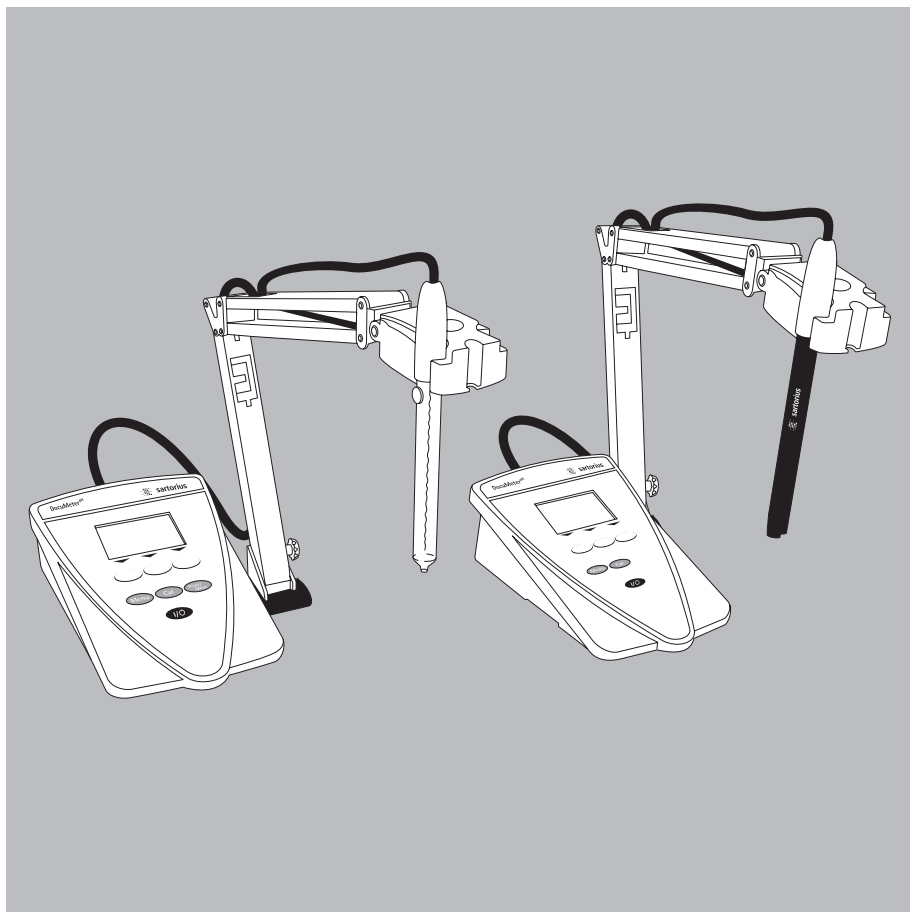


Operation Manual

Sartorius Docu-pH_{Meter}, Docu-pH⁺_{Meter}

Docu-pH, Docu-pH+, pH/mV Meter



Contents

3	Contents
4	Intended Use
5	Warning and Safety Information
6	General View of the pH Meter
7	Getting Started
7	Equipment Supplied
7	Connecting the Equipment to AC Power
9	Installing Electrodes
12	Default Settings (Setup Menu)
12	Example: Selecting the Language
13	Parameter Settings (Overview)
15	Calibration (Adjustment)
15	Calibration for pH Measurement
18	Checking the Relative Millivolt Mode
19	Deleting Calibration Data
20	Docu-pH ⁺ _{Meter} Model: Calibration with Cal Reminder
21	Operating the Meter: Measurement
21	ATC Probe
21	Lock Function
21	Fast Mode (Shorter Measurement Time)
22	Measuring the pH
22	Measuring Redox Potential
23	Docu-pH ⁺ _{Meter} Model: Saving Measured Data
26	Electrode with DocuClip®
28	Interpreting Calibration Curves
29	Temperature Compensation
30	Docu-pH ⁺ _{Meter} Model: Data Output
31	Docu-pH ⁺ _{Meter} Model: Data Interface
32	Error Messages
33	Care and Maintenance
33	Recycling Instructions
34	Overview
34	Meter Specifications
35	Accessories
36	Declaration of Conformity

Intended Use

The Docu-pH_{Meter} is a meter for measuring pH/mV and temperature. The following measuring ranges are covered:

- pH range: -2.000 to 20.000
- mV measuring range: -2,000 to +2,000
- Temperature range: -5 to +105C°

The pH meters simplify and speed up routine procedures thanks to their:

- Automatic electrode recognition
- Simple operation
- Rugged and sturdy construction
- Easy to calibrate with 1, 2 or 3 calibration points
- Automatic buffer recognition
- Automatic electrode test during calibration
- Automatic temperature compensation
- Clear readout with easy-to-understand symbols and LCD
- Intuitive menu controls with plain-language instructions via LCD and softkeys
- Electrode operation with DocuClip®: Previous calibrations are traceable
- Docu-pH⁺_{Meter}: Serial interface for data transfer to PC or printer
- Docu-pH⁺_{Meter}: Data storage capacity: 500 datasets

Symbols

The following symbols are used in these instructions:

- indicates required steps
- indicates required steps, but only under certain conditions
- > describes what happens after you perform a certain step
- indicates an item in a list



indicates a hazard

Conventions Used in This Operation Manual

- The pictures in this Operation Manual are based on the “Docu-pH_{Meter}” model. On the other models, some display readouts and printouts may differ slightly from the ones shown. Any differences that impact operation of the meter will be explained.

Hotline for Technical Applications Advice

Phone: +49.551.308.4440

Fax: +49.551.308.4449

Warning and Safety Information

Your pH/mV meter complies with the European Council Directives as well as international regulations and standards for electrical equipment, electromagnetic compatibility, and the stipulated safety requirements. Improper use or handling, however, can result in damage and/or injury.

- To prevent damage to the equipment, read this Operation Manual thoroughly before using your pH/mV meter. Keep these instructions in a safe place. Please observe the following instructions to ensure safe and reliable operation of your pH/mV meter.

Designated Use

- Designated use of the pH/mV meter is exclusively for measuring pH and millivolt values in a laboratory environment. Any use above and beyond this is considered non-intended use.

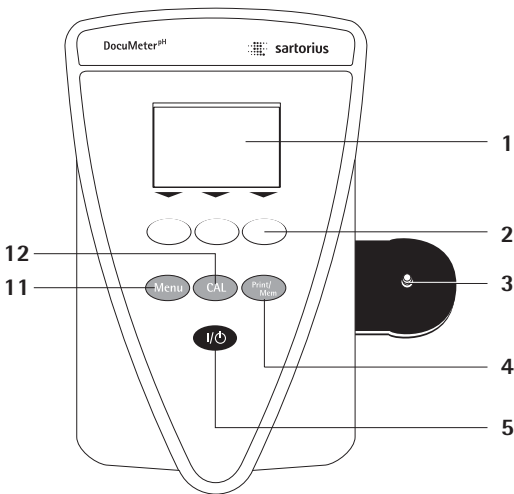
Operational Safety

- ⚠ Do not use this equipment in potentially explosive atmospheres.
- ⚠ If you use electrical equipment in installations and under ambient conditions requiring higher safety standards, you must comply with the provisions as specified in the applicable regulations for installation in your country.
- ⚠ If you use an AC adapter, make sure the voltage rating printed on the AC adapter is identical to your local line voltage.

- If you transport your pH/mV meter from a cold to a warm environment, condensation may occur and your pH/mV meter may malfunction. In cases like this, allow the meter's temperature to reach the room temperature prior to using it again.
- Use Sartorius accessories, as these are optimally designed for use with your pH/mV meter.
- Calibration:
The temperature dependency for some buffer solutions and DIN/NIST is saved in your pH/mV meter. Automatic temperature compensation is only accurate if the stored buffers are used.
- Installation instructions:
The operator shall be responsible for any modifications to Sartorius equipment and must check and, if necessary, correct these modifications. On request, Sartorius will provide information on the minimum operating specifications (in accordance with the standards listed above for defined immunity to interference).
- Protection ratings for the housing:
 - This meter complies with IP43
 - AC adapter complies with IP20
- Only clean the meter as described in the cleaning instructions: see the chapter entitled "Care and Maintenance."
- If you have any problems with your pH/mV meter:
contact your local Sartorius office, dealer or service center.

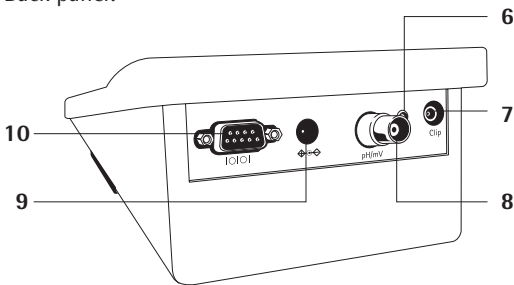
General View of the pH Meter

Front view:



- 1 LCD
- 2 Softkeys
- 3 Mounting for electrode holding arm
- 4 Only for the Docu-pH⁺ Meter: key: Print/Save
- 5 key: On/off
- 6 Jack for ATC probe
- 7 Female connector for "intelligent" DocuClip[®] electrode with automatic recognition capability
- 8 BNC connector for pH or ORP (redox) electrode
- 9 Power jack for AC adapter
- 10 Only with the Docu-pH⁺ Meter: Serial interface
- 11 key: Access to Settings
- 12 key: Calibration

Back panel:



Getting Started

Storage and Shipping Conditions

Do not expose the pH/mV meter unnecessarily to extreme temperatures, moisture, shocks, blows or vibration.

Unpacking the pH/mV Meter

- After unpacking the pH meter, please check it immediately for any visible damage.
- If any sign of damage is visible, proceed as directed in the chapter entitled “Care and Maintenance,” under the section on “Safety Inspection.”
It is a good idea to save the box and all parts of the packaging until you have successfully installed your portable meter. Only the original packaging provides the best protection for shipment. Before packing your portable meter, unplug all connected cables to prevent damage.

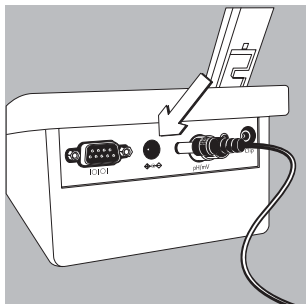
Equipment Supplied

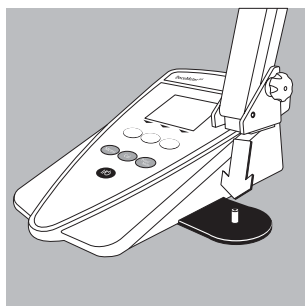
The equipment supplied includes the components listed below:

- pH meter
- AC adapter
- Electrode holding arm
- Technical buffers; pH = 4.00 and 7.00 at 25°C:
One capsule each for producing 100 ml of buffer solution; pH = 4.00 ml and pH= 7.00
- The pH/mV meter is also available in sets (including electrode/DocuClip®). For more information, please contact your local dealer or Sartorius directly.

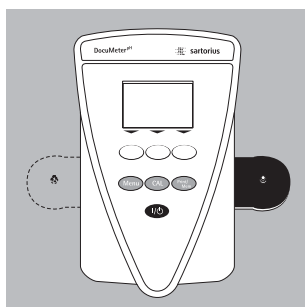
Connecting the Equipment to AC Power

- Use only the original Sartorius power adapter supplied:
In Europe: 102 078.1.
This AC power adapter has protection rating IP20 in accordance with the European standard EN 60529.
- Plug the AC adapter into the power jack.

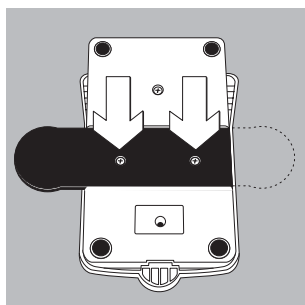




- Attach the electrode holding arm



- Position the electrode arm holder on the left, if necessary.



- Unscrew the 2 screws on the bottom of the pH/mV meter.
- Position the black plate with the mounting on the other side.
- Use the two screws to secure the plate back into place.

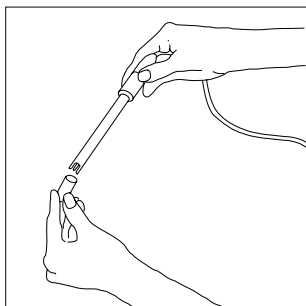
Installing Electrodes

You can use the following electrodes with the meter:

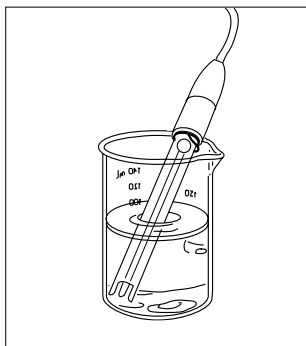
- pH combination electrode with BNC connector
 - Separate 2.5 mm phone plug for ATC probe
 - Ion-selective electrode or ORP (redox) electrode with BNC connector
 - Sartorius electrodes with DocuClip®
-
- The Docu-pH_{Meter} automatically recognizes the types of the ACT probes at the temperatures listed below:
 - NCT10 kohm: +14°C to 76°C
 - NCT30 kohm: -5°C to 40°C
 - PT1000: 4°C to 105°C

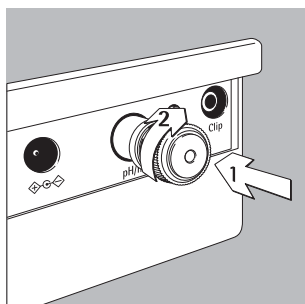
Installation:

1. Remove the protective cover from the electrode.

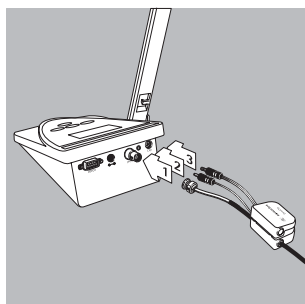


2. Prior to first use of the pH electrode, soak it overnight in an electrode filling solution or electrode storage solution (3 mol/L KCl solution).

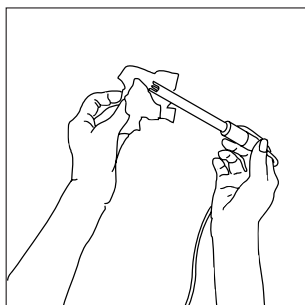




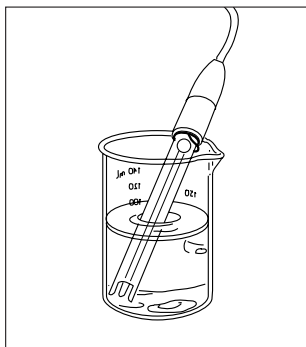
3. Check the pH/mV meter for correct functioning as follows:
 Connect the shorting cap to the BNC input.
 Select mV mode and record the mV value:
 Press the **mV** softkey, if necessary.
 Make sure the portable meter is in mV mode.
 If the mV value is 0 ± 0.3 , the meter is functioning correctly. Note that the long-term drift specified for this portable meter is 0.1 mV/month since the most recent calibration.



- Connect the electrode to the input connector **(1)** on the meter (push in and twist to lock).
 For accurate measurements, you can connect an additional ATC probe to the ATC port **(2)**.
 Female connector for Sartorius DocuClip® **(3)**:
 Automatic electrode recognition, automatic documentation and storage of calibration data.



4. Rinse and blot-dry electrodes between measurements (do not wipe). Rinse electrodes with distilled water, deionized water, or some of the next test solution.



5. Store pH electrodes in KCl solution (3 mol/L concentration). Always leave the filling hole open when in use and closed when the electrode is in storage. Refill with filling solution when the internal solution drops to 1 inch (approx. 25 mm) below the filling hole.

△ Equipment Supplied: Docu-pH..|P12... and ...|P20... and ...|P23...:

The electrode supplied is a low-maintenance gel-filled electrode that cannot be refilled.

Default Settings (Setup Menu)

Intended Use

Configuration of the pH meter, i.e. adapting to user requirements by selecting predefined parameters from a menu.

The Setup menu is divided into the items:


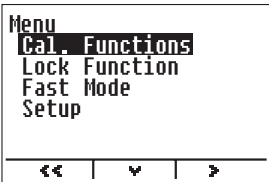


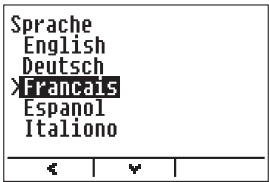
- Calibration functions
- Lock function
- Fast mode
- Settings
- Docu-pH+ only: data memory

Language Selection

There are 5 languages available for displaying information:

- English (factory setting)
- German (Deutsch)
- French (Français)
- Spanish (Español)
- Italian (Italiano)

Example: Selecting the Language "French"

Step	Press key	Display
1. Turn meter on, if required		
2. Select default		
3. Select setup and confirm	Press v softkey repeatedly, > softkey	
4. Confirm language	> softkey	
5. Select "French (Francais)" and confirm	Press twice or repeatedly, as needed v softkey, OK softkey	
6. Exit the menu and save	Press < softkey repeatedly, << softkey	

> Factory setting; ✓ User setting

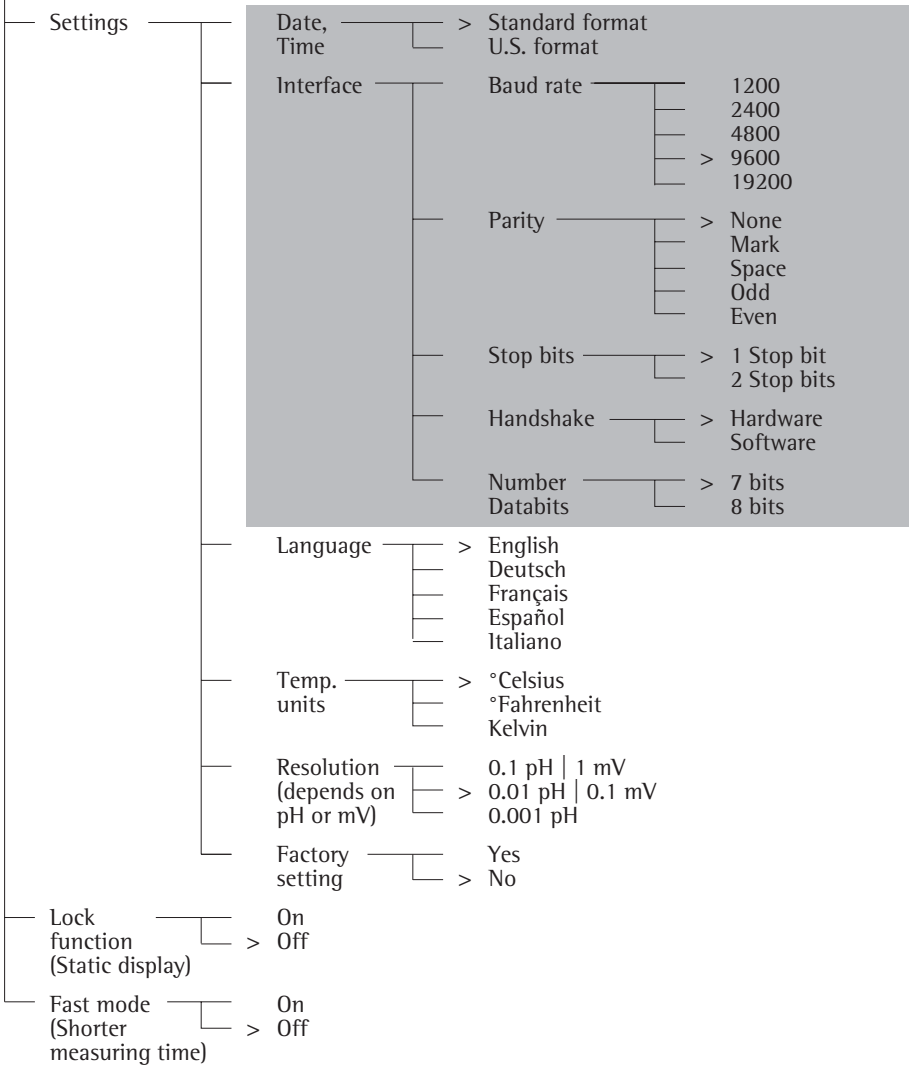
Menu



> Factory setting; ✓ User setting

Menu

 = Setting and function only with Docu-pH⁺ Meter



Calibration (Adjustment)

Intended Use

Because electrodes vary in their response, you must calibrate (standardize) your pH/mV meter and electrode to compensate for electrode variation. The more frequently you calibrate, the more accurate your measurements.

Note on usage of the terms “standardize”, “calibration” and “adjustment”: The pH meter performs adjustments. In pH meter jargon, however, one refers to “calibration” or “standardization” instead of “adjustment”.


Preparation

Calibrate the meter and electrode using at least two buffers. The buffers should be in the range of the minimum and maximum pH values to be expected for the samples.

Printing Out Calibration Results

Only the most current calibration result can be printed out.

Procedure:

- 1) Menu: Calibration functions:
Load calibration dataset
(see also Chapter “Default Settings”)
- 2) Then print out the calibration result by pressing the  key.




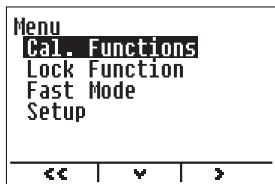
ATC Probe

Calibration can be carried out with or without an ATC probe. If an ATC probe is connected, the meter adjusts continually for temperature during calibration. In this case, the pH value of the buffer at the current temperature is taken into account when calculating the slope of the electrode.



When calibrating without an ATC probe, the current temperature of each buffer solution must be entered manually:

- 1) Determining the current temperature using a thermometer.
- 2) Start temperature entry:
Softkey **Temp**
- 3) Set temperature value:
Softkey **↵**, softkey **↶**
- 4) Save temp value: Softkey **OK**




Calibration for pH Measurement

Step	Press key	Display
1. If required, turn on meter		
2. Immerse the electrode in a standard solution. Stir gently. Allow the electrode to reach a stable value on the display.		
3. Display current buffer set and modify if required:		

Step	Press key	Display
4. Confirm calibration functions and then pH	2x > softkey	<div>Cal. Functions</div> <div>Cal. Record</div> <div>Erase Cal</div> <div>Select Buffer Set</div> <div>◀ ▼ ▶</div>
5. Select buffer set and confirm	2x ▼ softkey, > softkey	<div>Select Buffer Set</div> <div>1.68 4.01 6.86</div> <div>>9.18 12.46</div> <div>4 7 10</div> <div>2 4 7 10 12</div> <div>◀ ▼ ▶</div>
6. Change buffer set if required and confirm	Press ▼ softkey repeatedly; press OK softkey once	
7. Exit the menu and save	press < softkey repeatedly, << softkey	
8. Select Calibration	Cal	<div>Calibration</div> <div>Buffer 1</div> <div>Bufferset:</div> <div>1.68 4.01 6.86</div> <div>9.18 12.46</div> <div>Cancel Start</div>
9. Start calibration with first buffer	Press Start softkey	<div>in progress ...</div> <div>25.0°C</div> <div>12.50 pH</div> <div>Cancel </div>
Calibration running The meter recognizes the buffer automatically from the selected set. Once the signal stabilizes, the calibration result is stored automatically. The old calibration data is automatically overwritten.		<div>Calibration</div> <div>Buffer 2</div> <div>Bufferset:</div> <div>1.68 4.01 6.86</div> <div>9.18 12.46</div> <div>Cancel End Start</div>

Step	Press key	Display
10. Calibrate with a 2nd buffer: Immerse the electrode in the second buffer solution.		
11. Start calibration with second buffer	Start softkey	<div>Calibration 25.0°C  6.90 pH Cancel </div>
Carry out a 3-point calibration: Continue, if required, with step 10: Standardize with a 3rd buffer		<div>Calibration Buffer 3 Bufferset: 1.68 4.01 6.86 9.18 12.46 Cancel End Start</div>
12. End 2-point calibration The calibration result is displayed (electrode slope, etc.).	End softkey	<div>Cal. Results Slope1 98.7% Offset -8.4 mV ◀◀ ▼ ▶▶</div>
13. Further calibration data	▼ softkey ▲ softkey	<div>Cal. Results Buffer 2 6.86 mV : -0.0 °C : 25.0 ◀ ▶</div>
14. Perform pH measurement	◀ softkey	

Checking the Relative Millivolt Mode

Step	Press key	Display
1. If required, turn on meter		
2. Immerse the redox electrode in a standard solution. Stir gently. Allow the electrode to reach a stable value.		
3. Toggle to the millivolt measurement	mV softkey	<div><div>25.0 °C AT S</div><div>-341 mV</div><div>Cancel pH</div></div>
4. Select calibration		<div><div>mV Calibration</div><div>mV</div><div>Cancel Start</div></div>
5. Start calibration Calibration running ...: When the signal has stabilized: The meter automatically stores the measured value. The current absolute mV value becomes zero relative millivolts.	Start softkey	<div><div>25.0 °C AT S</div><div>0 rel mV</div><div>mV -341</div><div>Cancel pH</div></div>


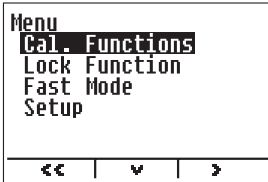
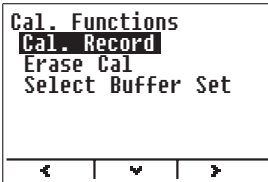
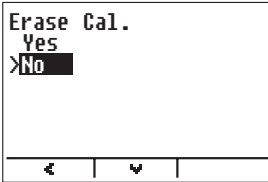
Deleting Calibration Data

Intended Use

Example: Here, delete calibration of the pH measurement

pH measurement: measuring at default settings


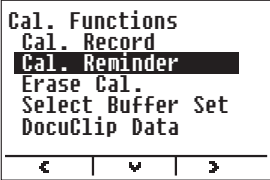
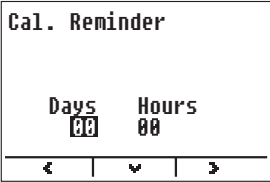
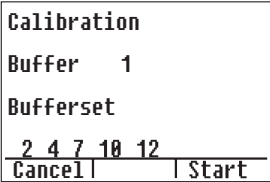
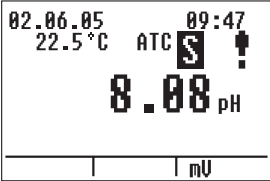
Redox potential: Delete the mV offset and return to the absolute mV mode.

Step	Press key	Display
1. Activate menu		
2. Confirm calibration functions and then pH	Press ∇ softkey; if necessary press \triangleright softkey repeatedly	
3. Select "Clear" and confirm	∇ softkey, \triangleright softkey	
4. Delete: select "Yes" and confirm	∇ softkey, OK softkey	

Docu-pH+_{Meter} Model: Calibration with Cal Reminder

Intended Use

In the Setup Menu, a calibration reminder can be programmed as a reminder of when electrode calibration should be repeated.

Step	Press key	Display
1. Activate menu		
2. Confirm calibration functions and then pH	Press ∇ softkey If necessary, press \triangleright softkey repeatedly	
3. Select "Cal reminder"	∇ softkey,	
and confirm	\triangleright softkey	
4. Set Cal reminder	∇ , \triangleright softkeys	
5. Confirm Cal reminder	OK softkey	
6. Exit the menu	\triangleleft , $\triangleleft\triangleleft$ softkeys	
> Docu-pH+ automatically displays "Calibration" after the Cal reminder has been overwritten.		
> When a calibration interval has expired, the following values will appear with an exclamation mark:		
- Current measurements		
- Measurements in data memory		
- Measurements on the printout		

Operating the Meter: Measurement

Preparation

- To select measuring mode: Press softkey pH or mV.
- △ Improperly standardized electrodes yield inaccurate measurements. Perform calibration regularly prior to measurement.
- Temper buffer or buffer solutions or measure current temperature, if the measurement is performed without an ATC probe.


ATC Probe

- Measurements can be performed with and without an ATC probe.
- The Docu-pH_{Meter} detects the following type of ATC probes automatically:
 - NCT10 kohm: +14°C to 76°C
 - NCT30 kohm: –5°C to 40°C
 - PT1000: 4°C to 105°C

△ It is imperative that you measure the temperature to achieve accurate pH measurements. When measuring without an ATC probe, enter the current temperature manually:

- 1) Determine the current temperature using a thermometer.
- 2) Start temperature entry:
Softkey **Temp**
- 3) Set temperature value:
Softkey **↵**, softkey **↶**
- 3) Save temperature value:
Softkey **OK**

Lock Function


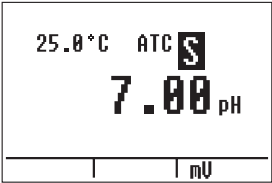

- The lock function freezes the value in the display. Once the stability conditions have been met, the value is displayed statically (Symbol: ““)
Deactivate lock function:
Press Softkey **Unlock**

Activate function: see chapter entitled “Default Settings.”

Fast Mode (Shorter Measurement Time)


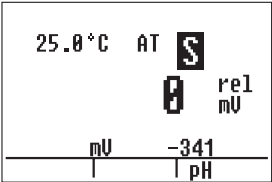

- The fast mode reduces the measuring time by using a lower stability criterion. Activate function: see chapter entitled “Default Settings.”

Measuring the pH

Step	Press key	Display
1. If required, turn on meter. > First the Sartorius logo appears, then the meter information.		
2. Immerse the electrode in the medium to be measured. Stir gently. The pH appears on the LCD.		

Measuring Redox Potential


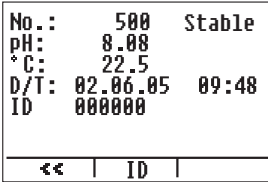

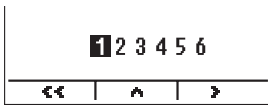

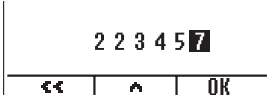
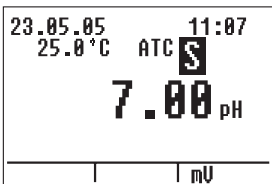
Millivolt measurement is used in electrode diagnostics, titration, and in measuring oxidation/reduction (redox) potential (ORP). ORP measurements indicate the oxidizing or reducing capacity of a solution. You can use ORP potential values to monitor and control solutions that require a defined level of oxidants or reductants.





Step	Press key	Display
1. If required, turn on meter. > First, the Sartorius logo appears, then the meter information.		
2. Toggle to the millivolt measurement.	mV or rel mV softkey	
3. Immerse the electrode in the medium to be measured. Stir gently. Allow the electrode to reach a stable value.		

Docu-pH⁺_{Meter} Model: Saving Measured Data

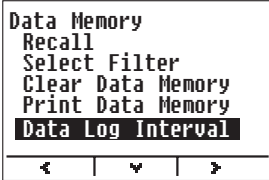
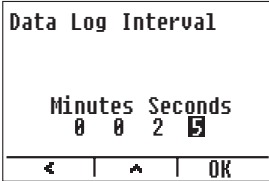
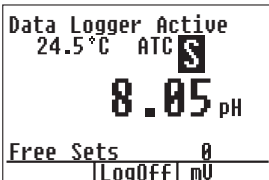
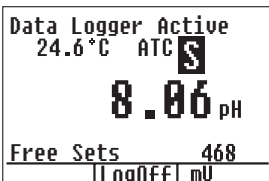
Features

- 500 data records can be stored in the nonvolatile memory.
- 21 CFR Part 11: Docu-pH_{Meter} and DocuClip® have been developed for use in quality management systems (for example, GLP, ISO 17025, 21 CFR Part 11).
- Sample ID: Input a six-digit number for each dataset.
- Set logging interval: allows you to enter the time interval for automatic data logging with a calibration reminder between 1 seconds and 99 minutes in the Setup Menu.
- Allows you to display and print out data records.
- Parallel to data logging, the data are always printed out on an interfaced printer.
- Data memory display and settings: see chapter "Default Settings"

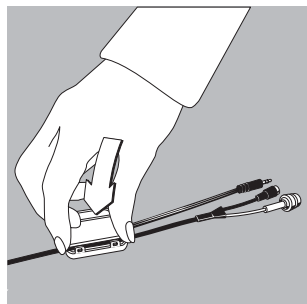
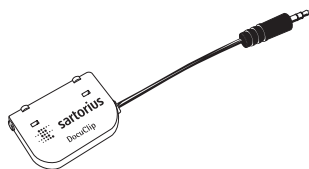
Step	Press key	Display
1. If required, turn on meter > First, the Sartorius logo appears, then the meter information		
2. If required, delete old data: Menu: data memory: delete memory	 , > softkey, repeatedly press v softkey	
3. Start saving to data memory		
4. If required, change sample ID	I D softkey	
5. Change 6-digit number	Repeatedly press ^ softkey, > softkey	
6. Save changed sample ID	OK softkey	

Step	Press key	Display /Printout
7. Log measurement to data memory and printout		<pre> No: 4 Stable pH: 6.65 'C: 21.5 ATC D/T: 20.05.05 08:53 ID: 135933 CAL: 19.05.05 11:52 </pre>
8. If required, store further measurements		
9. View various measurements in memory: Menu: data memory: Display stored data	 , press ➤ softkey twice	
10. If required, sort and filter data: Menu: data memory: Order data by ...	 , ➤ softkey, ↵, ➤ softkey	
11. If the memory is full: Confirm "Overwrite data"	OK softkey	<div data-bbox="711 898 982 1082"> <p>Confirm Overwrite</p> <hr/> <p>Cancel OK</p> </div>

Saving Measured Data with Calibration Reminder

Step	Press key	Display
1. If required, delete old data: Menu: data memory: memory delete	Menu , ➤ softkey, ▼ softkey	
2. Change default setting: Menu: Data memory: Time interval for data logging	Menu , ➤ softkey, repeatedly press ▼, ➤ softkeys	 <p>Data Memory Recall Select Filter Clear Data Memory Print Data Memory Data Log Interval</p> <p>◀ ▼ ▶</p>
3. Set time interval for data logging	▼, ➤ softkeys	 <p>Data Log Interval</p> <p>Minutes Seconds 0 0 2 5</p> <p>◀ ▲ OK</p>
4. Confirm time interval for data logging	OK softkey	
5. Exit Menu	<, << softkeys	
6. Start data logging	LogOn softkey	 <p>Data Logger Active 24.5°C ATC S</p> <p>8.05 pH</p> <p>Free Sets 0 LogOff mV</p>
> Data is logged according to the preset calibration reminder.		
7. End data logging	LogOff softkey	 <p>Data Logger Active 24.6°C ATC S</p> <p>8.06 pH</p> <p>Free Sets 468 LogOff mV</p>
8. View various measurements in memory	Menu , 2× softkey ➤	
9. If required, sort and filter data: Menu: data memory: Order data by...	Menu , ➤ softkey, ▼, ➤ softkey	

Electrode with DocuClip®



Intended Use

DocuClip® performs the following functions:

- The Sartorius “Docu-pH_{Meter}” automatically recognizes any connected electrode and stores the current calibration value from the DocuClip®.
- Permanently stores the serial number and initial calibration data of an electrode.
- Displays 4 calibration data records via Docu-pH_{Meter}
- Sartorius PY-P...DOC electrode models:
Autom. stores the serial number of the connected electrode
- Product name
- Type of electrode
- Calibration data logging

Usage

- DocuClip® communicates with the Sartorius Docu-pH_{Meter}
- DocuClip® can be used with just about all electrochemical sensors, such as all pH electrodes that can be connected to the Docu-pH_{Meter}
- DocuClip® is irreversibly fastened to the cable of the sensor.
- DocuClip® is preformatted; easy-to-understand user guidance prompts in the Docu-pH+ enable the user to intuitively perform initialization and initial calibration.

Using Sartorius electrodes with DocuClip® (PY-P...DOC):

- The factory-set initial calibration is displayed as the last of the calibration values and cannot be overwritten.

Using DocuClip® with any type of electrode:

- Installing DocuClip®: If no calibration data are available, Docu-pH+ prompts the user to manually enter an electrode number and the initial calibration data. The initial calibration value will be displayed as the last of the calibration values and cannot be overwritten.

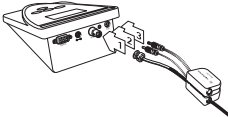
The following data are stored permanently in DocuClip®:

- Initial calibration including date and time
- pH and voltage in mV
- Nominal values of the buffers used
- Serial number of Docu-pH_{Meter}
- Serial number of the electrode
- Temperature

● **View data of installed electrode/DocuClip®:**

See Setup-Menu: Calibration functions: pH/mV: Data DocuClip®

Enter serial number of the Electrode on Docu-pH⁺:

Step	Press key	Display
1. Connect DocuClip®		
2. Start "Serial number input"	Start softkey	<div>Initial Calibration</div> <div>Input Serial No.</div> <div>Cancel Start</div>
3. Set "Electrode number" (S/N)	Repeatedly press ^ softkey, > softkey	<div>Initial Calibration</div> <div>Input Electrode No.</div> <div>1 2 3 4 5 6</div> <div>← ^ OK</div>
4. Confirm "Electrode number"	OK softkey	<div>Calibration</div> <div>Buffer 1</div> <div>Bufferset:</div> <div>1.68 4.01 6.86</div> <div>9.18 12.46</div> <div>Cancel Start</div>
△ Initial calibration: Please work with particular care. The initial calibration documents the degree of effectiveness of the new electrode. This calibration is the reference point for the later analysis whenever there is a change in performance.		

Interpreting Calibration Curves

This depends on the chemical composition and temperature of the samples that are measured regularly and can strongly affect how the efficacy of the electrode slope declines due to aging of the electrode's glass membrane. This information therefore provides clues that have to be interpreted taking into account the true situation.

Situation	Cause:	Measure
Virtually constant calibration results over all four logged calibrations.	The electrode has hardly been subjected to the effects of aging.	The calibration interval can be increased.
A constant reduction in slope or zero point drift.	Normal aging process of electrode.	Possibly shorten the calibration interval to always measure with current data.
A constant and strong reduction in slope and/or zero point drift in one direction.	Aging of the electrode can be accelerated by extremely acidic/basic samples and/or high temperatures.	Adhere to shorter calibration intervals to always measure with current data. If the lifetime of the electrode is too short: If appropriate, check whether the electrode is suited for the samples to be measured and the measuring conditions.
An abruptly sharp drop in slope compared to last calibration	Impure electrolyte, dirty membrane or defective electrode.	Replace electrolyte, clean membrane (see electrode operation manual), replace electrode
Strong fluctuations among calibration results without any identifiable trend.	Measuring conditions often vary greatly (e.g. very hot or very acidic/alkaline media to be measured.	If required, use special for electrodes different measuring conditions (see also electrode operation manual).
Strong fluctuations in the zero point without any identifiable trend	Fiber junction clogged	Clean the electrode (see electrode operation manual) If required, check whether the electrode type used is suitable for the sample.
After a constant reduction in slope, an increase occurs	Previous calibration was incorrect. Cleaning or regeneration improved the performance of the electrode.	Recalibrate because previous calibration was incorrect. Document cleaning/regeneration.

Temperature Compensation

△ Note: The temperature is compensated automatically only if an ATC probe is connected.

Temperature has two major effects on the results:

1. Temperature affects buffer pH values.
The values are usually given on the buffer label.
Most technical buffers correspond to the values listed in the table shown here on the left.

When you perform calibration in the pH mode, the pH value is adjusted to the current value for the current temperature.

For example, if the buffer has a pH of 7.00 at 25°C and the current buffer temperature is 20°C, the portable meter calibrates the buffer to pH 7.02.

Standard Buffers:

	pH 4.00	pH 7.00	pH 10.00
0°C	4.005	7.13	10.34
5°C	4.003	7.10	10.26
10°C	4.001	7.07	10.19
15°C	4.002	7.05	10.12
20°C	4.003	7.02	10.06
25°C	4.008	7.00	10.00
30°C	4.010	6.99	9.94
35°C	4.020	6.98	9.90
40°C	4.030	6.97	9.85
50°C	4.061	6.97	9.78

2. Temperature affects electrode efficiency.
The theoretical voltage change per pH unit – the so-called Nernst factor – is approximately 59.17 mV/ΔpH at 25°C. This value changes, however, as the temperature changes. The meter compensates for this effect by calculating the pH measurements based on the measured temperatures and the corresponding Nernst factors (for example, 58.16 mV/ΔpH at 20°C).

Docu-pH⁺_{Meter} Model: Data Output

Print Data Log

Intended use

For printing out measurements, calibration data and ID codes in accordance with the requirements of quality management systems.

Preparation:

△ Switch off numerator on the optional Sartorius printer.

The data log in the pH mode can include the following lines:

.	Dotted line
	Blank line
No: 4	Consecutive number and measurement status
pH: 6.63	pH
mV:	If required, mV in the mV mode
°C: 25.0	Temperature is set manually here
MTC	
D/T: 20.05.05	Date and time
11:53	
ID: 135933	Sample ID, entered by user
CAL: 19.05.05	Date and time of the calibration
08:52	(forms the basis for calculating the pH)

The data log for calibration results:

.	Dotted line
	Blank line
Cal. Record	
Sartorius Docu-pH+Meter	Instrument number
S/N: 1234567800	Docu-pH _{Meter} serial number
pH Electrode PY-P12D0C	Type of electrode
S/N: A044805002	Serial number of the electrode
20.05.05	Date and time of calibration end
11:56	
S1: 97.2 %	Slope 1 (between buffer 1 and buffer 2)
S2: 97.1 %	Slope 2 (between buffer 2 and buffer 3)
Offset : -9.1 mV	Zero point in mV (= deviation ... at pH = 7.00)
B1: 1.68	Nominal value of buffer 1 at 25°C
+310.8 mV	Voltage and temperature of buffer 1
+25.0 °C	
B2: 6.86	Nominal value of buffer 2 at 25°C
+0.1 mV	Voltage and temperature of buffer 2
+25.0 °C	
Calibration OK	Calibration status

Data log from memory identifiable in line:

ID: 135933	memory	Sample ID and memory printout
------------	--------	-------------------------------

Docu-pH⁺_{Meter} Model: Data Interface

Intended Use

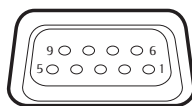
The Docu-pH⁺_{Meter} comes equipped with an interface port for connection to a computer or Sartorius printer.

Available Features

- Interface type: serial interface
- Operating mode: unidirectional
- RS232
- Transmission rate:
1200, 2400, 4800, 9600, 19200 baud
- Parity: odd, even, none, mark, space
- Character format: 7-/8-bit ASCII, parity,
1 or 2 stopbits
- Handshake:
2-wire interface: Software (XON/XOFF)
4-wire interface: Hardware (CTS/DTR-none)
- Data output format: 24 characters

Female Interface Connector:

- 9-pin D-subminiature DB9 connector with screw attachment for direct connection to a computer or an optional Sartorius data printer.



Pin Assignment:

Pin 1: Not connected
Pin 2: Serial data input (Rx/D)
Pin 3: Serial data output (Tx/D)
Pin 4: Data Terminal Ready (DTR)
Pin 5: Signal GND
Pin 6: Not connected
Pin 7: Not connected
Pin 8: CTS
Pin 9: Not connected

⚠ No other pins may be assigned in the Docu-pH⁺_{Meter}!

Cabling Diagram

Diagram for interfacing a computer to the Docu-pH⁺_{Meter} using the RS232C/V24 standard and cables up to 15 m (~50 ft.) long

pH meter, 9-pin	Computer, 9-pin
TxD 3	2
RxD 2	3
CTS 8	4
DTR 4	8
GND 5	5

Most Common Errors:

- The baud rates between the Docu-pH⁺_{Meter} and the computer/printer are different.
- The parity or stop bits are not set in the computer properly
- The pins in the cable are not properly configured.

Error Messages

Error

If the meter displays a calibration error:
this indicates an error in the electrode reaction.
If this is displayed during calibration, this means
the electrode shows under 90% or over 105% of the
correct slope according to the Nernst equation.

The "Error" message can mean one of the following:

- A bad electrode
- One or more contaminated or expired buffer(s)
- Wrong buffer selected
- mV offset greater than |30|mV

Testing a pH electrode:

- Immerse the electrode in a good neutral pH 7 buffer.
- Access mV mode: Press softkey **mV**
- > Record the measured value
- Make sure the portable meter is in the mV mode and not in the relative mV mode (rel. MV). Repeat these steps with basic or acidic buffers. At a temperature of approx. 25°C, the electrode signal should be within the limits shown here:

Zero point at pH = 7.00 ¹⁾	Slope	Cause	Solution
Between -30 mV and +30 mV	53...62 mV/ΔpH 90...105 % of the theoretical value	Electrode OK	
Between -55...-65 mV or +55...65 mV	< 10 mV/ΔpH < 17 % of the theoretical value	Glass membrane ruptured	Replace electrode
< -30 mV and > +30 mV	53...62 mV/ΔpH 90...105 % of the theoretical value	Wrong or contaminated electrolyte	Replace electrolyte. Not possible with gel- filled electrodes – here: replace electrode.
Between -30 mV and +30 mV	15...50 mV/ΔpH 25...85 % of the theoretical value	Membrane aged	Regenerate membrane (see manual of the electrode or replace electrode).
< -30 mV and > +30 mV	15...50 mV/ΔpH 25...85 % of the theoretical value	Membrane or junction dirty	Clean electrode carefully (see electrode manual).
	> 62 mV/ΔpH	Buffer error	Throw out buffer. Recalibrate with fresh buffer.

1) for pH = 6.86, added 8 mV to the values.

Care and Maintenance

Cleaning

- Unplug the AC adapter from the wall outlet.
 - Clean the pH meter using a piece of cloth which has been wet with a mild detergent
 - Wipe down the pH meter with a soft cloth.
 - Cleaning the electrode: refer to the Instructions for Use of the particular electrode.
- △ Make sure that no liquid enters the instrument.
- △ Do not use any aggressive cleaning agents (solvents or similar agents)

Safety Inspection

If there is any indication that safe operation of the equipment is no longer guaranteed:

- Disconnect the power cord from the outlet
- > Ensure that the equipment cannot be used during this time. Notify your nearest Sartorius Service Center.

Maintenance and repair work may only be performed by specialized service technicians.

Recycling Instructions

To ensure adequate protection for safe shipment, your instrument has been packaged to the extent necessary using environmentally friendly materials. After successful installation of the instrument, you should return this packaging for recycling because it is a valuable source of secondary raw material. For information on recycling options, including recycling of old weighing equipment, contact your municipal waste disposal center or local recycling depot.

Overview

Meter Specifications

	Docu-pH _{Meter}	Docu-pH ⁺ _{Meter}
pH measurement		
Measuring range	-2.000 ... 20.000	
Readability	0.001 0.01 0.1, adjustable	
Accuracy	± 0.005	
mV measurement		
Measuring range in mV	-2000.0 ... +2000.0	
Readability in mV	0.1 1 adjustable	
Accuracy in mV	± 0.2 < 1000	± 1 > 1000
Temperature measurement		
Measuring range in °C	-5 ... 105	
Readability in °C	0.1	
Accuracy in °C	± 0.2	
Temperature compensation	Automatic or manual from -5°C ... 105°C	
Buffer recognition	Automatic: technical buffers, DIN/NIST buffers	
Calibration points, max. number	3	
Date/Time battery-supplied	-	×
Sample IDs	-	×
Calibration reminder	-	×
Complete GLP-compliant record	-	×
Memory for measurement data	-	×
Communication with DocuClip®	×	×
Input for pH combination electrodes	BNC	BNC
Input for temperature probes		
NTC 10 kΩ, NTC 30 kΩ, Pt1000	2.5 mm phone plug	2.5 mm phone plug
Interface RS232C	-	×
Dimensions in mm	89 × 229 × 145	
Weight in kg	1	

Accessories

	Order No.
pH/ATC combination electrodes with DocuClip®; Clip ready installed and precalibrated:	
Gel electrolyte, fiber junction with integrated ATC probe	PY-P12doc
Gel electrolyte, fiber junction	PY-P20doc
KCl liquid-filled, fiber junction with integrated ATC probe	PY-P10doc
KCl liquid-filled, platinum junction with integrated ATC probe	PY-P11doc
KCl liquid-filled, platinum junction	PY-P21doc
KCl liquid-filled, platinum junction (microelectrode)	PY-P22doc
Gel electrolyte-filled, annular gap junction (surface electrode)	PY-P23doc
KCl liquid-filled, adjustable flow rate, sleeve junction	PY-P24doc
All Sartorius pH electrodes standard equipped without DocuClip®	PY-P...
DocuClip® for use with any electrode	DocuClip®
Redox/ORP combination electrode with DocuClip® , Clip ready installed:	
KCl liquid-filled, platinum disk	PY-R01doc
ATC probe:	
10 kΩ NTC	PY-T01
pH buffer solutions:	
Buffer pH = 4.00 (0.01 at 25°C), twin-neck bottle, 500 ml	PY-Y21
Buffer pH = 7.00 (0.01 at 25°C), twin-neck bottle, 500 ml	PY-Y22
Buffer pH = 10.00 (0.01 at 25°C), twin-neck bottle, 500 ml	PY-Y23
Cleaning solution , pepsin hydrochloric acid, 500 ml	PY-Y06
Electrolyte solution , KCl (3 mol/L), silver ion-free, 500 ml	PY-Y07
Sartorius lab printer	YDP05-pH
"IQ OQ" Qualification for pH meter	8407pH



**Declaration of Conformity
to Council Directives 89/336/EEC and 73/23/EEC
(amended by Directive 93/68/EEC)**

**The electronic pH meter of the series
Docu-pH & Docu-pH+**

meets the applicable requirements of the test standards listed below, in conjunction with the associated power supplies, auxiliary peripheral devices and installation equipment listed in Annex A2 (see Annex A1 for a technical description and a list of the individual versions).

1. Electromagnetic Compatibility

1.1 Source for 89/336/EEC: Official Journal of the European Communities, No. 2003/C271/04

EN 61326 Electrical equipment for measurement, control and laboratory use
EMC requirements

Limitation of emissions: Residential areas, Class B

Defined immunity to interference: Industrial areas, continuous unmonitored operation

2. Safety of Electrical Equipment

2.1 Source for 73/23/EEC: Official Journal of the European Communities, No. 2003/C60/01

EN 61010 Safety requirements for electrical equipment for
measurement, control and laboratory use
Part 1: General requirements

Sartorius AG
37070 Goettingen, Germany
2006

C. Oldendorf
Vice President, R&D
Technological Operations & Innovations
Mechatronics Division

Dr. D. Klausgrete
Head of
International Certification Management
Mechatronics Division

Sartorius AG
Weender Landstrasse 94–108
37075 Goettingen, Germany

Phone +49.551.308.0
Fax +49.551.308.32 89
www.sartorius.com

Copyright by Sartorius AG,
Goettingen, Germany.
All rights reserved. No part
of this publication may
be reprinted or translated in
any form or by any means
without the prior written
permission of Sartorius AG.
The status of the information,
specifications and illustrations
in this manual is indicated
by the date given below.
Sartorius AG reserves the
right to make changes to the
technology, features,
specifications and design of the
equipment without notice.

Status:
November 2006, Sartorius AG,
Goettingen, Germany

Printed in Germany on paper that has
been bleached without any use of chlorine
W1A000 · KT
Publication No.: WDO6003-e06112