OCTAX Log & Guard™ pH Online™

Preface:

OCTAX Log & Guard™ is a monitoring and alarming device for assisted reproduction laboratories. OCTAX Log & Guard™ integrates sensors for temperature measurement in incubators, liquid nitrogen tanks, refrigerators etc. as well as CO_2 sensors for incubators. A combined sensor for measurement of ambient temperature and humidity is also available. For continuous pH monitoring in incubators, **pH Online™** sensor units can be integrated. Alarm relays of external devices can be connected. Measured data are logged in the internal memory (independent from a PC). OCTAX Log & Guard™ is operated via a web interface for graphical visualization of logged data and for adjusting the settings of connected sensors.

OCTAX Microscience GmbH
Made in Germany

User Manual
November 2011 Edition
OLG 0.163A

Contents

WARNING

This symbol denotes important information regarding the correct treatment of cells and the proper application of pH Online™. Please read all warnings before treating any cells to ensure safe application and optimal results.

NOTE

This symbol denotes important additional information regarding OCTAX Log & Guard™ and pH Online™.

Part I: Introduction

This chapter gives an outline of the principle, the applications and key features of OCTAX Log & Guard™ and pH Online™. Specification of the system components will familiarize you with the devices.

Introduction

OCTAX Log & Guard™ device

OCTAX Log & Guard™ was developed to monitor critical parameters in the IVF and cryopreservation laboratory. OCTAX Log & Guard™ (Fig 1) integrates peripheral devices like pH Online™ sensor units, temperature loggers and CO_2 sensors. It provides a user friendly software environment for pH Online™. Logged data are available for display and download via web interface for easy access from any PC in the intranet.

In case the measured values exceed pre-defined normal ranges, an optical and acoustical alarm is triggered. An alarm message can be sent to mobile phones. Optionally, the alarm can be transmitted via output relays. In addition, OCTAX Log & Guard™ monitors the switching status of alarm relay inputs from external devices and is able to document and forward those alarms.

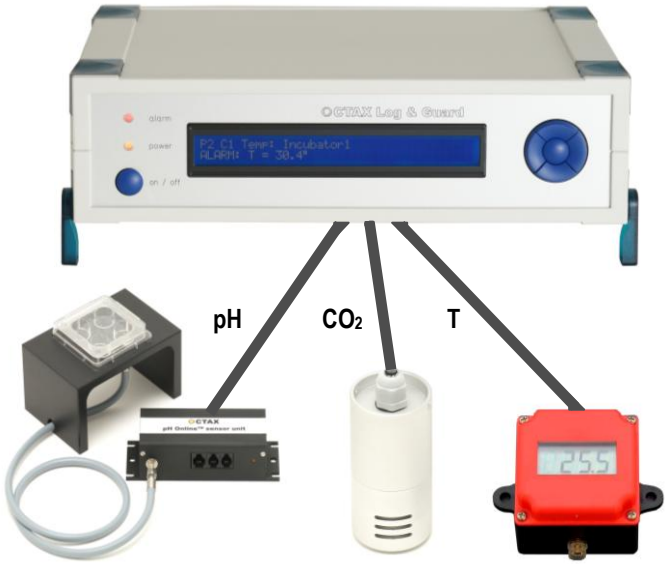


Fig. 1: OCTAX Log & Guard™ device with pH Online™ pH meter, CO_2 sensor and temperature logger.

The measured values and status of the channels can be reviewed directly on the display of the OCTAX Log & Guard™ device or using the web interface to OCTAX Log & Guard™.

WARNING

To avoid damage of the OCTAX Log & Guard™ controller by overheating, proper air circulation has to be guaranteed at the backside and top of the device. Do not place any object on top of the device! .

pH Online™ for continuous pH monitoring

pH Online™ is a compact, fiber-optic pH meter for non-invasive pH monitoring in cell culture media inside the incubator (Fig. 2). pH Online™ was specially developed to work with small fiber optics and pH mini sensors. It is based on a novel technology which creates very stable, internally referenced pH values from optical pH sensor spots.

Sensor spots are integrated into modified four well culture dishes in order to measure pH in IVF culture media from outside through the wall of the dish placed in an incubator. The optical pH sensors are based on the new "Dual Luminophore Referencing" method (see also chapter "Additional information", p. 75). They consist of an inert long decay time reference dye and a short decay time pH indicator dye with pH dependent response time. pH is calculated from the phase shift between reference dye and pH indicator dye light responses. Consequently, the signal is internally referenced and not sensitive to photo bleaching.

For pH measurement, pH Online™ sends an excitation light pulse through the fiber optics to the sensor spot. The light response which is measured by pH Online™ represents the ratio of the fluorescence intensities of the two fluorochromes (reference and pH sensitive) in the spot. It is converted to a phase shift by the pH Online™ sensor unit to calculate the corresponding pH value. The final pH value is displayed by OCTAX Log & Guard™. For preparation of the pH Online™ sensor dishes see part II, pp. 35.

pH Online™ sensor dish sitting on an holding rack inside the incubator

pH Online™ sensor unit is placed outside of an CO_2 incubator

Fig. 2: The holding rack for pH Online™ sensor dish is placed in the inner chamber of the incubator. The grey fiber optic (FO) is making contact with the sensor spot integrated into a modified four well culture dish (sensor dish). For connection to the pH Online™ sensor unit the fiber optic has to be fit through the access port.

Key Features of OCTAX Log & Guard™

The key features of OCTAX Log & Guard™ are:

- integration of pH Online™ and CO_2 sensors, temperature loggers and external alarm relay inputs
- online display and graphical visualization of measured data
- PC independent data logging
- user-friendly operation via web interface, no separate PC required
- download of logged data and automatic conversion into an MS Excel Sheet
- individual and adjustable alarming thresholds for each sensor channel
- individual and adjustable alarming options for each sensor channel
- various alarming functions: optical, acoustical, text message to mobile phone
- alarm on mains failure (battery backed function)
- alarm transmission via output relay

Key features of pH Online™

The key features of the pH Online™ sensor unit are:

- contact free and non-destructive pH analysis through the wall of the dish
- disposable, sterile, pre-calibrated pH sensor dish with integrated pH sensor spot for pH measurement under culture conditions without the need of cleaning or re-sterilization
- adjusted to pH measurement in the physiological range of pH 5 – 9
- excellent long-term stability of measurement
- no reference electrode needed
- accuracy up to 0.03 pH
- resolution up to 0.01 pH
- insensitive towards electrical interference and magnetic fields
- convenient operation, data logging and display through OCTAX Log & Guard™

Installation of pH Online™

Required components

- pH Online™ sensor unit including line adapter
- Fiber optic (heat resistant, standard length 75 cm)
- RS 232 cable
- Black aluminum rack for sensor dish and fixation of fiber optic inside the incubator
- Disposable pH Online™ sensor dishes with integrated pH sensor spot (starter package included in pH Online™ equipment; Ref. No. 14850/8998)
- OCTAX Log & Guard™ device including line adapter
- LAN network cable for connection of OCTAX Log & Guard™ to intranet (not included in pH Online™ equipment)
- PC connected to intranet (not included in pH Online™ equipment)

Installation of pH Online™ (single channel setting only!)

NOTE

For pH measurements inside the incubator using pH Online™ the incubator needs to have an access port to install the fiber optic.

Length of the fiber optic is 75 cm. Attach the pH Online™ sensor unit to the rear wall of the incubator, close to outlet of the access port.

Default length of the RS 232 data cable connecting the pH Online™ sensor unit and OCTAX Log & Guard™ is 1.8 m. A longer cable is available on request.

CAUTION

The fiber optic must not be folded or squeezed (a bending radius greater than 5 cm is tolerated). The polished front ends of the fiber optic must not be scratched or contaminated.

For non-invasive pH measurement inside an incubator the components of pH Online™ and OCTAX Log & Guard™ have to be connected appropriately. The grey, heat resistant

fiber optic is required for transmitting light pulses between the pH sensor spot in the dish and the pH Online™ sensor unit. Connection of pH Online™ to OCTAX Log & Guard™ via a RS 232 data cable enables display and logging of measured pH values. OCTAX Log & Guard™ is connected to the intranet by a LAN cable to access logged data (display and download) and adjust the settings of pH Online™ devices via web interface.

- Carefully pass one end of the fiber optic through the access port into the chamber of the incubator (for details see manual of your incubator). Make sure the access port is sealed appropriately after installing the fiber optics.
- Place the aluminum rack in the incubator. Feed the fiber optic through the side hole in the aluminum rack. Remove black protective caps from the ends of the fiber optic. **Avoid any scratching or contamination of the polished front ends of the fiber optic! Do not bend the fiber too strongly!** Connect the fiber optic to the holding rack by screwing its end to the thread underneath the holding rack (see Fig. 3).

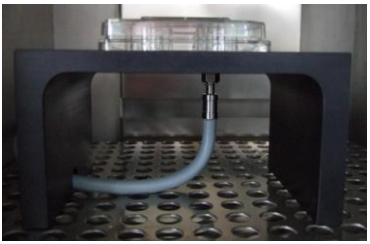


Fig. 3: Holding rack for pH Online™ sensor dish in the inner chamber of an incubator. The grey fiber optic is fixed under the holding rack and exits the incubator through the access port (not shown).

- Connect other end of the fiber optic (outside the incubator) to the fiber connector of the pH Online™ sensor unit (Fig. 4) and fix it with the screw nut. Do not bend any part of the fiber optic to a radius smaller than 5 cm!
- Connect the power supply to the 12V DC port (RJ-11) of the pH Online™ sensor unit (Fig.4).

! WARNING

To avoid damage of the OCTAX Log & Guard™ controller by overheating, proper air circulation has to be guaranteed at the backside and top of the device. Do not place any object on to of the device! .

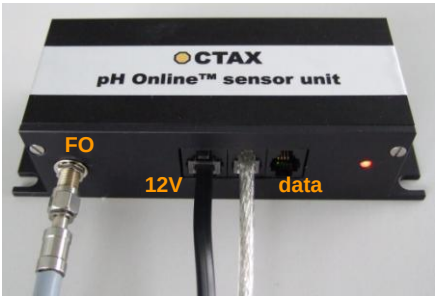


Fig. 4: Connection of the grey fiber optic (FO) to pH Online™ outside the incubator. Data connection to OCTAX Log & Guard™ via serial cable (silver cable; data). Power supply is plugged in the 12V DC port (black cable).

- Connect the central data port (RJ-10) of the pH Online™ sensor unit to port 1 on the backside of the OCTAX Log & Guard™ device using the RS 232 data cable (Fig. 5)

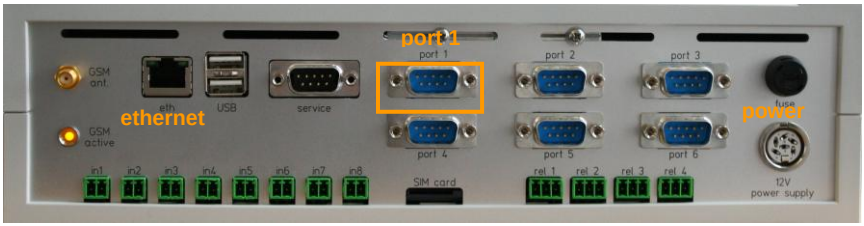


Fig. 5: Backside of the OCTAX Log & Guard™ device with highlighted ports for Ethernet, RS 232 data connection and 12V DC power supply.

- Connect the power supply to the 12V DC port (Fig. 5) of OCTAX Log & Guard™.
- Connect OCTAX Log & Guard™ to the intranet (ask your local IT administrator for support)
- Prepare a sensor dish and place on holding rack (see manual pp. 32).
- See pp. 34 for instructions on pH Online ™ calibration using the batch specific calibration certificate.

OCTAX Log & Guard™ and pH Online™ are now ready for use. See next chapters for details on measuring pH and channel configuration.

Part II:

Monitoring pH, temperature and CO_2 using OCTAX Log & Guard™

Basic operation of OCTAX Log & Guard™

After installation of OCTAX Log & Guard™ and connection to the external sensors, the system will monitor and log the data of connected channels. For continuous monitoring, the system has to be running and all connections to OCTAX Log & Guard™ ports have to remain in place. If you need to shut down the system, press the “on / off” button for approx. two seconds until a message appears in the display “logging has been stopped good bye”. The system will shut down safely within the next minutes.

Starting the OCTAX Log & Guard™ system

To start the system, press the blue “on / off” button on the front plate of OCTAX Log & Guard™ (Fig. 6) for about one second. Booting the system and initializing the connected sensors and channels takes few minutes. Information in the display informs about the progress. When initialized, OCTAX Log & Guard™ automatically starts measuring and logging data according to the preset conditions (see chapter “Channel configuration”, pp. 39). The active channels and their measurement values are shown in the display and can also be accessed via the web interface of OCTAX Log & Guard™.

Fig. 6: Front view of the OCTAX Log & Guard™ device.

Information in the display of OCTAX Log & Guard™

The LCD display of OCTAX Log & Guard™ shows important data in condensed form. A data and, alternatively, a system menu is displaying information by cyclic auto-scrolling. Information on the system menu is: IP address of the OCTAX Log & Guard™ device, host name of the device and signal quality of the integrated GSM modem.

In the data menu the following information is displayed by cyclic auto-scrolling (for each of the connected channels): port number, channel number, monitored parameter, individual channel name, measurement value and alarm or normal status if applicable.

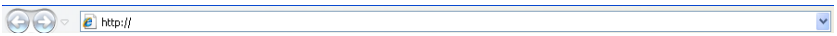
Data can be accessed directly (by overriding the auto scrolling function) using the up and down keys. The display can be switched between data and system menu by the right and left keys. Pressing the central button suspends alarms in all channels ("Alarm off", Fig. 7).

Fig. 7: Control keys of OCTAX Log & Guard™.

Access to OCTAX Log & Guard™ web interface

Review of current data and operation of OCTAX Log & Guard™ is performed via web interface. Any PC with an internet browser connected to the intranet can be used to access OCTAX Log & Guard™.

Open the browser and enter the IP address of OCTAX Log & Guard™ (e.g., http://169.254.1.1) to access the web interface. The IP address of the device can be read in the LCD display; see p.23. The web interface will open in the browser window and display a graphic overview of all connected channels as described in the next chapter (Fig. 8).



Review and download of logged data

Data overview of connected channels:

The OCTAX Log & Guard™ web interface opens with an overview page. All connected channels are displayed, showing the current measurement values and status of the channels (normal vs. alarm, Fig. 8).

The browser window is refreshed automatically every two minutes. The window can be refreshed manually by pressing F5 on the keyboard of the PC. The detailed data of an individual channel can be displayed by a left mouse click on the respective graph.

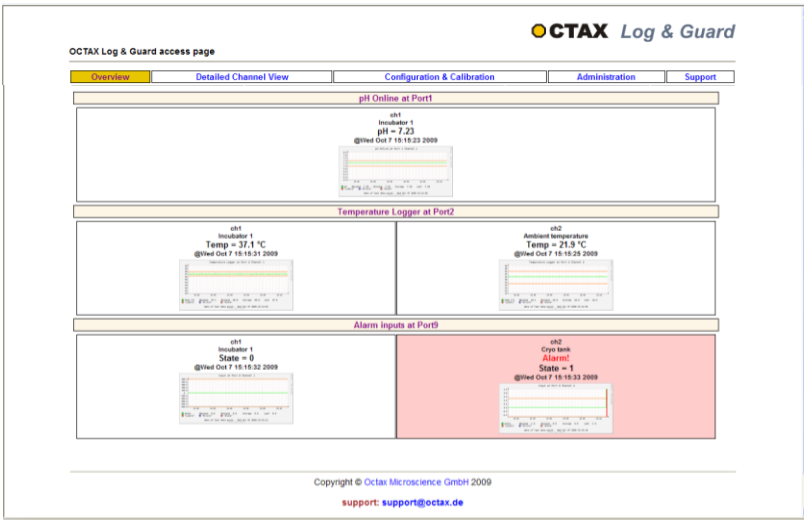
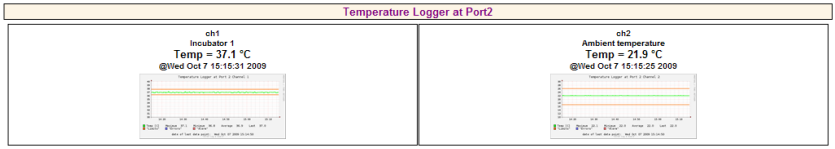


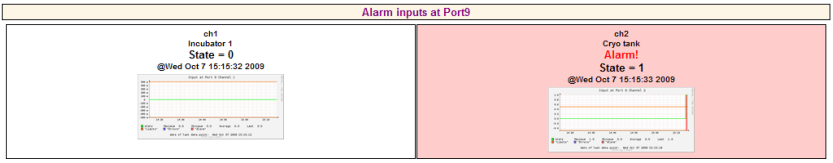
Fig. 8: Web interface to OCTAX Log & Guard™: overview page.

1. Sensor channels for pH, temperature and CO_2 measurements:



One serial port of OCTAX Log & Guard™ can operate up to four pH Online™ or up to eight CO_2 sensor units or up to nine temperature loggers (two temperature loggers shown in the example above). Information of each temperature or pH sensor is displayed as an individual channel. Each channel shows the current measurement value and additional information.

2. Channels for alarm relay inputs:



External alarm relay contacts of incubators, nitrogen vapor phase storage tanks, door alarms, etc. can be connected to the alarm relay inputs of OCTAX Log & Guard™. Accordingly, the state of alarm input channels can only switch between normal state = 0 and alarm state = 1. Like in all channels, alarm is indicated by a red background color of the channel and the text “Alarm!”.

Detailed channel pages for pH, temperature and CO_2

Clicking on a graph on the overview page or the “Detailed channel view” link will show the latest measurement value as well as an enlarged diagram with the options to visualize data on an hourly, daily or weekly scale. Alarm thresholds are shown as red lines (Fig. 9). Any alarm event is indicated in red color.

NOTE

Refreshing the browser window will not generate a new measurement point. Measurements are taken based on the measuring interval. Typically it will be longer than the refresh rate of the browser window. Exact measurement time of the displayed value is displayed as “@ date hour:minutes:seconds” above the graph.

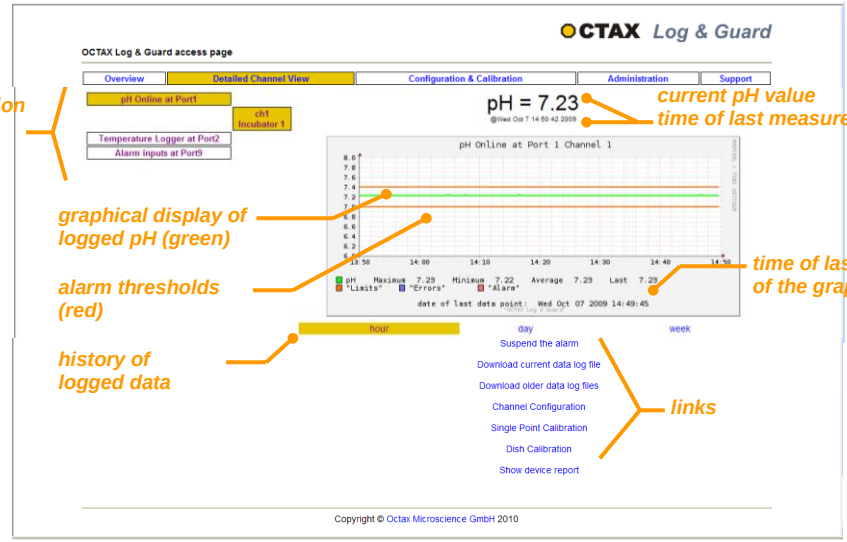


Fig. 9: Details of a pH channel page of OCTAX Log & Guard™. Temperature and CO_2-channels are identical.

The current window on display is indicated by a yellow background of the navigation buttons on the left side of the individual channel page. The individual pages for other ports or channels can be accessed by clicking on the respective boxes. To go back to the "Overview" page click on the link in the menu headline.

The individual pages for pH, temperature or CO_2 sensors are showing information about current and past measurement values (Fig. 10).

- Value of the last pH, temperature or CO_2 measurement
- Time point of last measurement (@ date hh:mm:ss year)
- Statistical overview of data (min, max, average, last)
- Graphical display:
    - History of logged data. Can be displayed on an hourly, daily or weekly scale by clicking the respective button (see Fig. 10)
    - Upper and lower alarm thresholds

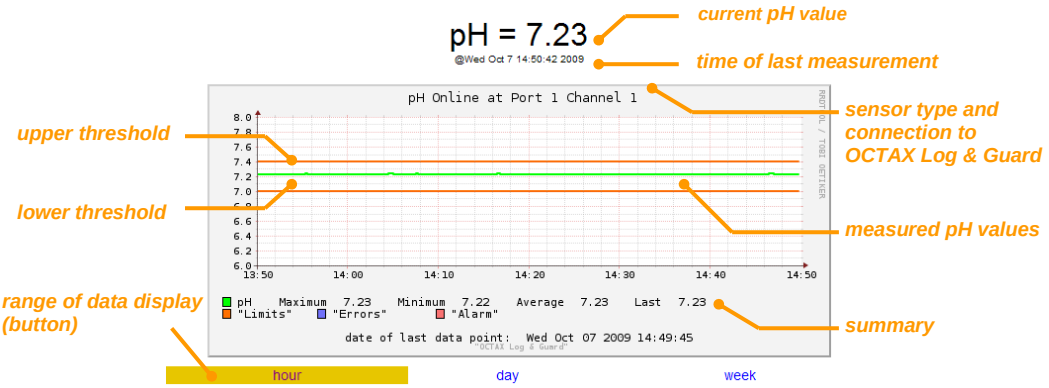


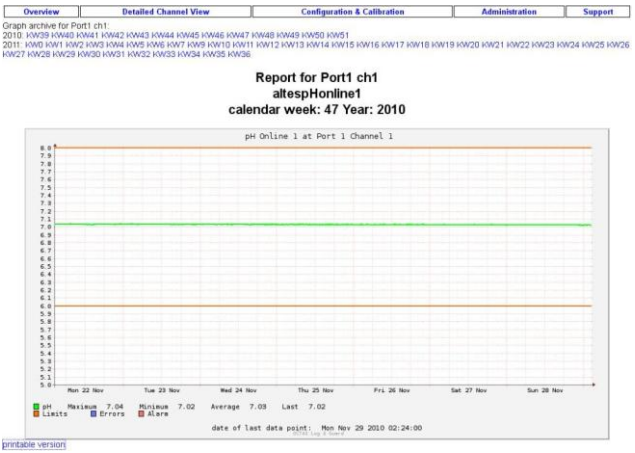
Fig. 10: Detailed view of a graph for pH (temperature and CO_2 are identical).

Link menu of the pH, temperature or CO_2 detailed channel pages

The list of text links below the graph is used to download logged data, to adjust channel settings and to perform single point calibration for pH, temperature or CO_2 (see Fig. 9). The actions may be protected by the configuration administrator password. See next chapter for a detailed description (pp. 39).

Graph Archive

Graphs of pH, temperature or CO_2 values were logged and saved per week while the respective channel was active. The *Graph archive* link opens a page where all calendar weeks of saved graphs for this channel are indicated. A graph is displayed when clicking on the calendar week. To print out click the “printable version” link in the left lower corner of the window.



Download current data log file (free access for all users)

"detailed"

Logged measurement values (pH, temperature or CO_2) can be converted into an MS Excel sheet (Fig. 11a, b). When clicking on the link "detailed", a window to open or save logged data as MS Excel file will be opened. The file shows all information which has been logged.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	ctime(s)	date(DD/MM/YY)	time(hh:mm:ss)	amp[a.u.]	phase[Â°]	temp[Â°C]	uncalibrated	pH	errors	lower threshold	upper threshold	alarm	cmax	cmin	cpho	cdph	calp	tmpc
4691	1255679306	16/10/09	09:48:26	5842	31.99	37.0	7.29	7.30	0	6.00	8.00	0	15.00	58.00	7.00	0.70	37	37.00
4692	1255679321	16/10/09	09:48:41	5842	31.97	37.0	7.29	7.30	0	6.00	8.00	0	15.00	58.00	7.00	0.70	37	37.00
4693	1255679338	16/10/09	09:48:58	5843	31.93	37.0	7.30	7.30	0	6.00	8.00	0	15.00	58.00	7.00	0.70	37	37.00
4694	1255679354	16/10/09	09:49:14	5846	31.97	37.0	7.29	7.30	0	6.00	8.00	0	15.00	58.00	7.00	0.70	37	37.00
4695	1255679370	16/10/09	09:49:30	5843	31.96	37.0	7.29	7.30	0	6.00	8.00	0	15.00	58.00	7.00	0.70	37	37.00

Fig. 11a: Log file of a pH Online™ sensor channel exported to MS Excel by OCTAX Log & Guard™.

	A	B	C	D	E	F	G	H	I
1	ctime(s)	date(DD/MM/YY)	time(hh:mm:ss)	uncalibrated temp	temp[Â°C]	errors	lower threshold	upper threshold	alarm
20542	1254920466	07.10.2009	15:01:06	38.8	36.9	0	36.3	37.8	0
20543	1254920480	07.10.2009	15:01:20	38.9	37	0	36.3	37.8	0
20544	1254920493	07.10.2009	15:01:33	38.9	37	0	36.3	37.8	0
20545	1254920506	07.10.2009	15:01:46	38.9	37	0	36.3	37.8	0

Fig. 11b: Log file of a temperature sensor channel exported to MS Excel by OCTAX Log & Guard™.

"simplified"

When clicking on the link "*simplified*", only logged date, time and pH are downloaded and displayed as MS Excel file.

"simplified,ods"

When clicking on the link "*simplified,ods*", logged date, time and pH are downloaded and displayed as Open Office file. A graph for all data in the current file is generated automatically. The link is functional from software versions Office2007 or Open Office 3.2.

"zoomable online view"

When clicking on the link "*zoomable online view*", all data in the current log file of the respective channel will be downloaded and converted into a graph. To zoom into the graph, click with the mouse and hold to draw a rectangle. When releasing the mouse button the selected area is enlarged (Fig. 12). The button "*Reset zoom*" will restore the original graph. This link is functional, if javascript is enabled in the browser. For best performance a recent version of Firefox browser software is recommended.

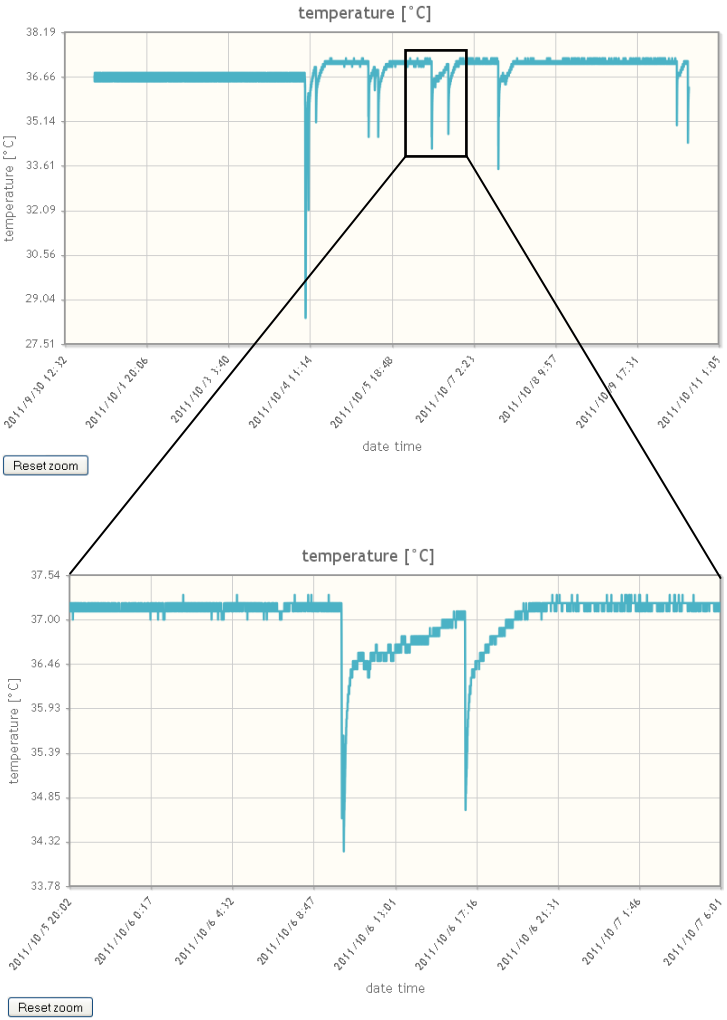


Fig. 12: Graph of a temperature channel in "*zoomable online view*". The black rectangle depicts the area which was marked with the mouse to zoom in. Zoomed view is shown below.

The *current data log file* contains up to 32,000 measurement points. Older data have to be saved in previous MS Excel files. For access see below.

Download older data log file

The link leads to a directory page (Fig. 13) showing all available older data log files for the respective pH Online™ (temperature logger or CO_2 sensor) channel. The selected log file can be opened or saved as MS Excel file.

Fig. 13: Directory page for *older data log file.*

Detailed channel page for external alarm relay inputs

External alarm sources can transmit the alarm to OCTAX Log & Guard™ via alarm relay inputs. The status of the alarm relays can be normal (0) or alarm (1). An individual page for the external alarm sources connected to OCTAX Log & Guard™ is opened by clicking on the small graph of the respective channel in the overview page (Fig. 14). To go back to the "Overview" page click on the link in the top menu.

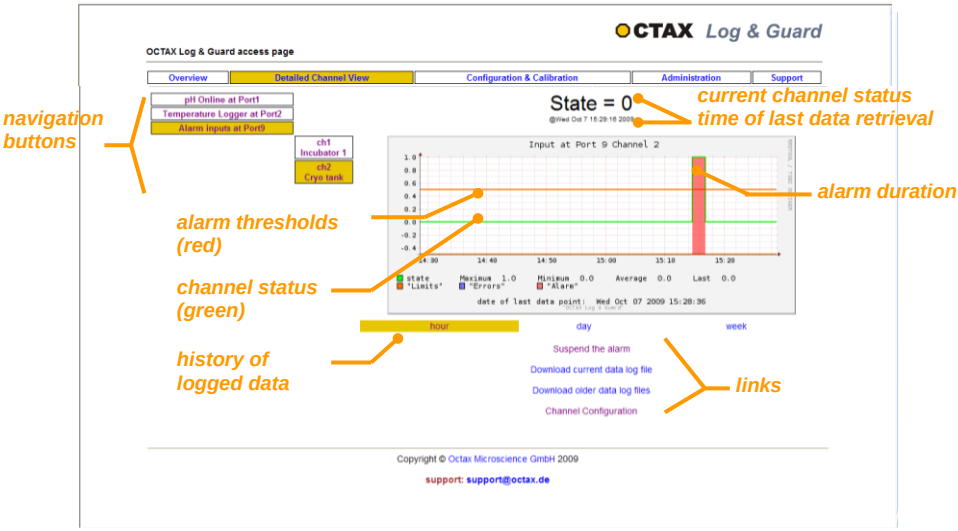


Fig. 14: Details of an alarm relay input channel of OCTAX Log & Guard™

The detailed page for an alarm relay input shows information about the current and past channel status.

- Channel status, indicated as 0 = normal or 1 = alarm
- Time point of last measurement (@ date hh:mm:ss year)
- Statistical overview of data (min, max, average, last)
- Graphical display:
    - History of logged data. Can be displayed on an hourly, daily or weekly scale by clicking the respective button (see Fig. 14)
    - Upper and lower alarm thresholds

Link menu of the alarm relay input detailed channel page

The list of text links below the graph is used to download logged data and to adjust channel settings. The latter actions are protected by the configuration administrator password. See next chapter for a detailed description (pp. 39).

Download current data log file

"detailed"

Logged data can be converted into an MS Excel sheet. When clicking on the link "detailed", a window to open or save logged data as MS Excel file will be opened. The file shows all information which has been logged.

"simplified"

When clicking on the link "*simplified*", only logged date, time and status are downloaded and displayed as MS Excel file.

"simplified,ods"

When clicking on the link "*simplified,ods*", logged date, time and status are downloaded and displayed as Open Office file. A graph for all data in the current file is generated automatically. The link is functional from software versions Office2007 or Open Office 3.2.

"zoomable online view"

When clicking on the link "*zoomable online view*", all data in the current log file of the respective channel will be downloaded and converted into a graph. To zoom into the graph, click with the mouse and hold to draw a rectangle. When releasing the mouse button the selected area is enlarged (see Fig. 12). The button "*Reset zoom*" will restore the original graph. This link is functional, if javascript is enabled in the browser. For best performance a recent version of Firefox browser software is recommended.

The *current data log file* contains up to 32,000 measurement points. Older data have to be saved in previous log files.

Download older data log file

The link leads to a directory page showing all available older data log files for the alarm input channel. The selected log file can be downloaded to MS Excel. The selected log file can be opened or saved as MS Excel file.

Use of pH Online™ sensor dishes

pH Online™ sensor dishes are modified four-well IVF culture dishes with an integrated pH sensor spot (Fig. 15). Sensor dishes come in a light protective package, they are sterile and ready for use. As a sensor dish is prepared in the same way as an embryo culture dish, pH values can be monitored under real culture conditions.

Fig. 15: Sensor dish for ph Online™ with integrated sensor spot in the left well.

WARNING

Human gametes or embryos must not be incubated in sensor dishes. Use the dishes for pH monitoring only!

Entering the calibration values of the pH Online™ sensor dishes

pH Online™ sensor dishes are pre-calibrated for measuring pH in IVF culture media inside an incubator. Four batch specific calibration values can be found on the calibration certificate of each batch. When starting a new batch of sensor dishes, these calibration values have to be entered into the calibration fields following the link “Dish calibration” on the respective pH Online™ detailed channel page (Fig. 16). Each channel has to be calibrated separately. Channel configuration and calibration pages of OCTAX Log & Guard™ are protected by a configuration administrator password (see also chapter “Channel configuration, pp. 47).

Lmin	58.000000
Lmax	15.000000
pH0	7.000000
dpH	0.700000

Fig. 16: Calibration values for pH Online™ sensor dishes on the OCTAX Log & Guard™ dish calibration page (example).

Preparing a pH Online™ sensor dish

- Remove the light protective plastic bag from the sensor dish under sterile conditions (keep package or note batch number for calibration purposes).
- Pipette a minimum volume of 300 µl of the medium you want to monitor into the well containing the sensor spot. The sensor spot has to be fully covered by medium!
- Overlay the medium with light mineral oil for embryo culture. Use enough oil to cover the whole surface of the medium (600-700 µl). **Avoid any contact between the sensor spot and the oil!** To avoid any extended exposure to light, the dish should be placed in the incubator immediately for over night equilibration (min. 5 h).
- After equilibration, place the sensor dish on the holding rack fixing the optical fiber inside the internal chamber of your incubator. Make sure that the sensor dish is oriented in a way placing the well containing the sensor spot above the optical fiber.
- When starting to use a new batch of sensor dishes, four corresponding calibration values (indicated in the accompanying calibration sheet) have to be entered on the "Sensor Dish Calibration" page of the respective pH Online™ channel (see p. 50). Once calibration values have been updated all other pH analyses using the same batch of sensor dishes can be performed directly.
- The pH sensors exhibit excellent long-term stability when used under sterile conditions. For IVF application, we recommend preparing a new sensor dish once a week. The recommended sampling rate is 20 – 30 min (1200 – 1800 s).

Important hints for the use of pH Online™ sensor dishes

- Human gametes or embryos must not be incubated in the sensor dishes. The dishes are for pH monitoring only!
- Do not use a sensor dish for more than one week to avoid contamination and degradation of the medium. Within this time do not empty and refill the sensor dish!

- Make sure that the sensor dish is correctly oriented on the holding frame: the sensor must be placed above the optical fiber!
- The sensor dishes are disposables and for single use only. Any cleaning or re-sterilization will destroy the sensor spot and make pH measurement unreliable.
- pH values exceeding 9 and organic solvents will destroy the sensor spot.

NOTE

The sensor spot attached to the bottom of one well of the pH Online™ sensor dish has to be fully covered with culture medium. The sensor spot must not be contaminated with mineral oil which is used to overlay the medium. Contaminated sensor spots will no longer be able to read correct pH values.

NOTE

Optical pH sensors are sensitive to light. Do not store sensor dished unpacked. After preparing a sensor dish, avoid extended light exposure.

Use sensor dishes before the expiry date indicated on the package. The expiry date is only valid if the light protective package is undamaged.

Do not store sensor dishes at temperatures above 40°C!

TECHNICAL SUPPORT

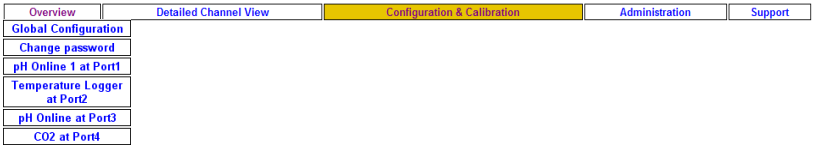
If you need assistance at any time, please contact OCTAX Technical Service. For contact details please refer to the section *Customer Service* p. 83.

Part III: Channel configuration

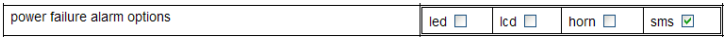
This chapter outlines channel configuration for different applications of OCTAX Log & Guard™ by the configuration administrator

Alarming options of OCTAX Log & Guard™

Alarming options in case of power failure can be entered when clicking “Configuration and administration” in the heading menu and “Global Configuration” in the navigation menu. Details are described on pp. 45.



All other alarm options for OCTAX Log & Guard™ can be selected on the detailed channel pages. To do so, the respective alarm devices have to be selected by their checkbox.



For a detailed description of channel configuration and alarming options of individual channels see the following chapters.

Alarm devices

An alarm by a specific channel triggers actions of the alarm devices below, if they were selected on the individual channel page.

led: LED on the front panel of the OCTAX Log & Guard™ device flashes red

horn: the built-in horn will give a beeping signal

sms: a text message will be sent to all mobile phone numbers indicated on the “Configuration and calibration” page. The message includes information about the alarming channel, the thresholds and current value

relays: the alarm can be transmitted via four alarm relay outputs. The output signal depends on the connected contacts. The relay is open (middle and left pin) or closed (middle and right pin) upon alarm. Most external alarm devices trigger an alarm if the circuit is opened and have to be connected to middle and left pin.

Alarm delays

To adapt alarming functions of the OCTAX Log & Guard™ device to the needs of individual IVF labs, triggering alarm devices can be delayed. For example: channel alarm

can be set to immediate activation of LED and horn signals but delayed alarming by sending a text message (Fig. 17). In case the alarm situation can be cured during the delay time, no text message will be sent. The respective delay times can be entered on the channel pages.

A reminder text message is sent if the alarm situation persists longer than the sms repeat time (default, 1800 sec = 30 min).

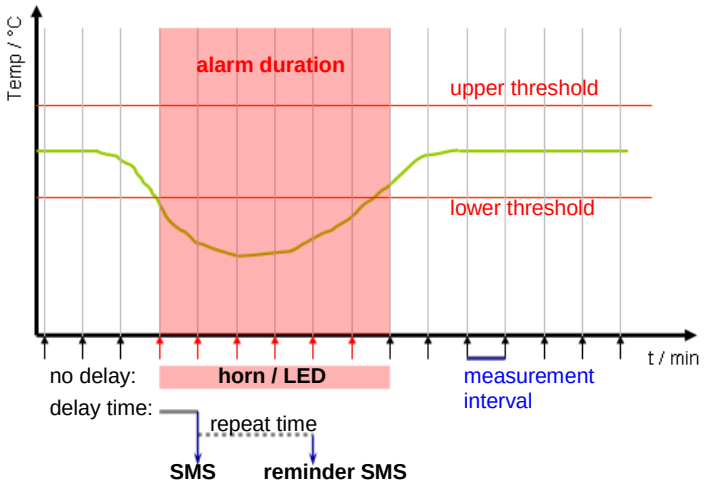


Fig. 17: Alarm management by OCTAX Log & Guard™: A measured value outside the thresholds triggers alarm. In this example LED and horn are promptly activated. A text message will be sent after the pre-defined alarm delay time (e.g., one measurement interval). As the alarm persists longer than the sms repeat time, a reminder sms will be sent.. Black arrows: measuring intervals, normal values; red arrows: measuring intervals, alarm status.

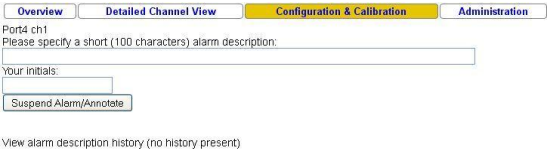
NOTE

Delay times are defined as multiples of the measurement interval. Accordingly, long measurement intervals result in long alarm delay times.

Suspend the alarm

There are two ways to suspend an alarm (horn, sending a text message, …) of OCTAX Log & Guard™: Via web interface or on the OCTAX Log & Guard™ device.

A) The configuration administrator can follow the "Suspend alarm" link on the detailed channel page of the alarming channel. A comment or alarm description can be typed in which will be shown when following the link *View alarm description history*. The alarming is suspended for the preset alarm interruption time (default: 15 min).



B) The alarm can also be suspended directly on the OCTAX Log & Guard™ device. Press the center button to suspend all alarms which may be present in different channels.

Alarm delay times and alarming actions will be re-started if the alarm conditions persist after the alarm interruption time. Information about suspended alarm / annotations and alarm restart is shown in the channel window on overview or detailed channel page (Fig. 18).

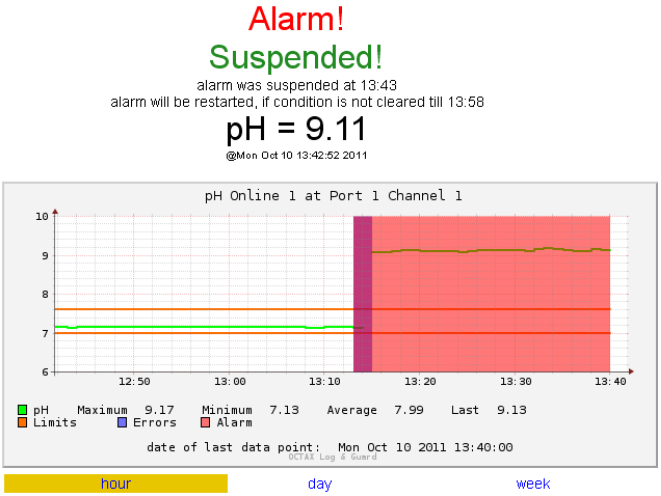


Fig. 18: Detailed channel view after action *suspend the alarm*.

Alarming actions will be re-activated after 15 min only if the alarm conditions persisted and no delay time was set for this channel (Fig. 19).

! CAUTION

After suspending an alarm, the resumption of alarming in case of persisting alarm conditions may be delayed if a long delay time (as multiples of the measurement interval) was set on the channel configuration page. Please look after the affected device after suspending the alarm!

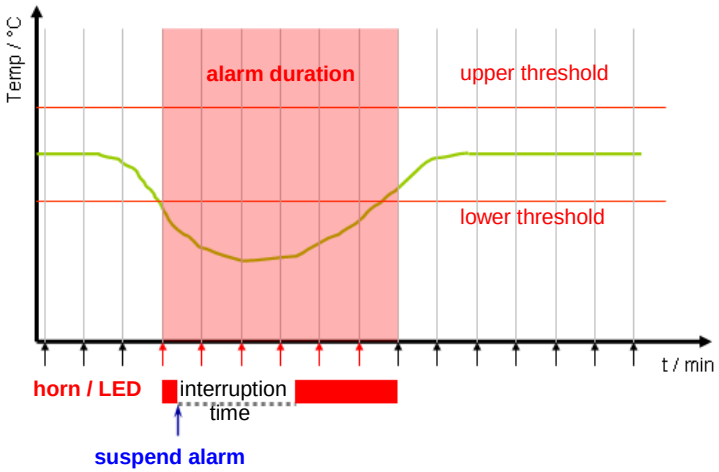


Fig. 19: Suspending an alarm inactivates alarm devices (hom / LED) of OCTAX Log & Guard™ for the duration of the preset alarm interruption time. If the alarm status is persisting after the interruption time elapsed, the alarm devices are re-activated. Blue arrow: time point of suspending the alarm by user; Black arrows: measuring intervals, normal values; red arrows: measuring intervals, alarm status.

NOTE

Active alarming by OCTAX Log & Guard™ is only triggered if the alarm device was selected on the respective channel configuration pages (see pp. 47).

Configuration of alarm text message recipients and mains monitoring

The configuration page for entering the mobile phone numbers of alarm text message recipients can be accessed by the configuration manager. Follow the link “Configuration & Calibration” and “Global Configuration” (Fig. 20).

When prompted by the login wizard below, type in “confadmin” as login user name and your password.

Up to four mobile phone numbers can be entered into the respective fields of the “Global Configuration” page (Fig. 20). The alarming options in case of power failure can be entered here as well. Sign the field “your initials” to identify last user in the next session. Press “Submit” to apply changes.

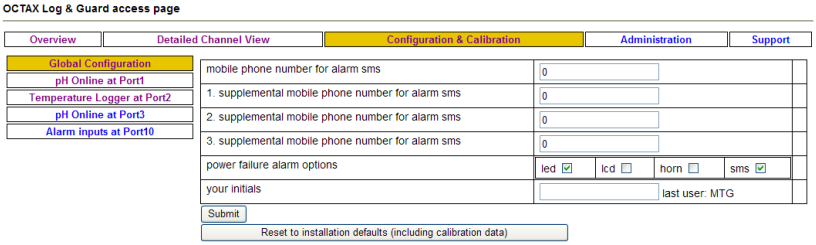


Fig. 20: Configuration for alarm text message recipients and for power failure alarm options.

NOTE

OCTAX Log & Guard™ will also send a text message to inform about the end of power failure. The system will re-start logging automatically.

The alarm message indicates the affected port and channel of OCTAX Log & Guard™, the individual name of the channel, the current measurement value (temperature, pH, status of alarm input relay) and the alarm threshold values (Fig. 21).

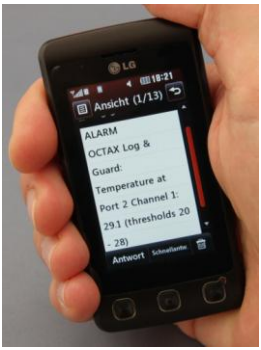


Fig. 21: Mobile phone display showing a temperature alarm message sent by OCTAX Log & Guard™

NOTE

Only if the text messaging function ("SMS") for alarming is activated on the channel configuration pages of individual channels, an alarming message will be sent to each mobile phone on the list above.

pH Online™ channel configuration

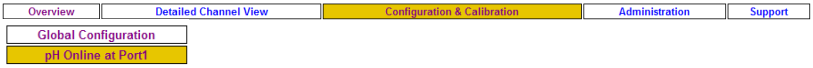
The following links on the pH Online™ sensor page of the OCTAX Log & Guard™ web interface can only be accessed after log in as configuration administrator. Type in "confadmin" as login and your password when prompted by the window below.

Suspend the alarm

Described in detail on pp. 43.

Edit properties of the pH Online™ channel

The configuration manager can change the configuration of each pH Online™ sensor channel by following the link "Channel Configuration". A configuration page for the pH Online™ channel is opened (Fig. 22). Changes can be performed on check boxes or by entering values. The *submit* button saves the changes.



Alternatively the yellow (active) window buttons "Configuration & Calibration" and "pH Online at Port1" will also lead to the page shown in Fig. 22.

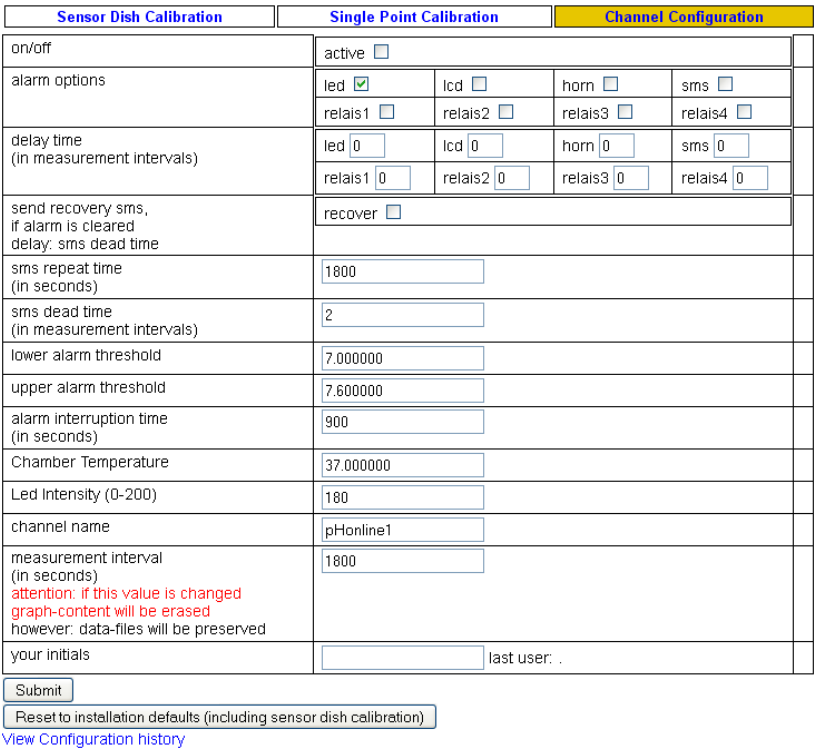


Fig. 22: Configuration page of an OCTAX Log & Guard™ pH Online™ channel.

Options on the configuration page for pH logging:

on/off	tick box to activate measurement and logging function of the selected channel
alarm options	tick boxes to select alarming devices (led, horn, sms, alarm transmitted to relay 1-4); there will be no active alarming if the respective box is unchecked
delay time	alarming action is triggered after delay time; to set individual times for delayed activation of alarming devices led, horn, sms and relay 1-4. The elapsed time is measured in multiples of the measurement interval
send recovery sms	a text message will be sent to inform if the alarm is cleared, in case a sms dead time has been set, the message will be delayed.

sms repeat time	a reminder text message is sent if the alarm status persists longer than sms repeat time (default, 1800 sec = 30 min)
sms dead time	after the first text message has been sent in an alarm situation, no repeated text messages are sent during the sms dead time even if an alarm is triggered from the same channel. This may happen if measured values are fluctuating around a threshold value causing repeated recovery and alarming.
lower alarm threshold	lower limit of pH value (e.g. 7.20)
upper alarm threshold	upper limit of pH value (e.g. 7.45)
alarm interruption time	alarming actions are repeated after suspending the alarm if the alarm status persists longer than interruption time (900 s = 15 min)
chamber temperature	default temperature of the incubator (e.g. 37)
led intensity	default 100, please do not change
channel name	individual name of the channel (here: K-Systems G185)
measurement interval	delay in sec between measurements (e.g. 1,800 s = 30 min) when changing this value the graphical display of logged data will be erased and restarted in an empty diagram; logging of data to the log file continues without interruption
sample as fast as possible	measurement is performed every 1-3 s depending on the load of the OCTAX Log & Guard™ system
your initials	initials help to identify last user in the next session
Submit	all changes will be applied after clicking this button
Reset to installation defaults	defaults of this channel, including the "Sensor Dish Calibration" page, will be restored to the settings of installation of OCTAX Log & Guard™
View configuration history	This link will open a window showing the changes in configuration in the past.

NOTE

When pressing the "Reset to installation defaults" button on the pH Online™ configuration page, the calibration data for pH Online™ dishes in the "Sensor Dish Calibration" dialog will be reset as well. Make sure that calibration data correspond to the lot of pH Online™ dishes in use to avoid wrong pH measurement.

Enter sensor dish calibration

The link "Dish calibration" on the detailed channel page of a pH Online™ sensor channel openes the page shown in Fig. 23. When changing to another lot of pH Online™ sensor dishes new calibration values from the calibration sheet have to be entered as shown below. Wrong calibration values will lead to incorrect pH measurement by the pH Online™ sensor unit. The *submit* button saves the changes.

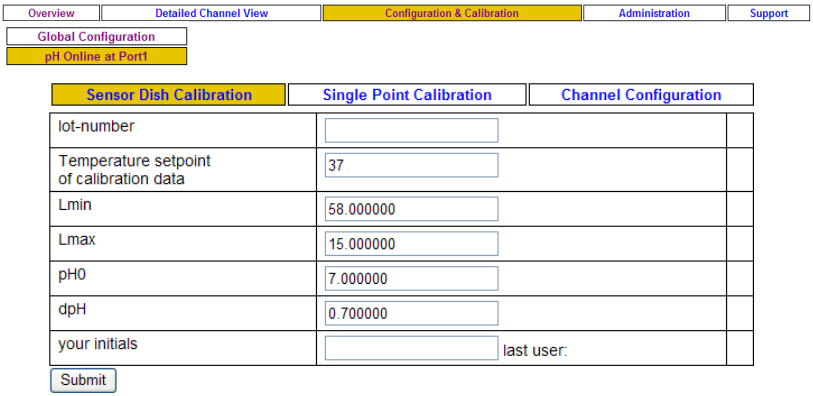


Fig. 23: Sensor dish calibration page of an OCTAX Log & Guard™ pH Online™ channel.

lot-number	lot number of pH Online™ sensor dishes corresponding to calibration values. If lot number of currently used dishes is different, please enter calibration values (see below)
Temperature setpoint of calibration data	37°C, temperature at which calibration of the sensor dishes has been performed (see calibration sheet)
Lmin, Lmax, pH0, dpH	calibration values of pH Online™ sensor dishes, see lot-specific calibration sheet for current values
your initials	initials help to identify last user in the next session
Submit	all changes will be applied after clicking this button

Single point calibration: pH

The pH sensor dishes are precalibrated per batch resulting in four specific calibration values published in the calibration certificate. We recommend to do single point calibration when changing to a new batch of dishes **if the setup of pH Online is different** from the conditions used for calibration of the dishes:

- length and combination of optical fiber used (default: grey fiber for new pH Online; combination of grey fiber and 3m thin black fiber for old pH Online)
- temperature of the incubator (default: 37°C)

A set off to the original calibration values is determined and activated by single point calibration using a specific calibration buffer with known pH value for the current batch of dishes (see value on calibration certificate). It is important that the four calibration values "for media with phenol red" for the currently used batch of sensor dishes have been entered on the dish calibration page of the pH Online™ channel (Fig. 23) before starting single point calibration. The date of last single point calibration is shown on the page.

Preparation of sensor dish for single point calibration:

- Unpack a pH Online™ sensor dish and label it with the correct batch number.
- Fill the well containing the pH sensor spot wit approx. 800 µl of pH Online calibration buffer and completely cover with sterile mineral oil (8-9 droplets of oil will be sufficient).
- Store the dish at room temperature in a dark environment for 4.5 hours to allow the pH sensor spot to fully equilibrate with the calibration buffer.
- Prior to starting the calibration procedure, place the dish on a heated surface for another 30 min to warm the buffer to 37°C (calibration temperature must correspond to pH monitoring temperature in an incubator). Protect from light as well as possible.
- **Do not** place the dish inside a CO_2 incubator for warming as CO_2 uptake will alter the pH value of the calibration buffer! The total CO_2 exposure time of the sensor dish containing the calibration buffer should not exceed 30 min.
- Start the OCTAX Log & Guard™ web interface, select the pH channel you want to calibrate, switch to the "Sensor dish calibration" dialog and make sure the correct calibration values ("for media with phenol red", as shown on the batch specific certificate) are entered in the corresponding fields.

- Switch to the “Configuration and Calibration” dialog of the same channel, set the sampling interval to 60 sec, enter your initials and confirm by pressing the “Submit” button.
- Switch to the “Detailed channel view” dialog of the same channel.

Single point calibration:

- Place the pre-warmed sensor dish containing the calibration buffer on the holding rack and make sure the sensor spot overlaps with the front end of the optical fiber.
- Allow pH Online to take pH readings for 5-10 min.
- Observe pH readings. When values have stabilized, select the “Single point calibration” dialog of the same channel.
- Enter the target value of the calibration buffer (indicated in the batch specific calibration certificate) into the field “nominal pH of calibration medium”.
- Make sure calibration temperature is set to 37°C, then enter your initials and confirm by pressing the „Calibrate“ button.

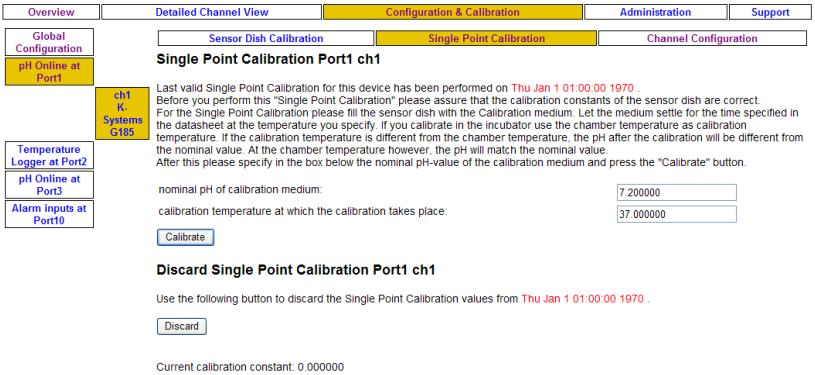
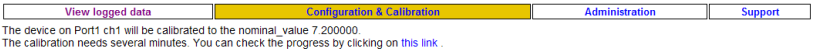
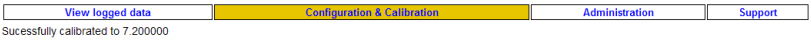


Fig. 24: Single point calibration page for the OCTAX Log & Guard™ pH Online™ channel.

Please be patient as pH Online™ performs a series of measurements to determine the correct pH offset for the single point calibration. You can check the status by a link on the page (see below).



After few minutes the calibration will be finished. When following the link you will receive information accordingly.



Now the sensor dish containing the calibration buffer can be replaced by a new dish for monitoring pH in culture medium (see p. 35 for preparing a sensor dish). Set back the sampling interval to 1800 s in the “Configuration and Calibration” dialog.

To erase the offset introduced by the last single point calibration press button “Discard” (Fig. 24).

Monitoring temperature or CO_2: channel configuration

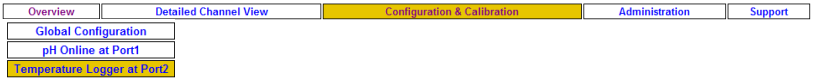
The following links on the temperature or CO_2 sensor page of the OCTAX Log & Guard™ web interface can only be accessed after login as configuration administrator. Type in "confadmin" as name and your password when prompted by the window below.

Suspend the alarm

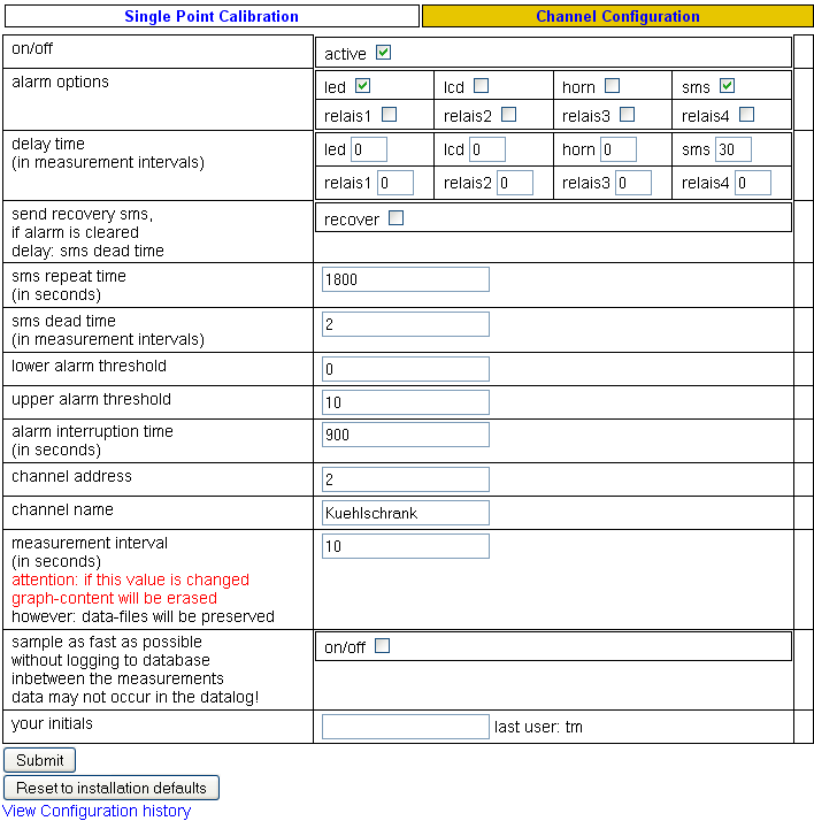
Described in detail on pp. 43.

Edit properties of the temperature logger channel

The configuration manager can change the configuration of each temperature logger channel by following the link. A configuration page for the temperature channel is opened (Fig. 25). Changes can be performed on tick boxes or by entering values. The *submit* button saves the changes.



Alternatively the yellow (active) window buttons "Configuration & Calibration" and "pH Online at Port1" will also lead to the page ishown in Fig. 25.



Single Point Calibration	Channel Configuration			
on/off	active ☑			
alarm options	led ☑	lcd ☐	horn ☐	sms ☑
	relais1 ☐	relais2 ☐	relais3 ☐	relais4 ☐
delay time (in measurement intervals)	led 0	lcd 0	horn 0	sms 30
	relais1 0	relais2 0	relais3 0	relais4 0
send recovery sms, if alarm is cleared delay: sms dead time	recover ☐			
sms repeat time (in seconds)	1800			
sms dead time (in measurement intervals)	2			
lower alarm threshold	0			
upper alarm threshold	10			
alarm interruption time (in seconds)	900			
channel address	2			
channel name	Kuehlschrank			
measurement interval (in seconds) attention: if this value is changed graph-content will be erased however: data-files will be preserved	10			
sample as fast as possible without logging to database inbetween the measurements data may not occur in the datalog!	on/off ☐			
your initials		last user: tm		

Submit

Reset to installation defaults

View Configuration history

Fig. 25: Configuration page of an OCTAX Log & Guard™ channel for temperature (or CO_2) monitoring.

Options on the configuration page for temperature or CO_2 logging:

on/off	tick box to switch measurement and logging of the channel on
alarm options	tick boxes to select alarming devices (led, horn, sms, alarm transmitted to relay 1-4); there will be no active alarming if the respective box is unchecked
delay time	alarming action is triggered after delay time; set individual times for delayed activation of alarming devices led, horn, sms and relay 1-4. The elapsed time is measured in multiples of the measurement interval

send recovery sms	a text message will be sent to inform if the alarm is cleared, in case a sms dead time has been set, the message will be delayed by this interval.
sms repeat time	a reminder text message is sent if alarm situation persists longer than sms repeat time (default, 1,800 s = 30 min)
sms dead time	after the first text message has been sent in an alarm situation, no repeated text messages are sent during the sms dead time even if an alarm is triggered from the same channel. This may happen if measured values are fluctuating around a threshold value causing repeated recovery and alarming.
lower alarm threshold	lower limit of temperature value (e.g. 36.5) or CO_2
upper alarm threshold	upper limit of temperature value (e.g. 37.5) or CO_2
alarm interruption time	alarming actions are repeated after suspending the alarm if the alarm status persists longer than interruption time (900 s = 15 min)
channel address	do not change: address is set upon installation
channel name	individual name of the channel (here: Incubator 1)
measurement interval	delay in sec between measurements (e.g. 1,800 s = 30 min) when changing this value the graphical display of logged data will be erased and restarted in an empty diagram; logging of data to the log file continues without interruption
sample as fast as possible	measurement is performed every 1-3 s depending on the load of the OCTAX Log & Guard™ system
your initials	initials help to identify last user in the next session
Submit	all changes will be applied after clicking this button
Reset to installation defaults	defaults of this channel as set upon installation of OCTAX Log & Guard™ are restored
View configuration history	This link will open a window showing the changes in configuration in the past.

Single point calibration: temperature

Use a calibration thermometer for calibrating each individual temperature logger attached to OCTAX Log & Guard™. Allow the calibration thermometer to equilibrate to the incubator´s chamber temperature before performing single point calibration. For ultra low temperature loggers inside liquid nitrogen storage tanks, the boiling point of liquid nitrogen (-196°C) can be easily used as a defined temperature level for calibration. Make sure the temperature sensors are immersed in liquid nitrogen during calibration.

The set point of the temperature logger can be changed to a calibrated value on the single point calibration page (Fig. 26).

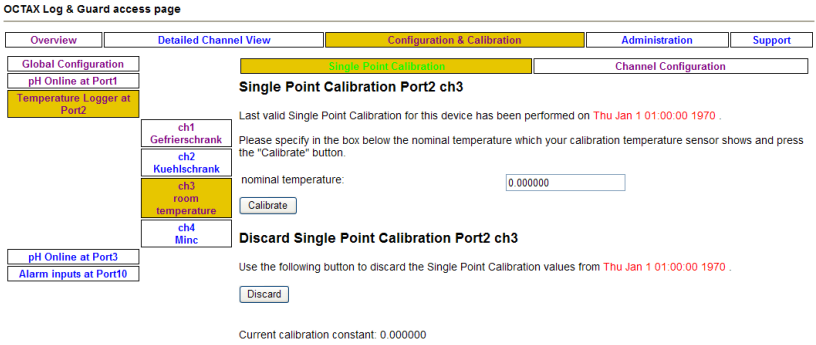


Fig. 26: Single point calibration page for the OCTAX Log & Guard™ temperature logger channel.

The nominal temperature (e.g. 37°C) has to be entered into the respective field. Press button “Calibrate” to perform the new calibration. The next page informs about the change.

Please be patient as OCTAX Log & Guard™ performs a series of measurements to determine the correct temperature offset for the single point calibration. You can check the status by links on the next pages.

After few minutes the calibration will be finished. You will receive information about successful calibration.

To erase the offset introduced by the last single point calibration press button “Discard” (Fig. 26).

Surveying external alarm devices: channel configuration of alarm input relays

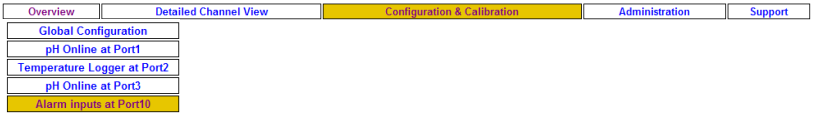
The following links on the alarm input relay page of the OCTAX Log & Guard™ web interface can only be accessed after login as configuration administrator. Type in "confadmin" as name and your password when prompted by the window below.

Suspend the alarm

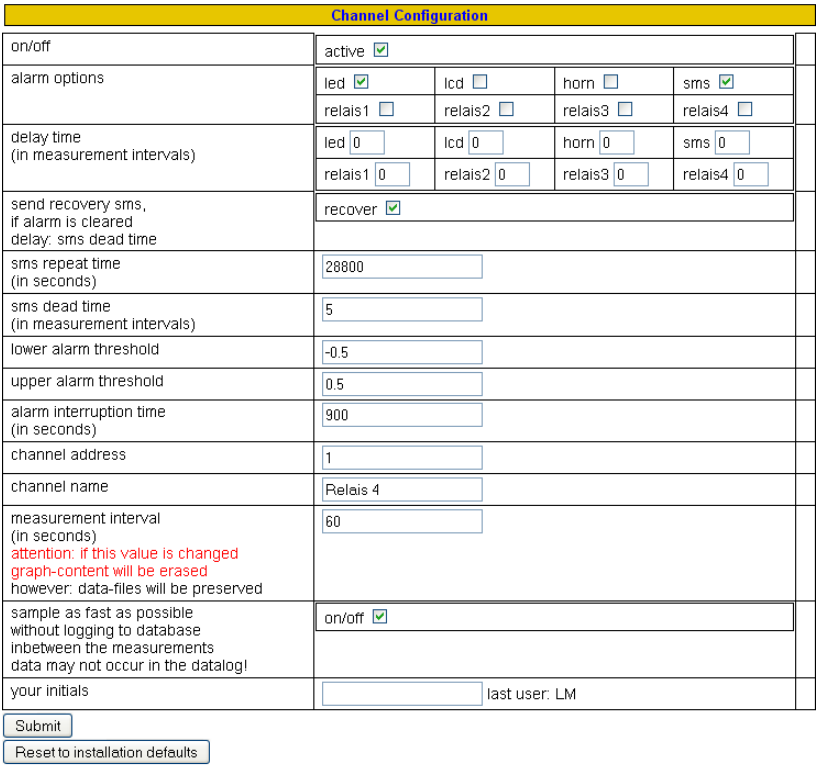
Described in detail on pp. 43

Edit properties of the alarm relay input channel

The configuration manager can change the configuration of each relay input channel by following the link. A configuration page for the relay input channel is opened (Fig. 27). Changes can be performed on tick boxes or by entering values. The *submit* button saves the changes.



Alternatively the yellow (active) window buttons "Configuration & Calibration" and "Alarm inputs at Port1" will also lead to the page ishown in Fig. 27.



Channel Configuration

on/off	active ☑			
alarm options	led ☑	lcd ☐	horn ☐	sms ☑
	relais1 ☐	relais2 ☐	relais3 ☐	relais4 ☐
delay time (in measurement intervals)	led 0	lcd 0	horn 0	sms 0
	relais1 0	relais2 0	relais3 0	relais4 0
send recovery sms, if alarm is cleared delay: sms dead time	recover ☑			
sms repeat time (in seconds)	28800			
sms dead time (in measurement intervals)	5			
lower alarm threshold	-0.5			
upper alarm threshold	0.5			
alarm interruption time (in seconds)	900			
channel address	1			
channel name	Relais 4			
measurement interval (in seconds) attention: if this value is changed graph-content will be erased however: data-files will be preserved	60			
sample as fast as possible without logging to database inbetween the measurements data may not occur in the datalog!	on/off ☑			
your initials		last user: LM		

Submit

Reset to installation defaults

View Configuration history

Fig. 27: Configuration page of an OCTAX Log & Guard™ channel for alarm relay input.

Options on the configuration page for logging of external alarm inputs:

on/off	tick box to switch measurement and logging of the channel on
alarm options	tick boxes to select alarming devices (led, horn, sms, alarm transmitted to relay 1-4); there will be no active alarming if the respective box is unchecked
delay time	alarming action is triggered after delay time; to set individual times for delayed activation of alarming devices led, horn, sms and relay 1-4. The elapsed time is measured in multiples of the measurement interval

send recovery sms	a text message will be sent to inform if the alarm is cleared, in case a sms dead time has been set, the message will be delayed by this interval.
sms repeat time	a reminder text message is sent if the alarm status persists longer than sms repeat time (default, 1,800 s = 30 min)
sms dead time	after the first text message has been sent in an alarm situation, no repeated text messages are sent during the sms dead time even if an alarm is triggered from the same channel. This may happen if measured values are fluctuating around a threshold value causing repeated recovery and alarming.
lower alarm threshold	preset -0.5 (normal is 0, alarm is 1)
upper alarm threshold	preset 0.5 (normal is 0, alarm is 1)
alarm interruption time	alarming actions are repeated after suspending the alarm if the alarm status persists longer than interruption time (900 s = 15 min)
channel name	individual name of the channel (here: Incubator)
measurement interval	delay in sec between measurements (e.g. 1,800 s = 30 min) when changing this value the graphical display of logged data will be erased and restarted in an empty diagram; logging of data to the log file continues without interruption
sample as fast as possible	measurement is performed every 1-3 s depending on the load of the OCTAX Log & Guard™ system
your initials	initials help to identify last user in the next session
Submit	all changes will be applied after clicking this button
Reset to installation defaults	defaults of this channel as set upon installation of OCTAX Log & Guard™ are restored
View configuration history	This link will open a window showing the changes in configuration in the past.

TECHNICAL SUPPORT

If you need assistance at any time, please contact MTG Technical Service. For contact details please refer to the section *Customer Service, p. 83.*

Part IV: Additional Information

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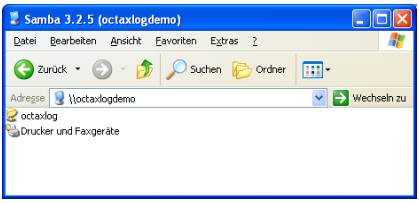
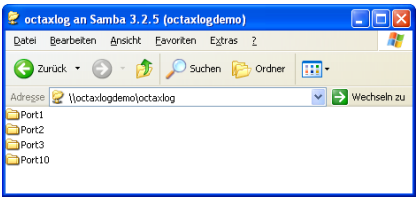
Expert download of logged data for backup

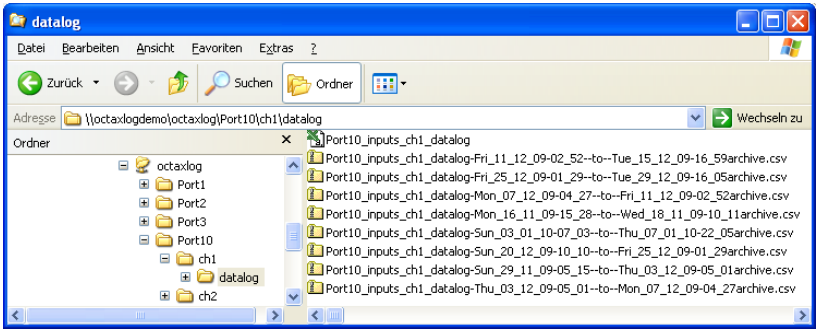
Logged data files from all connected channels of an OCTAX Log & Guard™ device can be accessed directly via windows explorer for convenient data archiving. Host name or IP address of the OCTAX Log & Guard™ device (p. 23) has to be typed into the address line of the explorer of any PC connected to the intranet. In the example below "\\octaxlogdemo" was typed to open the following window:



Open folder "octaxlog" (will be the name of your OCTAX Log & Guard™ device) to see the folders of all connected ports.



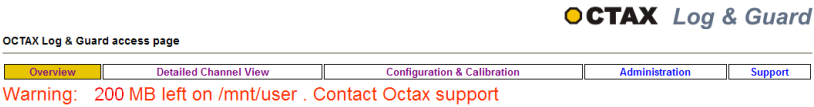
The logged data are sorted according to the hierarchy *port* > *channel* > *datalog* > *individual log files*, as can be revealed by the "folder" view of the file manager:



To obtain a backup copy of specific log files, go to the datalog folder of the respective OCTAX Log & Guard™ port and channel where the logged data are saved in MS Excel files. Only the currently used log file is displayed as MS Excel file. Older log files were automatically moved to their zipped folders (see image above).

The log files can be saved to external devices. Log files can not be changed or deleted in the file manager (and from the OCTAX Log & Guard™ device).

If free memory space of the internal data memory of OCTAX Log & Guard™ drops below 200 MB after a longer logging period, a warning message will be displayed on the overview page (see below). Please contact OCTAX support for advice to free memory space.



TECHNICAL SUPPORT

If you need assistance, please contact MTG or OCTAX Technical Service.

phone: +49 8765 939 900

fax: +49 8765 939 9070

e-mail: **support@octax.de**

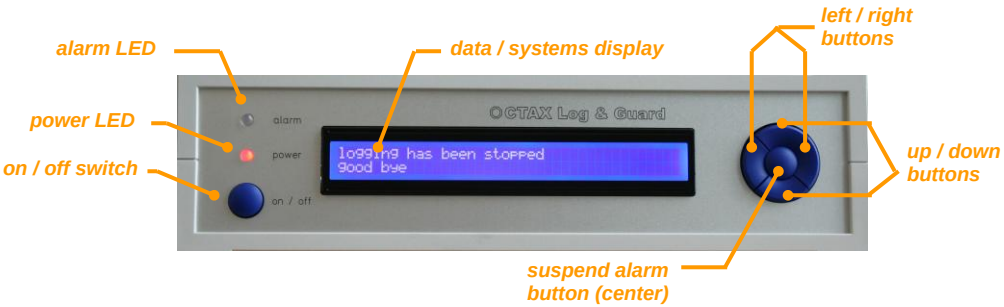
mail@mtg-de.com

Technical specifications

OCTAX Log & Guard™ device

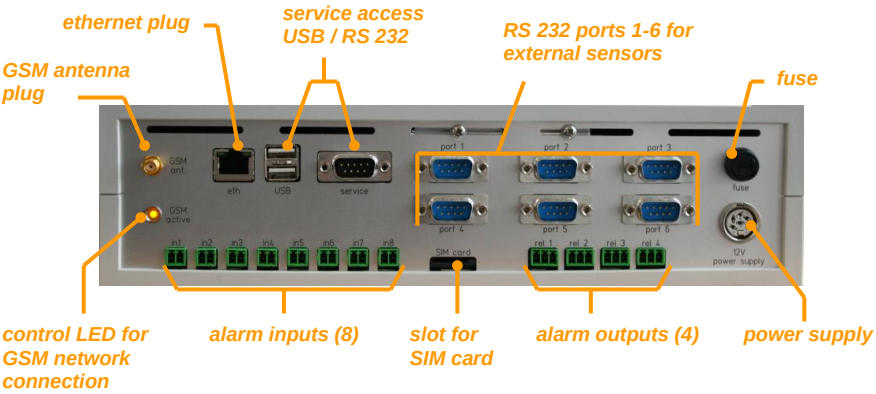
Supply voltage	100 -240V AC
Dimensions (cm)	26 x 30 x 9 (L x W x D)
Display	LCD display
Interfaces	- 6 serial interfaces to connect temperature loggers and pH Online™ sensors - network connection to LAN - antenna output for GSM module - 4 alarming outputs (relay) - 8 alarming inputs for external relays (e.g. from incubators etc.) - 2 USB (service only)
Measuring value memory	internal flash memory
Export file format	MS Excel
Measuring interval	adjustable; typically: 30 - 60min
GSM module	quad band GSM
Slot for SIM card	accessible; SIM card can be changed by user
Battery	internal
Battery service life	approx. 10 min; to send an alarming text message and for save shut down of the system

Front view of the OCTAX Log & Guard™ device:



alarm LED:	LED on in case of alarm
power LED:	LED on when OCTAX Log & Guard™ is running
on / off switch:	press 1 sec. to switch device on or off
display:	auto scrolling display of channel data or systems information
left / right buttons:	switch between display of channel data or systems information
up / down buttons:	override auto scrolling for direct data access
center button:	suspend alarm

Back view of the OCTAX Log & Guard™ device:



GSM antenna plug:	screw connection for GSM antenna
control LED for GSM modem:	LED on: GSM modem on LED off: GSM modem off
ethernet plug:	data connection to intranet / PC
service access:	USB / RS 232 connection for service access / updates
ports 1-6:	RS 232 connections for external sensors (pH Online units, temperature loggers)
alarm inputs:	alarm input relay (in1-8) for connection to external alarm triggers
slot for SIM card:	push-in slot to insert SIM card for GSM modem
alarm outputs:	alarm output relays (out1-4) for transfer of alarm to external devices (connect left and middle pin: alarm induces opening of the relay connect right and middle pin: alarm induces closing of the relay)
power supply:	connection with OCTAX Log & Guard™ line adapter

pH Online™ unit

Supply voltage	12V DC
Dimensions (cm)	4.7 x 13.4 x 3.6 (L x W x D); aluminum housing, to be fixed at the backside of the incubator
Connection	serial interface to OCTAX Log & Guard device ODU plug and socket for optical fiber
Measuring range	pH 5.5 – 9.0
Accuracy	+/- 0.03 pH
Resolution	0.01 pH
Calibration	pre-calibrated to 75 cm heat resistant optical fiber, single point calibration using special calibration buffer is possible

CO_2 sensor

Sensor	Dual wavelength infrared sensor
Measuring range	0 – 10% CO_2
Accuracy	Max. deviation +/- 5% of the indicated value
Resolution	0.01 % CO_2
Ambient temperature	-40 – 70°C (not suitable for auto decontamination!)
Working temperature	5 – 45°C
Rel. humidity range	0 – 99 % non-condensing
Dimensions	Diameter 43 mm; length 91 mm

Temperature logger for incubators and refrigerators

Sensor	Pt1000, 2-wire, connecting cable of variable length
Measuring range	-50.0... +150.0 °C
Accuracy	+/- 0.5 °C
Resolution	0.1 °C
Calibration	individual calibration and certificate by manufacturer
Measuring interval	2 s to 5 h
Measuring value memory	48,000 measuring values
Battery service life	approx. 12 years, depending on measuring cycle set (battery service only in case of mains failure)
Interface	easyBus
Housing (mm)	48.5 x 48.5 x 35.5 (L x W x D), without sensor and plug, ABS housing, transparent screen made of polycarbonate, splash-proof according to IP65

Temperature logger for liquid nitrogen tanks

Sensor	Pt1000, 2-wire, connecting cable of variable length
Measuring range	-199.9... +199.9°C
Accuracy	+/- 0.5°C
Resolution	0.1°C
Calibration	individual calibration and certificate by manufacturer
Measuring interval	2 s to 5 h
Measuring value memory	48,000 measuring values
Battery service life	approx. 12 years, depending on measuring cycle set (battery service only in case of mains failure)
Interface	easyBus
Housing (mm)	48.5 x 48.5 x 35.5 (L x W x D), without sensor and plug, ABS housing, transparent screen made of polycarbonate, splash-proof according to IP65

Technical details on non-contact pH monitoring using pH Online™

Characteristics of optical pH Online™ sensors

A sensor dish for use with the pH Online™ pH-meter contains an optical pH sensor spot integrated in one well of a four-well cell culture dish. Sensor dishes are packed sterile in a light protective blister package. Shelf life is 18 months when unpacked.

The characteristics of pH Online™ sensors are listed below:

Dynamic range:	pH 5.5 to 9.0
Resolution:	0.01 pH
Drift due to bleaching:	0.003 pH per 1000 measuring points
Response time:	less than 30 s

NOTE

In IVF application (renewal of the sensor dish once per week, sampling intervals 10-30 min) the sensor drift due to photo bleaching can be neglected.

Cross sensitivities:

Conventional pH electrodes are influenced by sulfide, electromagnetic fields or flow velocity. **The optical pH measurement interferes with ionic strength.** The pH sensors of pH Online™ were specially designed for physiological samples and media. Calibration of sensor dishes is performed by the manufacturer, using buffers with an osmolarity similar to embryo culture media. A data sheet containing the calibration values specific for embryo culture media is delivered with each batch of sensor dishes.

The measurement can also be influenced by small, highly fluorescent molecules like fluorescein or rhodamin in the sample.

NOTE

Conventional pH calibration buffers cannot be used to check pH Online function as their ionic strength is different from embryo culture media. Consequently, pH readings from such kind of buffers will be incorrect.

Dual Lifetime Referenced optical pH sensors

The measurement of intensity is simple in terms of instrumentation but its accuracy is often compromised by adverse effects such as drifts of the opto-electronic system and variations in the optical properties of the sample including fluorophore concentration, turbidity, coloration and refractive index. Therefore, efficient referencing methods are required for quantification of intensity signals. Among those, ratiometry, i.e., the measurement of the fluorescence intensity at two or more wavelengths of a single indicator fluorophore or an indicator fluorophore plus an inert fluorescence standard, is common to reference fluorescence intensity. However, this method requires two separate optical channels thus complicating the optical setup. For example, the drift in the sensitivity of both channels can be different, as can be the intensities at two excitation wavelengths. Light scatter and signal loss caused by fiber bending (e.g. in fiber optic sensors or certain sensor titer plate readers) further contribute to effects not compensated by two-wavelength referencing.

Alternatively, the measurement of the fluorescence decay time, an intrinsically referenced parameter, is hardly affected by fluctuations of the overall fluorescence intensity. The decay time of most pH-sensitive indicator dyes, however, is in the nanosecond time scale requiring a sophisticated and expensive instrumentation which limits the use in sensor application.

pH Online™ uses new and general logic to reference fluorescence intensity signals by decay time measurement. In contrast to the most common ratiometric method, where luminescence excitation or emission is measured at two wavelengths, this scheme uses a couple of luminophores with different decay times and similar excitation spectra. They can be excited at the same wavelength and their fluorescence can be detected using the same emission window and photo detector. A pH-insensitive long-lifetime luminophore is combined with an pH-sensitive short-lifetime fluorophore, and a method is presented how to convert fluorescence intensity into a phase shift.

The phase-modulation method is a well-established technique for the measurement of luminescence decay times of two luminophores with overlapping excitation and emission spectra. The reference luminophore gives a constant background signal while the fluorescence signal of the indicator depends on the pH of the sample. The average phase shift directly reflects the intensity of the indicator dye and, consequently, the pH of the sample. This method is referred to as Dual Lifetime Referencing (DLR).

Part V: Appendix

Trouble shooting

In case technical problems occur during use of OCTAX Log & Guard™ or pH Online™ please check possible causes of errors according to the list below before contacting the technical support.

Error messages in **D**isplay or **W**eb interface	Possible cause **Recommendation**
D: *fiber? dish?* W: *Is optical fiber connected to right channel? Is dish in place?*	No sensor dish present; sensor spot is not positioned above optical fiber on the holding rack. **Prepare sensor dish (p. 35) and place sensor spot above the front end of the fiber optic on the holding rack.** No optical fiber / not connected correctly. Low signal quality: fiber optics broken or damaged? **Check correct screw connections of the fiber optic. Do not scratch or contaminate surfaces of the fiber ends. Do not bend or squeeze the fiber optic (p.17).**
D: *power? com?* W: *Is the device connected to right port? Is it powered on?*	Missing power supply or data connection of external sensor. **Check cable connections of the device; plug in line adapter; plug in data cable to specific port.** Channel address was changed by mistake. **Open channel configuration page and press button "Reset to defaults" (pp. 47). Note that all other changes will also be reset to installation defaults. On a pH Online channel also the calibration values of the sensor dishes are erased. Re-enter on dish calibration page (p. 50).**
D / W: *nan* or: strange pH value	pH cannot be calculated from pH sensor signal. **Check lot number of the sensor dish and make sure the corresponding calibration values as well as the correct calibration temperature has been entered on the dish calibration page (p. 50). Calibration temperature and four calibration values can be found on the batch specific calibration certificate.** **Check on the single point calibration page if previous calibration constant still is appropriate.**

D: *sensor?* W: *Is the temperature sensor connected to temp. logger?*	Temperature sensor is broken or disconnected from logger box (low temperature sensors). **Check screw connection of sensor cable and logger box. Replace sensor if broken**.
D: *channel not active* W: *Data may be outdated*	Channel is connected but not measuring / logging data. **Activate by on/off box on top of the channel configuration page (pp. 47).**
D: specific *error code* W: *Sample or communication error*	Internal error. **Note down the error code and contact the support hotline (p. 83).**

There may be the following problems without error messages:

Problem	Possible cause **Recommendation**
No active alarm of alarm devices (although alarm on the display and web interface)	Alarm device(s) not selected on channel page. Long alarm delay time entered. **Check settings on the channel configuration page (pp. 47).**
No text message alarm	Alarm option “SMS” not selected on channel configuration page (pp. 47). Wrong / no phone number entered on configuration page (p. 45). **Check settings on respective pages.** No SIM card inserted. **Insert SIM card into slot on the back of the OCTAX Log & Guard™ device. The local GSM signal quality and optimal provider are displayed in the systems menu of the display if no SIM card has been inserted.** Prepaid card ran out of credit. **Check balance of SIM card. The use of prepaid cards is not recommended.** No GSM network connection. Message “signal quality 0%” in the systems menu of the display. **Change to optimal provider (see above). Connect external antenna.**

LED signals of OCTAX Log & Guard™

Power LED:

orange	powered
red (while shutting down)	mains failure, battery backed save shut down of the system. OCTAX Log & Guard™ will re-start automatically as soon as power is back.
off	power off or mains failure

Alarm LED:

off	normal status of all connected devices
red	alarm in at least one channel
green (blinking)	test while booting (ignore if not switched off or restart device)

GSM LED (backside):

on	GSM modem is switched on
off	GSM modem is switched off

Customer Service

TECHNICAL SUPPORT

If you need assistance at any time, please contact MTG or OCTAX Technical Service.

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At this site:

- read about who we are and where we are
- get convinced by our significant scientific background
- review informative publications
- have a look at our products, latest releases and software updates
- consult our troubleshooting guide

Or send an e-mail to **support@octax.de** or **mail@mtg-de.com**