer position Bit 8 HV relay
	HVSection?	<Nr1>		x		x	Bit 0 High voltage collective alarm Bit 1 Alarm Bit 2 Trip Bit 3 Voltage trip Bit 4 Current trip Bit 5 Exciter voltage trip Bit 6 Earth switch Bit 7 Exciter tap changing Bit 8 Reactor tap changing Bit 9 Timer Bit 10 Flashover

Dangers and Safety Notes (English)

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.).

Dangers when Working on the Control Desk

The desk / rack of the AC Control System is a unit enclosed within itself, that 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.

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.

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.

Gefahren- und Sicherheitshinweise (German)

Allgemeine Hinweise

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

Die Steuerung OT248 AC darf nur von **geschultem** Personal bedient werden.

Die Hochspannung kann nur eingeschaltet werden, wenn alle Sicherheits-bedingungen 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 Sicherkreis öffnen. (z.B. Einschleifen in Türkontakte usw.).

Gefahren beim Arbeiten am Steuerpult

Das Pult / Rack der Steuerung *OT248 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 Demontagearbeiten 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 Sicherheitsabschrankungen befindet.

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 Abschrankungen dürfen nicht überstiegen werden.

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.

Dangers et indications de sécurité (French)

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 OT248 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.) .

Dangers lors de travaux au niveau du pupitre de commande

Le pupitre / rack du système de commande OT248 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.

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.

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.

CE Declaration

HAEFELY TEST AG

Declaration of Conformity

Haefely Test AG
Birsstrasse 300
4052 Basel
Switzerland

declare, under his own responsibility, that the product here mentioned, complies with the requirements of the listed standards or other normative documents.

So, the product complies with the requirements of the EMC directive 2004/108/EC and the low voltage directive 2006/95/EC.

Product:	**Operating Terminal OT 248**
Description:	AC System Operating Terminal OT 248 is used to control, measure and operate AC systems for high-voltage test purposes.
Standards:	EN 61010-1: 2001 EN 61326-1: 2006

R. Mäder
Quality Department Manager
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Basel, June 21, 2011

.....
(Signature)

HAEFELY HIGH VOLTAGE TEST Tettex INSTRUMENTS HAEFELY TECHNOLOGY

Haefely Test AG, Birsstrasse 300, CH-4052 Basel/Switzerland
www.haefely.com

Maintenance

General

The OT248 AC control system is almost maintenance free. The following points should nevertheless be observed:

Cleaning the Frontpanel and the Screen

The frontpanel 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.

Fan

The 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.

Glossar

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 a almost fixed ratio between input and output voltage and therefore the output voltage is relatively easy to be controlled.

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.

RTS

Resonant Test System

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 fix. 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.

Tuning

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

Uout

Output Voltage

warning lamp

One red and one green lamp that indicate the system status. 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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