

# pH-1 mini Fiber optic pH transmitter

[Instruction Manual](#)





# pH-1 mini v2

Specification:

Fiber optic pH transmitter for use  
with non-invasive pH sensors & sensor probes

Software version:

pH1-View (Version 1.0.0)

Document filename: IM\_pH-1 mini\_dv1

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# 1 Preface

You have chosen a new, innovative technology for measuring pH.

The pH-1 mini is a compact, easy to transport and completely PC-controlled fiber optic pH transmitter. The data evaluation is PC supported as well.

The pH-1 mini was developed especially for small fiber optic pH sensors, flow-through cells and non-invasive sensors. It is based on a novel technology, which creates very stable, internally referenced measured values. This allows a more flexible use of pH sensors in various fields of interest.

Optical pH sensors (also called optodes) have several important features:

- They are small.
- Their signal does not depend on the flow rate of the sample.
- They can be physically divided from the measuring system which allows a non-invasive measurement.
- They can be used in disposables.

Therefore, they are ideally suited for the examination of small sample volumes, for highly parallelized measurements in disposables, and for biotechnological applications. A set of different pH minisensors, flow-through cells and non-invasive sensors is available to make sure you have the sensor which matches your application.

Please feel free to contact our service team to find the best solution for your application.

Your PreSens Team

**PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY BEFORE WORKING WITH THIS DEVICE.**

## 2 Description of the pH-1 mini Transmitter

The pH-1 mini is a precise single channel pH transmitter with fiber optic pH minisensors based on 2 mm polymer fibers. The small outer dimensions and low power consumption make it suitable for portable use. For operation, a PC / notebook is required. The pH-1 mini is controlled using a comfortable software, which also saves and visualizes the measured values.



**Fig. 1** pH-1 mini v2, fiber optic pH transmitter for use with non-invasive pH sensors & sensor probes

The pH-1 mini has two analog outputs (0 - 4 V) and one trigger input (TTL) to be connected to a data logger. Analog connectors are BNC connectors.

The analog outputs are programmable to deliver pH, temperature or the raw values (phase shift or amplitude). The data are retrieved via PC / notebook and RS232 (digital) or using the external trigger input (analog).

### **pH-1 mini v2 features:**

- Non-invasive measurements
- Single point calibration
- Two analog outputs
- One trigger input
- Digital data output
- External temperature measurement

## 2.1 Scope of Delivery



**Fig. 2** Case with all delivered equipment

- pH transmitter pH-1 mini v2
- Software pH1-View
- RS232 cable
- Power supply (110 - 240 VAC, 18 VDC)
- Temperature sensor PT 1000

## 2.2 Front Panel

The front panel is equipped with a connector for the fiber optic sensor, a connector for the temperature sensor, a control LED and an ON / OFF switch.



**Fig. 3** Transmitter front panel

ELEMENT	DESCRIPTION	FUNCTION
<b>POWER</b>	ON / OFF switch	Switches the device ON and OFF.
	Control LED	red: device off green: device on orange: standby
<b>pH SENSOR</b>	SMA fiber connector	Connect the fiber optic sensor here.
<b>TEMP</b>	Connector for PT 1000 temperature sensor	Connect the PT 1000 temperature sensor for temperature compensated measurements here.

## 2.3 Rear Panel

Two standard BNC connectors are added for analog output channels 1 and 2, another one for external trigger input. The electrical specifications of all rear panel connectors are given in chapter 5 "Technical Data". Please follow these notes to avoid mistakes.



Fig. 4 Transmitter rear panel

ELEMENT	DESCRIPTION	FUNCTION
<b>12 VDC</b>	Line adapter for power supply	Connect the power supply cable. Use the provided parts only.
<b>RS232</b>	RS232 interface (male)	Connect the device with a RS232 data cable to your PC / notebook. Use the provided parts only.
<b>CH 1</b>	Analog out (channel 1)	Connect the device with external devices, e.g. a data logger.
<b>CH 2</b>	Analog out (channel 2)	Connect the device with external devices, e.g. a data logger.
<b>EXT TRIG</b>	External trigger input	Connect the device with external devices, e.g. a data logger with a trigger output, pulse generator.

## 3 Installation

### 3.1 Set-up

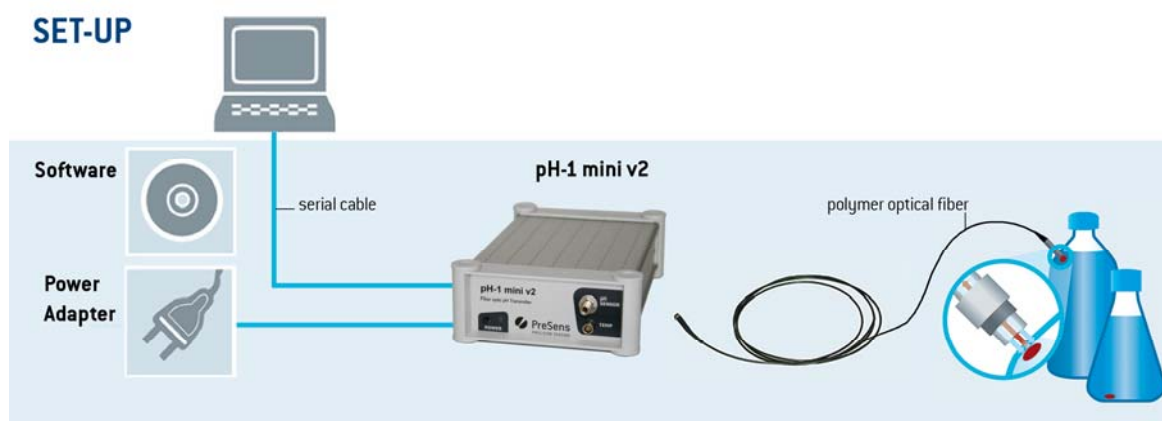


Fig. 5 Set-up for pH-1 mini v2

A typical set-up is shown in Fig.5. A sensor spot is connected optically via a polymer optical fiber i.e. to the transmitter which is connected via a serial com port to a PC.

The pH1-View software is compatible with Microsoft® Windows® XP and Microsoft® Windows Vista™.

**!** It is recommended to clean the SMA connector with a dust free cleaning wipe or a cleaning implement for SMA connectors before the measurement.

### 3.2 Software Installation

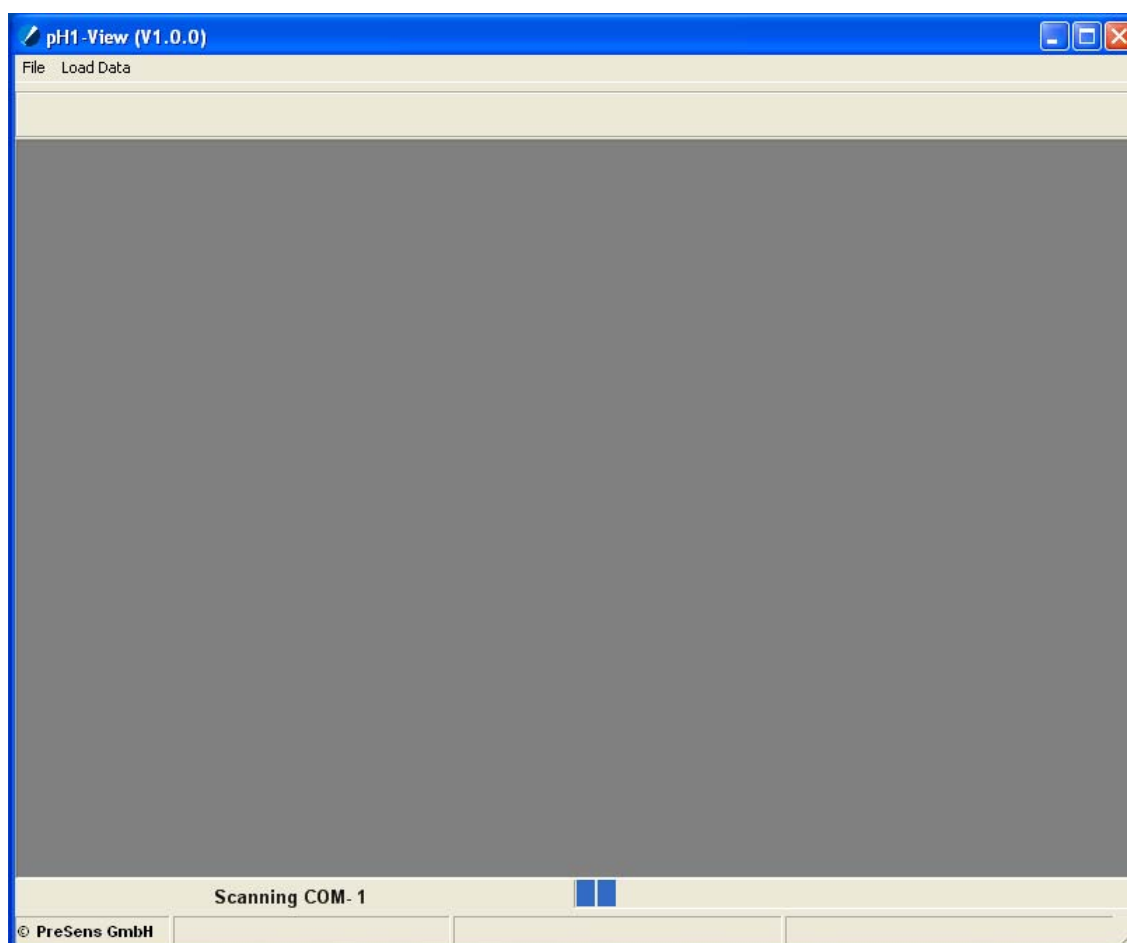
The software is working with English and German regional settings. Please change your setting to one of these settings before installing the software.

1. Please close all other applications as they may interfere with the software.
2. Insert the supplied CD-ROM into the respective drive.
3. Start the installation by double clicking setup.exe.
4. Follow the instructions of the installation wizard.

# 4 Operation

## 4.1 Starting the Device

1. Connect the pH-1 mini via the supplied serial cable to a serial com port of your PC / notebook. Tighten the cable with the screws on your PC / notebook.
2. Connect the power supply.
3. Please close all other applications as they may interfere with the software. Start the software pH1-View.

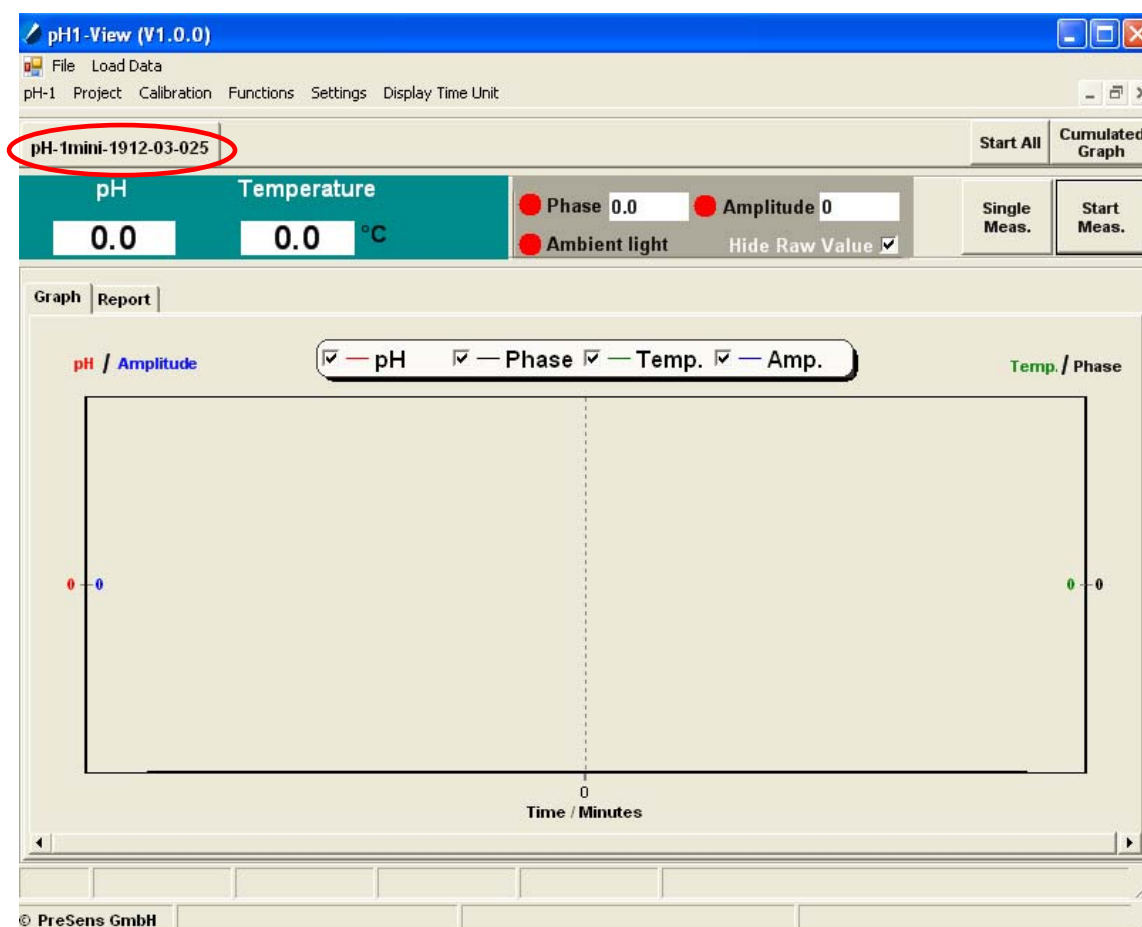


**Fig. 6** Initial Window - Software is scanning to detect connected pH-1 mini devices

The software is scanning all com ports available to detect and configure all connected pH-1 mini devices. Up to 10 devices can be controlled simultaneously.

- !** If no device is detected, please check all connections and proper installation of serial com ports and scan for devices by pressing “ctrl + S”.

The window shown below is displayed after the connected transmitters got detected:



**Fig. 7** Initial display of pH1-View software

The serial number of the activated transmitter is displayed. The devices are activated by clicking on the respective serial number.

## 4.2 Calibration

### 4.2.1 Manual Calibration

All pH sensors are pre-calibrated. Calibration data are listed on the Final Inspection Protocol of the sensors which is provided together with each sensor:

Data			
<b>HP5</b>			
T= 37° C, PBS 40mM, 140mM ionic strength, 10mg/l phenol red			
Constant	Actual value	Valid range	QC-passed?
Imin	54.70	45-60	OK
Imax	24.84	30-15	OK
pH0	6.36	6.0-8.0	OK
dpH	0.59	0.3-1.0	OK
Temperature	37	35-40	OK

Fig. 8 Calibration data on the Final Inspection Protocol

The calibration details listed on the protocol can be typed in this dialog.

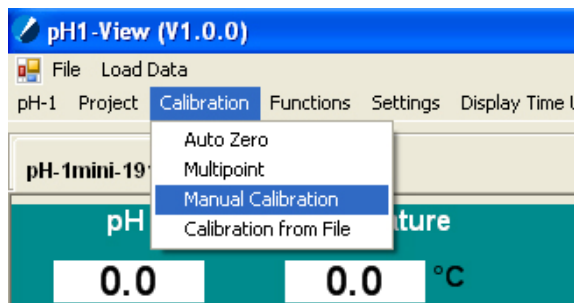


Fig. 9 Submenu for Manual Calibration

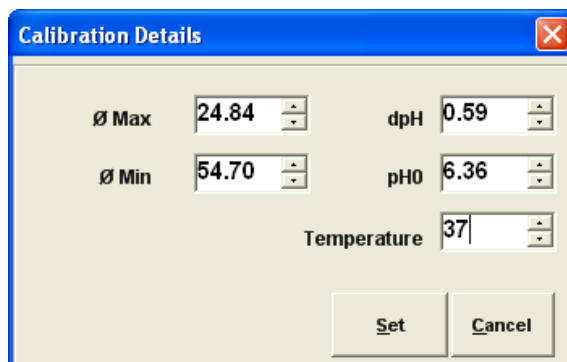


Fig. 10 Dialog for Calibration Details

## 4.2.2 Multipoint Calibration

A multipoint calibration is required to obtain best accuracy. It is necessary especially when working with difficult samples, e.g. with background fluorescence, or after sensor treatment like  $\gamma$ -irradiation.

A multipoint recalibration is recommended to ensure precise measurement. The transmitter and sensor can only perform optimally by recalibrating the transmitter in combination with the sensor.

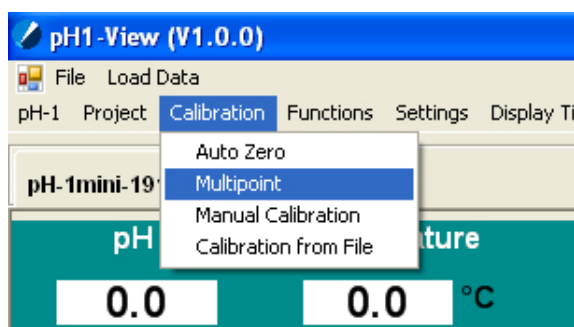


Fig. 11 Submenu for Multipoint Calibration

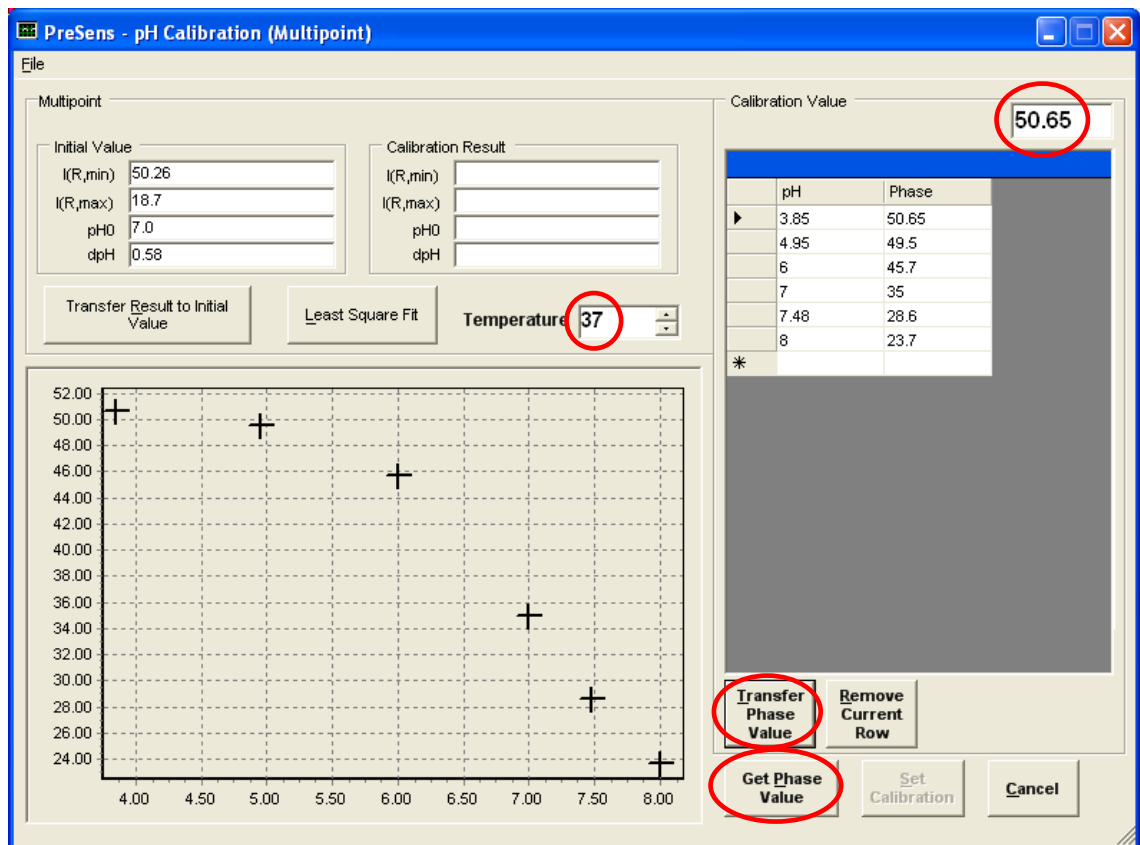


Fig. 12 Dialog for Multipoint Calibration

Enter the temperature of the sample in the temperature box. Please ensure that the sensor is inserted properly in a sample of known pH and that the measured phase is stable. Press **Get Phase Value**. The currently measured phase value is displayed in the upper right corner.

	pH	Phase
▶	3.85	50.65
	4.95	49.5
	6	45.7
	7	35
	7.48	28.6
	8	23.7
*		

Fig. 13 Display for pH / phase value data couples

Type the current pH in the active row.

Press **Transfer Phase Value** to transfer the current phase value into the active row.

Create at least 5 data couples by changing pH of the sample. Ensure that the pH values cover your pH range of interest. Suitable pHs are 4, 5, 6, 7, 8 and 9.

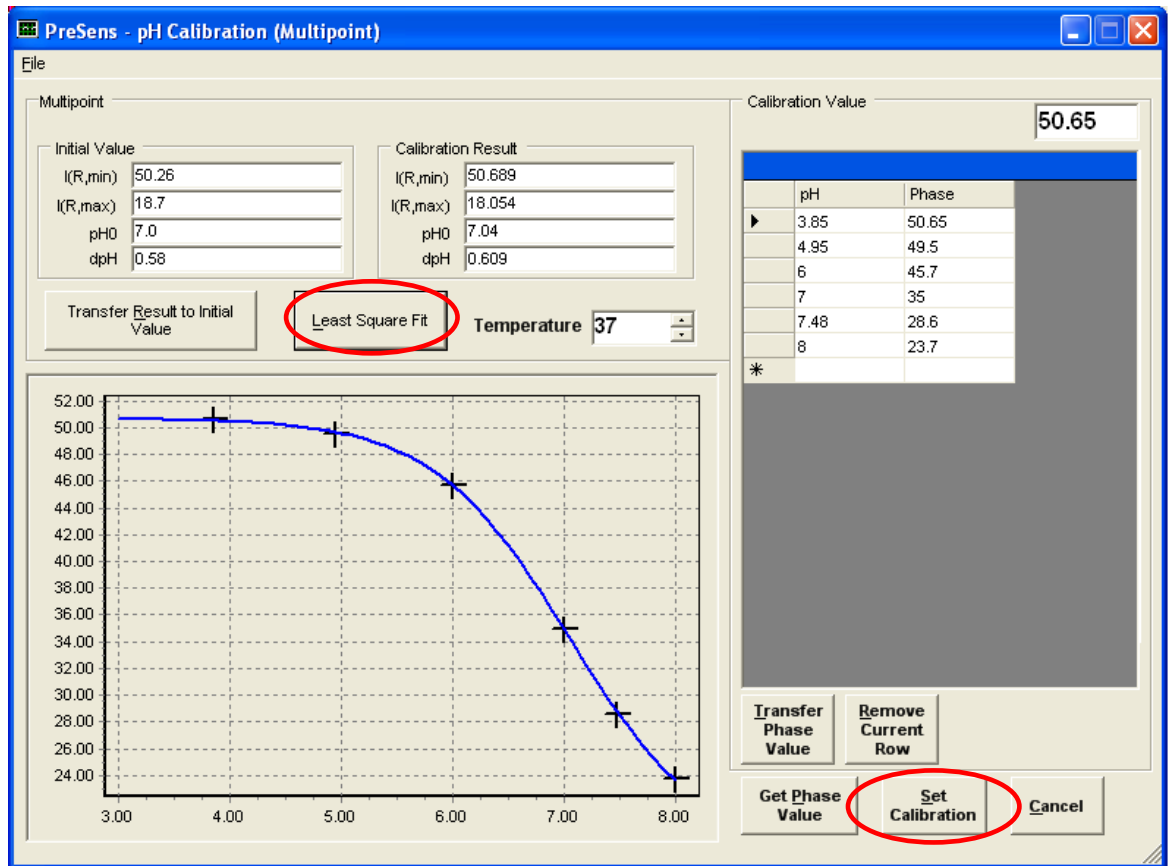


Fig. 14 Dialog for Multipoint Calibration

Press **Least Square Fit** to create the calibration constants and **Set Calibration** to transfer the calculated constants to the device.

### 4.2.3 Calibration from File

The dialog allows to store calibration data in a file and to upload previous sets of calibration data. This helps organizing different sets of calibration data for different sensors and allows storing recalibration data.

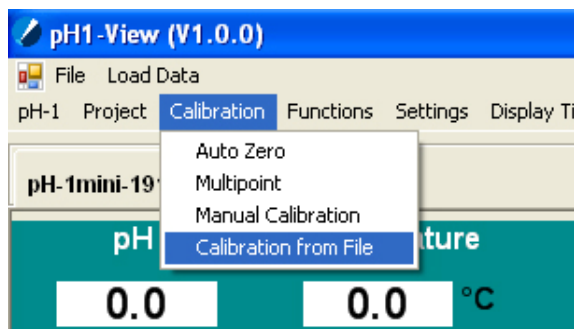


Fig. 15 Submenu for Calibration from File

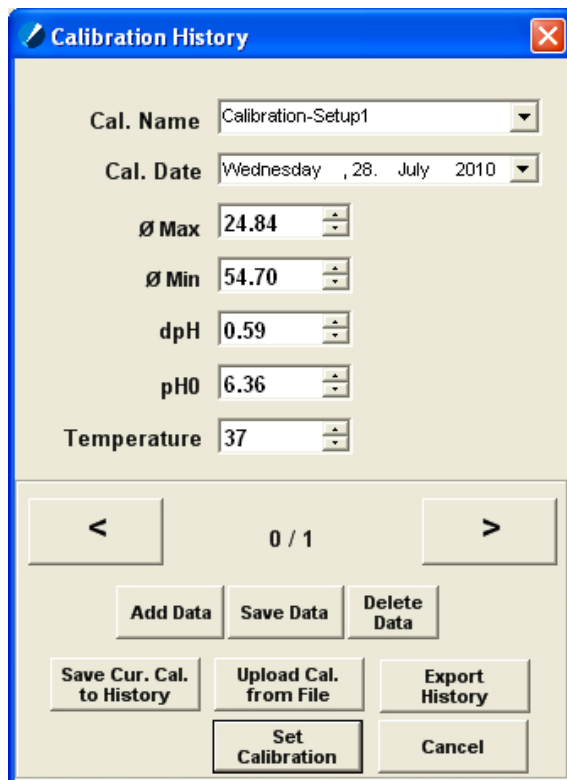


Fig. 16 Dialog for uploading and saving calibration data

Each set of calibration data can be stored under a new name. A multitude of different sets of calibration data can be stored in one history file. The arrows allow navigating the entries of the calibration history.

**Add Data** creates a new entry in the history. Type in the calibration data, name and date you would like to add to the history.

**Save Data** adds the current content of the window to the history.

**Delete Data** removes the current calibration data from the history.

**Save Cur. Cal. to History** adds the data of the current calibration to the history and clears the window.

**Upload Cal. from File** opens the dialog to import previously saved calibration histories to the current history.

**Export History** saves the current history to a file. Data format is xml.

**Set Calibration** applies the data of the currently shown calibration to the calibration data used in the device.

**Cancel** closes the window.

## 4.2.4 Auto Zero

Auto Zero offers a one point calibration which is recommended in case of a significant offset of the measured pH and a known starting pH.

! The sensor used for Auto Zero has to be calibrated prior to this procedure.

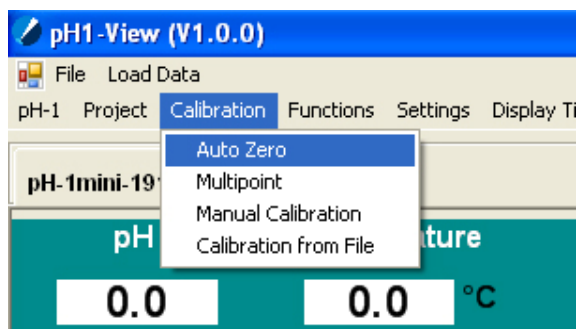


Fig. 17 Submenu for Auto Zero

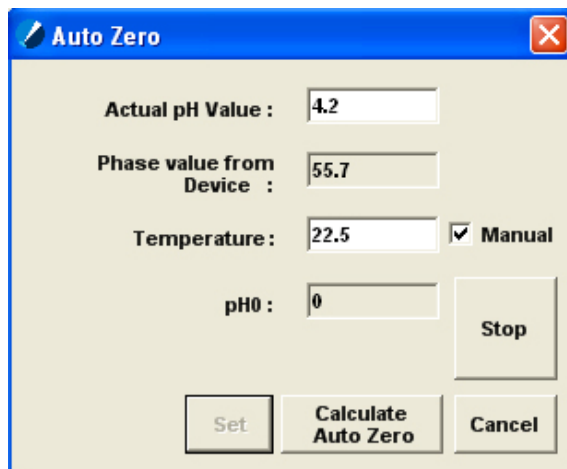


Fig. 18 Dialog for Auto Zero

Please ensure that the sensor is inserted properly in a media of known pH and that the measured phase is stable. The transmitter is constantly measuring now. Enter the current pH of your sample.

If the temperature sensor is connected to the transmitter, insert it in the sample. The temperature box in the dialog will show the measured value. If the temperature sensor is not connected or not inserted in the sample activate **Manual** and type in the current temperature of the sample.

You can stop updating phase values by pressing **Stop**.

Press **Calculate Auto Zero** to recalculate the point of inflection of the calibration curve. Press **Set** to recalibrate or **Cancel** to discard.

## 4.3 Measurement

The software offers two measurement types:

Pressing **Single Measurement** will result in a single measurement displayed in a graph temporarily stored.

**Start Measurement** or in case of more than one pH-1 mini connected **Start All** opens the dialog:

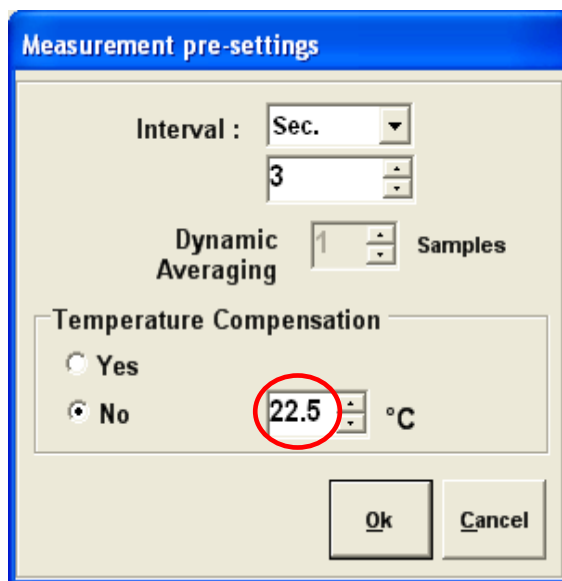


Fig. 19 Dialog for Measurement pre-settings

By pressing **Start Measurement** only the measurement pre-settings of the activated transmitter will be changed. Using **Start All** the measurement pre-settings will be the same for all transmitters connected.

Adjust your desired measurement interval, dynamic averaging (only active in 1 s and 2 s mode) and temperature compensation.

In case you want to discard measurement data enter the submenu **Clear**. This will clear the projects graph and data.

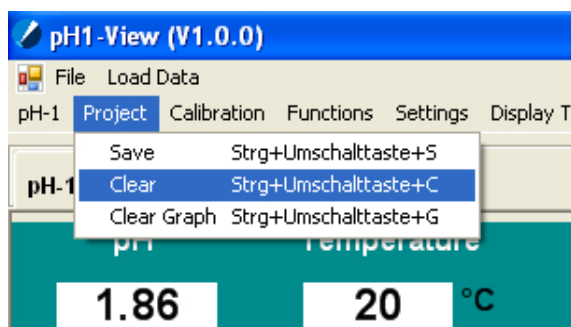


Fig. 20 Submenu for clearing project graphs and data

If there is more than one transmitter connected to the software you can start each transmitter individually by pressing **Start Measurement** at the activated transmitter, or start all transmitters simultaneously by pressing **Start All**.

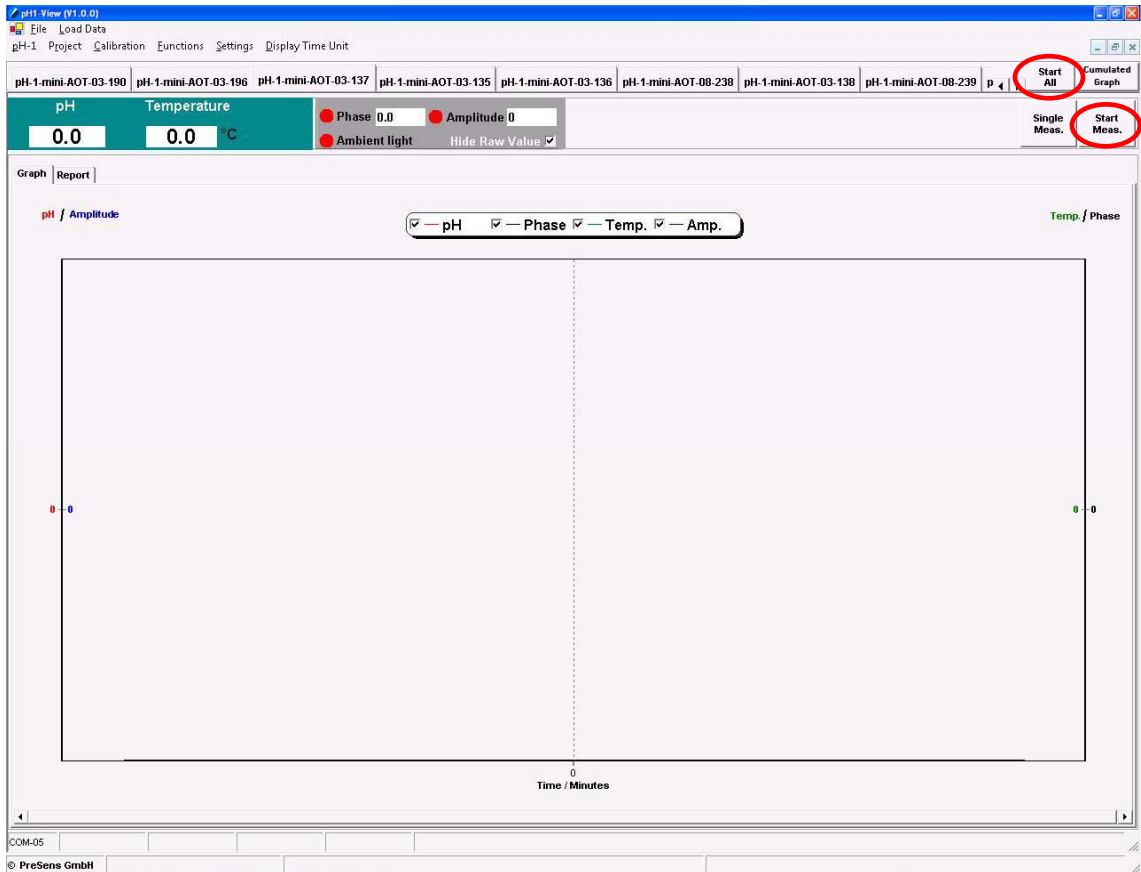


Fig. 21 Multiple transmitters connected to the software

Close the active data set or transmitter by entering the submenu **Exit**.

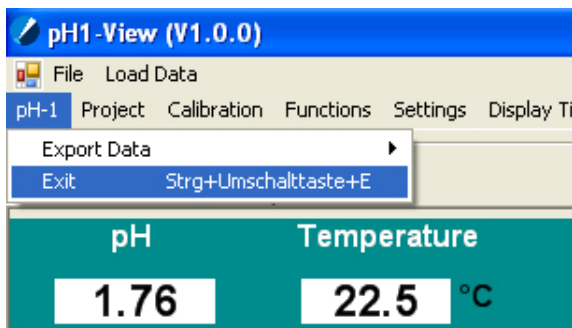


Fig. 22 Submenu to close active data set or transmitter

### 4.3.1 Control Bar

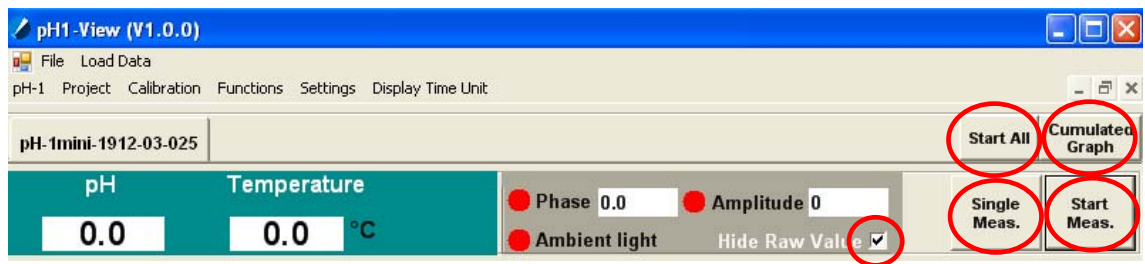


Fig. 23 pH1-View Control Bar

The control bar contains a numerical display for pH and temperature as well as warning lights and a numerical display (to be switched on and off by clicking **Hide Raw Value**) for the raw values amplitude and phase.

The **Start All** button activates measurements of all connected devices, the **Cumulated Graph** button opens a window with all active and uploaded measurements (see Fig. 28).

The **Single Measurement** button starts a single measurement of the activated device while the **Start Measurement** button opens the dialog for a continuous measurement of the activated device.

## 4.3.2 Graphical Display (Chart)

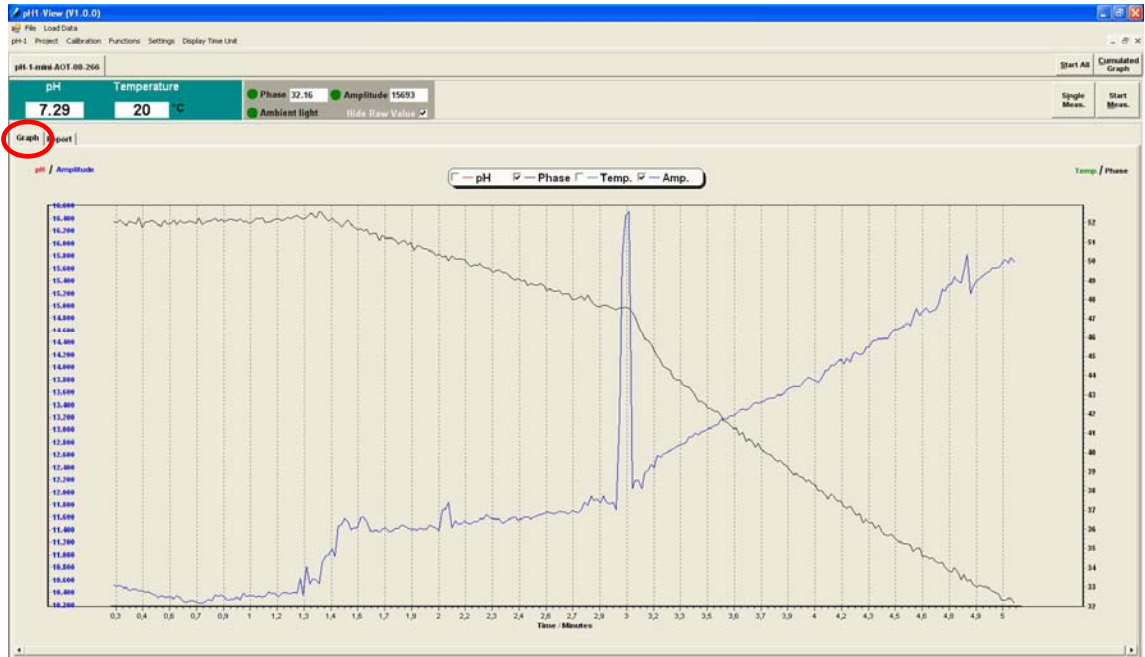


Fig. 24 Graphical Display

The graphical display shows the data of uploaded measurements or active devices. By clicking the check boxes **pH**, **Phase**, **Temp.** (Temperature), and **Amp.** (Amplitude) the respective graph will be hidden or shown. With a double click on the respective axis, limits can be defined. Zooming is possible by a left mouse click and movement from the upper left corner to the lower right corner of the area of interest. Zooming out is done vice versa.

Enter the menu **Display Time Unit** to define the displayed time unit on the x-axis.

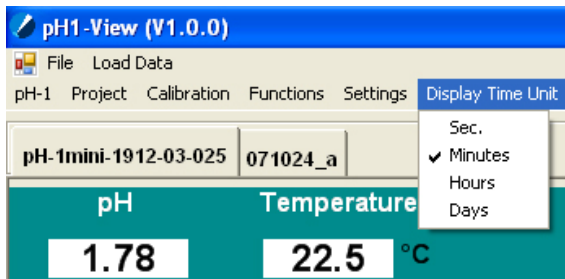


Fig. 25 Submenu to define the displayed time unit on the x-axis

The submenu **Clear Graph** allows clearing the graph for the current project without clearing the project data.

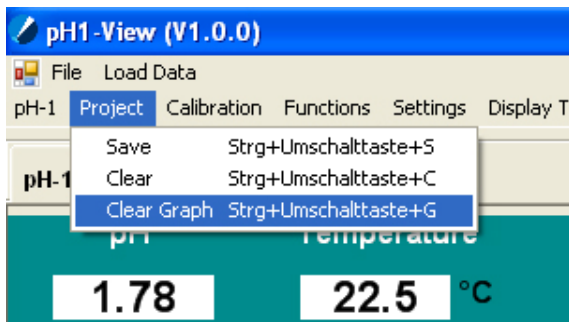


Fig. 26 Submenu for clearing the graph

The submenu **Trend** opens the dialog for linear regression. Activate the respective graph (**pH**, **Phase**, **Temperature** or **Amplitude**) by checking the box on the left. Now you have to select the starting point of the trend by using the cursor and clicking on the respective position in the graph. The first point value (**Point 1 val.**) is set. Then mark the position in the graph where the trend should end and the second point value (**Point 2 val.**) will be set.

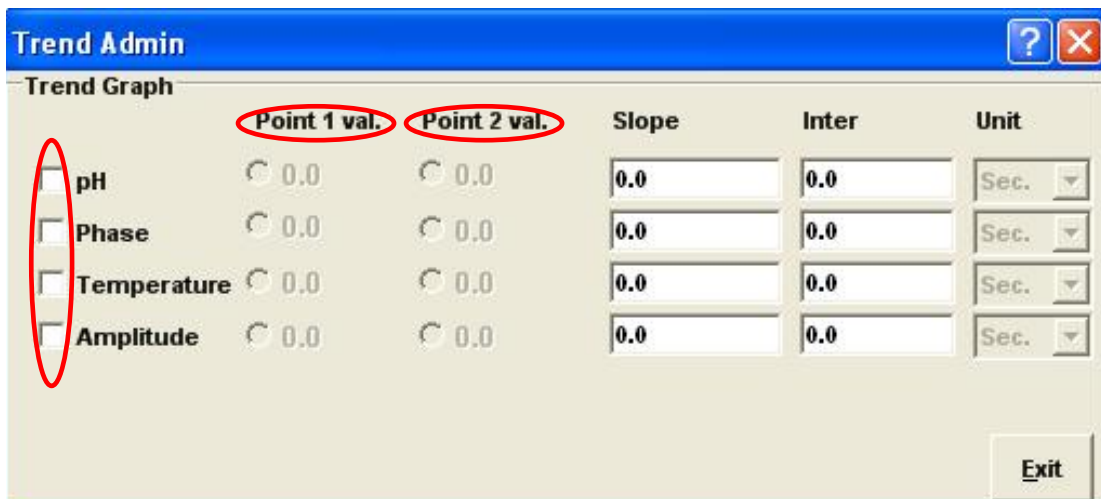


Fig. 27 Dialog for linear regression

The **Cumulated Graph** button opens a window in which all active and uploaded measurements are displayed. The data of the individual transmitters can be selected separately. Clicking on the check boxes to the left of the transmitter serial numbers will either hide or show the data of the respective devices.

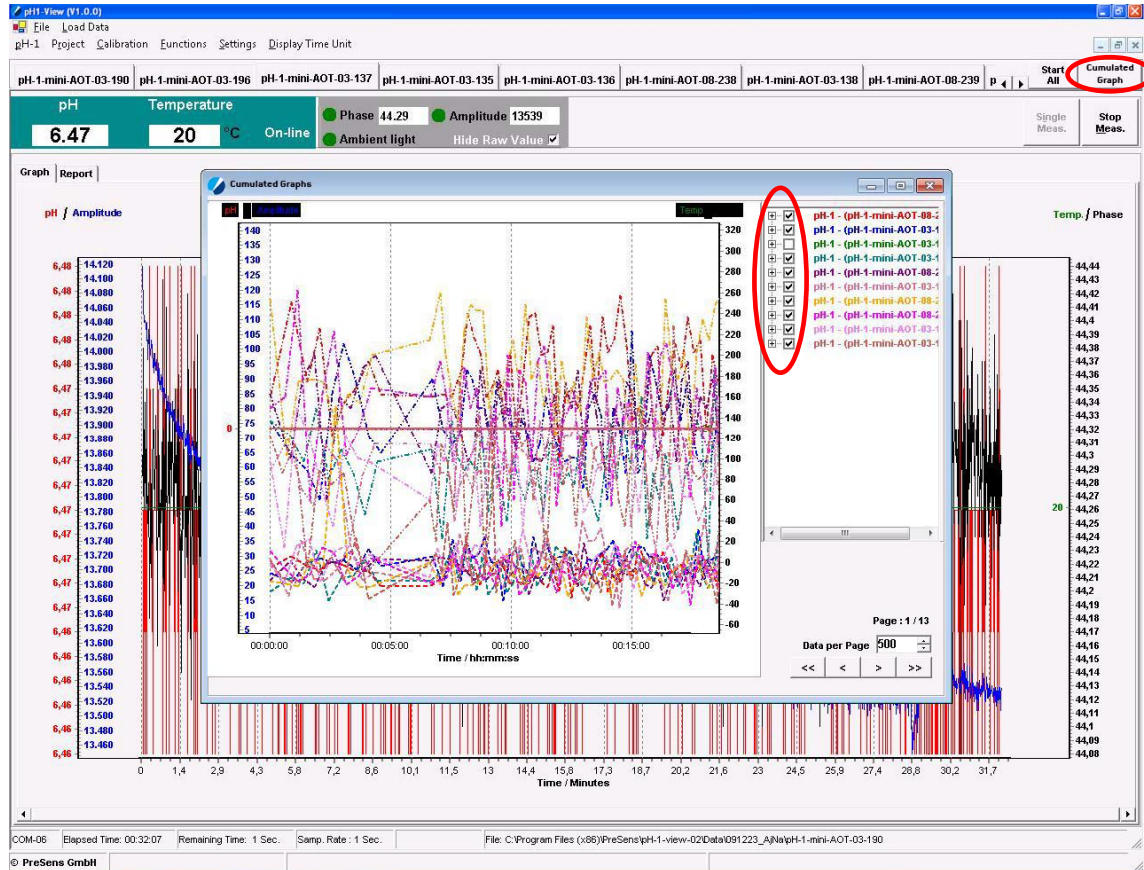


Fig. 28 Cumulated graphs window

The report area contains information about the status of the activated transmitter and lists the data string of the device sent to the software.

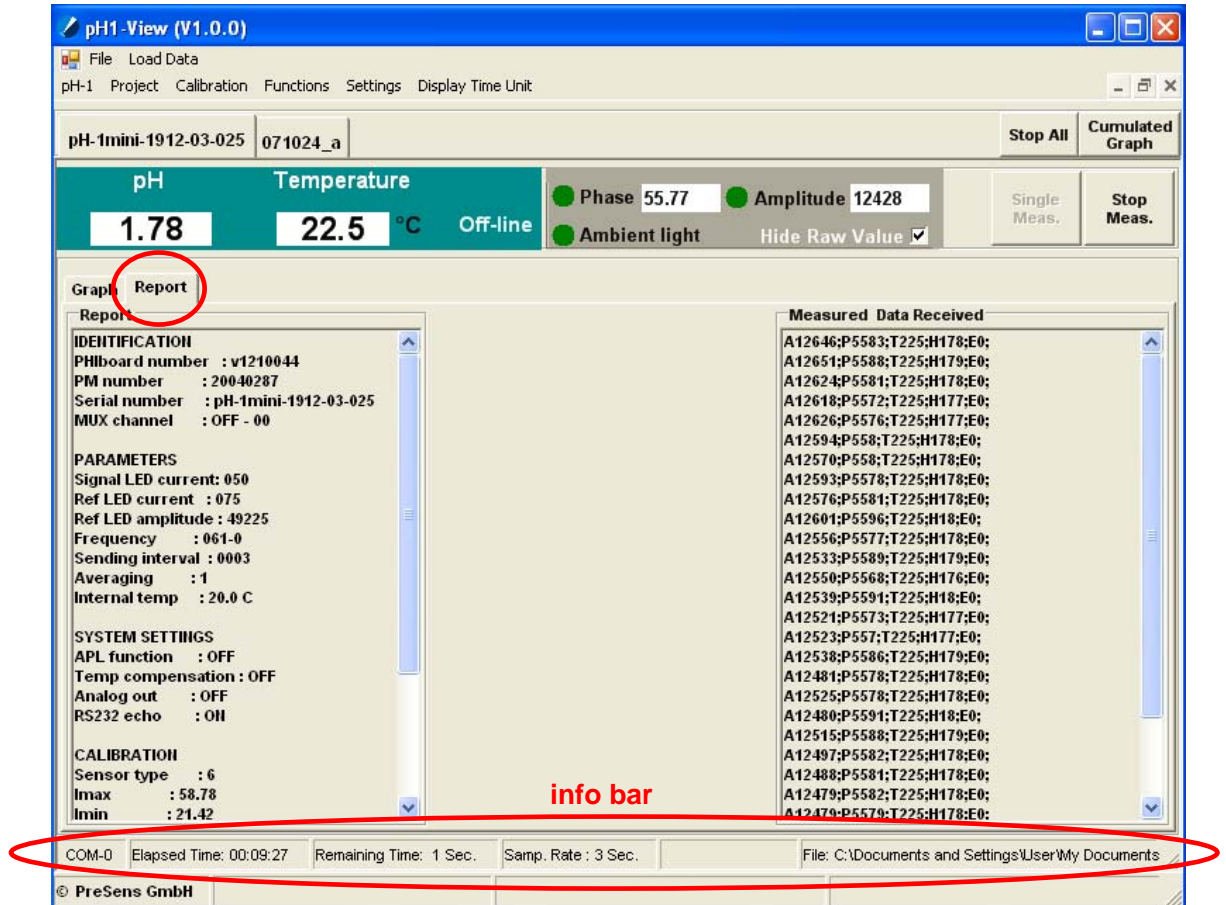


Fig. 29 Report display showing the info bar

The info bar located at the bottom of the screen provides information about the connected serial com port, the running measurement (elapsed time, remaining time until the next measurement) and information about file name and location.

## 4.4 Saving or Exporting Measurement Data

The dialog **Save Project** allows internal data saving. Click **Select File** to choose a location for the project file and then name it. Store the data by clicking **Save & Exit** or cancel the process by clicking **Cancel**.

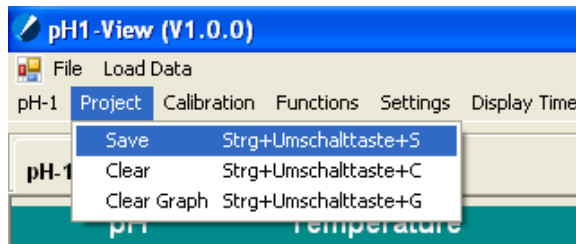


Fig. 30 Submenu for saving projects

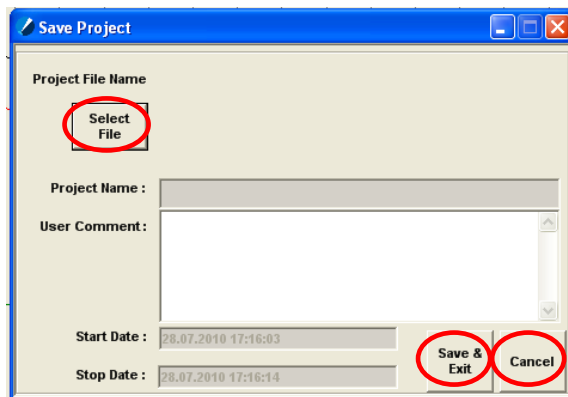


Fig. 31 Dialog for saving projects

It is possible to continue measurements after the data got stored. Saving the project again will then replace the already saved project file. The data generated during the last measurement will be added to the previously stored data.

The submenu **Export Data** allows exporting the current project into an Excel or ASCII file. A dialog is opened, in which you can choose a location for the file and name it.

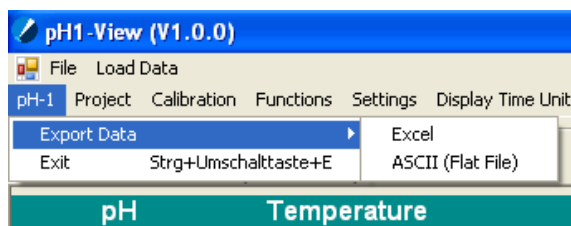


Fig. 32 Submenu for exporting data

## 4.5 Analog Output

The submenu **Analog Output** opens the dialog for configuring the analog out of the device. There are different options for output parameters. For each channel you can choose one output parameter from the list.

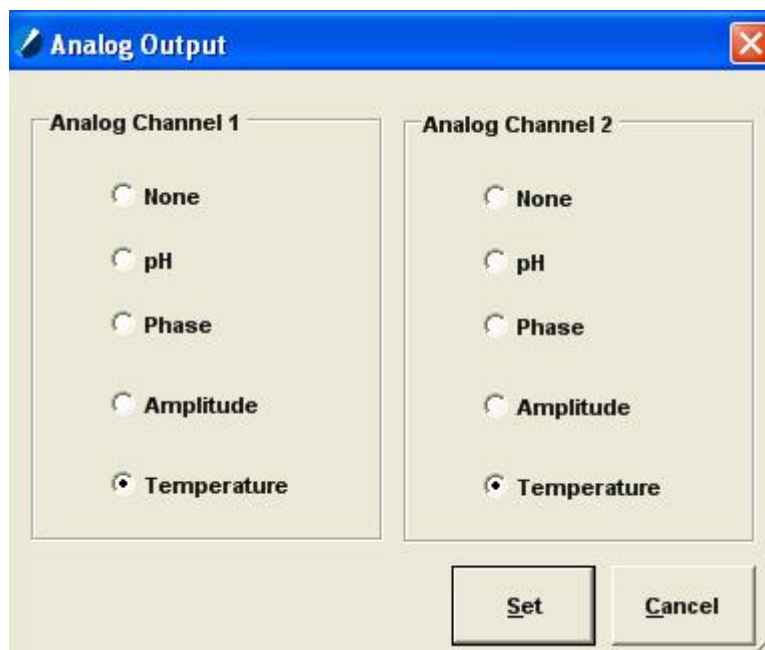


Fig. 33 Dialog for analog output configuration

## 4.6 Software Menu Structure

The first menu row contains general commands:

File	Load Data
→ <b>Scan devices</b> searches for pH-1 devices connected to com ports.	opens the dialog for uploading previous measurements.
→ <b>Exit</b> closes the software.	

The second menu row contains the tool bar of the selected device or data set.

pH-1	Project	Calibration	Functions	Settings	Display Time Unit
→ <b>Export data</b> opens the dialog for exporting data to Excel or ASCII.	→ <b>Save</b> opens the dialog for saving the current project.	→ <b>Auto Zero</b> opens the dialog for a one point calibration.	→ <b>Trend</b> opens the dialog for linear regression.	→ <b>Analog output</b> opens the dialog for configuring the analog out of the device.	defines the displayed time unit on x-axis.
→ <b>Exit</b> closes the active data set or device.	→ <b>Clear</b> clears the current projects graph and data.	→ <b>Multipoint</b> opens the dialog for a multipoint calibration.			
	→ <b>Clear Graph</b> clears graph but does not clear project data.	→ <b>Manual Calibration</b> opens the dialog for typing in calibration data.			
		→ <b>Calibration from File</b> opens the dialog for uploading or saving calibration data.			

## 5 Technical Data

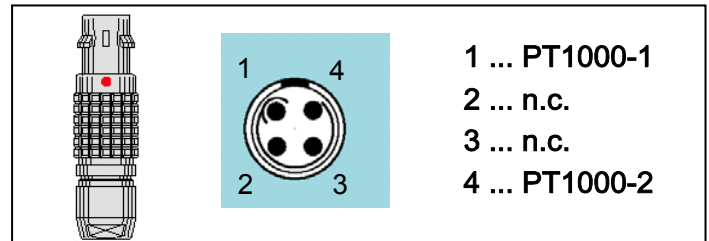
### 5.1 Specifications

#### OPTICAL SENSOR

pH sensor	HP5 / HP8
Optical connector	SMA compatible, 2 mm PMMA Fiber
Channels	1
LED peak wavelength	470 nm

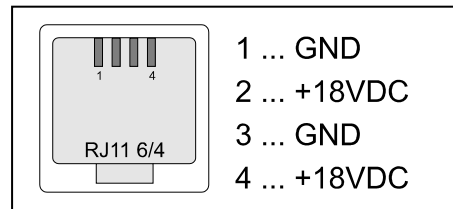
#### TEMPERATURE SENSOR

Potentiometric temperature sensor (Pt 1000)	Range	0 – 50 °C
	Resolution	± 0.1 °C
Temperature sensor plug	Plug type	Lemo FGG.00.304.CLAD35



#### DC INPUT

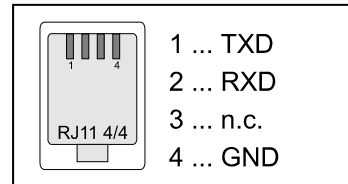
DC-Supply: 18 V/900 mA / type TRC-18-0830  
Use the provided parts only.



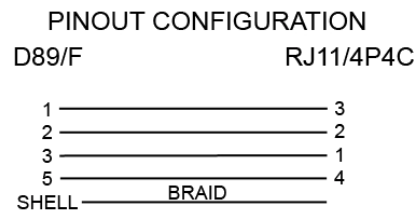
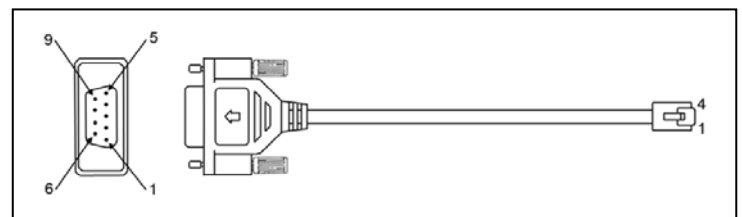
**DIGITAL INTERFACE**

Serial communication      RS232 serial interface  
 19200 Baud  
 (Databits 8, Stoppbits 1, Parity none, Handshake none)

Transmitter port      RJ11 4/4 socket



Serial interface cable to PC      RJ11 4/4 to DSub9

**ENVIRONMENTAL CONDITIONS**

Operating temperature      0 °C to + 50 °C  
 Storage temperature      - 10 °C to + 60 °C  
 Relative humidity      0 % to 80 % (non-condensing)

**OPERATION CONTROL**

LED at the front panel      Red      Device off  
    Green      Device on  
    Orange      Standby

**DIMENSIONS/WEIGHT**

210 mm x 120 mm x 50 mm  
 0.65 kg

## 5.2 Analog Output and External Trigger

The pH-1 mini is supplied with a dual programmable 12 bit analog output with galvanic isolation and an external trigger input.

### ANALOG OUTPUT SPECIFICATIONS

Channels	Dual outputs
Output range	0 – 4095 mV
Socket type	BNC connectors
Resolution	12 bit
Accuracy	± 10 mV
Galvanic isolation	500 Vrms
Shortcut protection	Yes
Output parameters (PC software allows to choose the parameter.)	pH Temperature Phase Amplitude
Equivalence coefficients:	10 mV represent: pH            0.1 pH Temperature 1 °C Phase        0.25° Amplitude    200 r.U.
Update rate	Dependent on the sampling rate of the software or if external trigger is used the update rate is dependent to the trigger pulse rate (minimal 3 s)

### EXTERNAL TRIGGER INPUT

Channels	Single input
Socket type	BNC connector
Input voltage range	TTL-compatible, up to 24 V
Trigger mode	Low-High-Low
Normal state	No current
Galvanic isolation	500 Vrms
Timing specifications	Min rise & fall time for trigger 15 ns Max rise & fall time for trigger 2 ms Min pulse length 3 ms Min pause length 10 ms Min period length 13 ms (TTL-compatible)

## 6 Operational Notes

### 6.1 Optical Output

The SMA connector is a high precision optical component. Please keep it clean and dry. Always use the rubber cap to close the output when not in use.

### 6.2 Temperature Compensation

Use only the temperature sensor supplied. The use of any other temperature sensor may damage the device.

### 6.3 Warm-Up Time

The warm-up time of the electronic and opto-electronic components of the pH-1 mini is 5 min. After 5 min. stable measuring values will be obtained.

### 6.4 Power Adapter

pH-1 mini always has to be used with the original power adapter (110 - 240 VAC; 50 - 60 Hz; 18 V / 900 mA; 5 W; type TRC-18-0830) which is supplied.

As an alternative power source a battery can be used that meets the DC input voltage given in chapter 5 "Technical Data". The battery adapter cable is available as an additional accessory.

### 6.5 Analog Outputs

**WARNING:** The analog outputs are not protected against any input voltage. Any voltage applied to the analog outputs can cause irreversible damage to the transmitter.

### 6.6 RS232 Interface

The transmitter uses a special interface cable. A different cable can cause malfunction. Use the provided parts only.

### 6.7 Maintenance

The transmitter is maintenance-free.

The housing should be cleaned only with a cloth. Avoid any moisture entering the housing. Never use benzene, acetone, alcohol or any other organic solvents.

The SMA fiber connector of the sensor can be cleaned only with lint-free cloth or a cleaning implement for SMA connectors.

## 6.8 Service

Alignment, rework or repair work may only be carried out by the manufacturer:

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Please contact our service team in case of any question. We look forward to helping you and are open for any proposition or criticism.

# 7 CE and FCC Conformity

## CE Conformity

For the evaluation of above mentioned Council Directives for Electromagnetic Compatibility (2004/108/EEC) and for Low Voltage (2006/95/EEC) following standards were consulted:

DIN EN 61326-1: 2006-10

DIN EN 61010-1: 2002-08

## Verification of FCC Rules

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

## 8 Concluding Remarks

Dear Customer,

With this manual, we hope to provide you with an introduction to work with the pH-1 mini fiber optic pH transmitter.

This manual does not claim to be complete. We are endeavored to improve and supplement this version.

We are looking forward to your critical review and to any suggestions you may have.

You can find the latest version at [www.PreSens.de](http://www.PreSens.de).

With best regards,

Your PreSens Team











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