MeterLab®

Reliable pH, Ion and Conductivity Measurements

Radiometer analytical

A Hach Company Brand

- when you need to be sure...

The MeterLab® Concept

Following Good Laboratory Practice is second nature with MeterLab

MeterLab from Radiometer Analytical incorporates all elements of the measuring chain - pH, ion and conductivity meters, electrodes and conductivity cells, solutions and sample handling - ensuring totally reliable measurements in the laboratory and in the field. All elements are designed to make operation simple and error-free.

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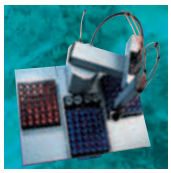

Automation page 6

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Whatever your measurement need, you are sure to find your ideal pH, ion or conductivity meter in this catalogue. If you are dealing with large batches, add a sample changer and dedicated software to make a flexible automated setup.

Radiometer Analytical has designed standard packages containing meters with appropriate electrodes or cells, solutions and accessories for all the instruments in the MeterLab family. And what's more, we are confident enough in the quality of our products that MeterLab laboratory meters now come with a free 5-year guarantee!

For complete information on our extensive range of electrodes and conductivity cells, certified pH and conductivity standards, buffer solutions and maintenance solutions for electrodes, please ask for our **Guide to Reliable pH, Ion and Conductivity Measurements** or visit us at www.radiometer-analytical.com.

Conductivity Measurements

Conductivity and resistivity made simple

To simplify routine measurements in all types of laboratories, the CDM210 Conductivity Meter offers **user-friendly** features such as AUTOREAD and automatic range switching. The CDM210 lets you choose the **2, 3 or 4-pole conductivity cell** most suited to your application.

The ultimate in conductivity measurements

For any sample from ultrapure water to concentrated sulphuric acid, the CDM230 Conductivity Meter offers you **high-precision** conductivity measurements over 7 decades. It is ideally suited for measurements according to United States Pharmacopoeia (**USP**) and the European Pharmacopoeia (**EP**).

Glossary

At intervals:
measurements are continuously monitored and results printed out at set intervals.

Automatic determination:
cell constant value is determined automatically using certified standards.

AUTORANGE:
optimum range is set automatically.

AUTOREAD:
result is locked on display as soon as stability criterion is reached.

Calibration reminder:
user is prompted to perform a new calibration when necessary.

GLP functions:
to help you keep track of your measurements in compliance with Good Laboratory Practice.

Manual measurement:
result is read directly from the display using a sliding stability indicator.

Natural water correction:
non-linear temperature correction according to ISO/DIS 7888.

Pure water correction:
automatic subtraction of the conductivity of pure water at the current temperature according to ASTM D1125-91.

Salinity:
sum of the concentration of salts in seawater based on oceanographic tables and standards endorsed by UNESCO.

TDS:
Total Dissolved Solids.

Specifications at a glance

	CDM210	CDM230		CDM210	CDM230
Methods			**Temperature correction**		
Conductivity	✓	✓	20, 25°C or none	✓	
Resistivity	✓	✓	User-defined or none		✓
Salinity on seawater		✓	Natural water correction		✓
TDS		✓	**GLP functions**		
Concentration		✓	Date and time		✓
Number of methods	1	3	Calibrations stored	1	5 per method
Conductance ranges			Calibration reminder		✓
Number of ranges	5	7	Results storage		50
Measuring dynamics			Sample ID number		✓
0.01 µS - 400.0 mS	✓		Instrument ID on printout		✓
0.001 µS - 2000 mS		✓	**Connections**		
AUTORANGE	✓	✓	Conductivity cell (2, 3 or 4-pole)	✓	✓
Manual range selection	✓	✓	Temperature sensor	✓	✓
Measurement procedures			Printer/PC	✓	✓
Manual (stability indicator)	✓	✓	Recorder*	✓	✓
AUTOREAD	✓	✓	**Other features**		
User-defined criterion		✓	Pure water correction		✓
At intervals		✓	Date format on printout	N.A.	DD-MMM-YY
Cell calibration			Error messages	✓	✓
Entered	✓	✓	Audible prompts		✓
Adjusted	✓	✓	Autotest	✓	✓
Automatic determination		✓			

* Direct and calibrated signal.

For full specifications, please ask for a technical data sheet.

pH and Ion Measurements

Pocket-size performance

If you are looking for the features of a benchtop meter in a **lightweight** hand-held model, the PHM201 Portable pH Meter is the instrument for you. **User-friendly** features include automatic buffer recognition and AUTOREAD. To suit the way you work, the PHM201 can be run by mains or battery power.

Unbeatable convenience for everyday applications

For **routine** measurements of pH and mV in the classroom and in the lab, the PHM210 Standard pH Meter is ideal. Features such as automatic buffer recognition and temperature compensation ensure optimum measuring performance while **simplifying** the operator's task.

Universal lab pH meter to meet your GLP requirements

For reliable pH, mV and temperature measurements in all types of analytical laboratories, the PHM220 Lab pH Meter is a versatile solution. With its unique storage and **documentation** facilities, it helps fulfil the stringent demands of **Good Laboratory Practice**.

The obvious choice for advanced pH and simple ion measurements

To satisfy more exacting requirements, the PHM240 pH/Ion Meter performs pH measurements using **multi-point** calibrations on up to nine buffer solutions and direct ion measurements using a two-point calibration curve. Connection of a **sample changer** lets you perform unattended analyses.

High-specification ion meter

For **advanced** pH, mV and ion concentration measurements, the PHM250 Ion Analyzer performs multi-point calibrations and offers 16 easy-to-edit methods. The **method link** facility and dual electrode inputs enable you to perform two different measurements in the same sample at the press of a button.

Glossary

At intervals:
measurements are continuously monitored and results printed out at set intervals.

AUTO buffer recognition:
Certain values are automatically recognised from 3 ranges: IUPAC standards, Technical buffers according to DIN 19267 and 4-7-10 Series buffers.

AUTOREAD:
result is locked on display as soon as stability criterion is reached.

Calibration reminder:
user is prompted to perform a new calibration when necessary.

FIXED buffer selection:
buffers chosen from 15 pre-programmed values are automatically recognised.

FREE buffer entry:
the value of the buffer at the calibration temperature is entered during calibration.

GLP functions:
to help you keep track of your measurements in compliance with Good Laboratory Practice.

Ion direct/addition:
ion concentration measurements can be performed directly based on a calibration curve or using 1 of 4 addition/subtraction techniques.

Manual measurement:
result is read directly from the display using a sliding stability indicator.

Specifications at a glance





	PHM201 Portable pH Meter	PHM210 Standard pH Meter	PHM220 Lab pH Meter	PHM240 pH / Ion Meter	PHM250 Ion Analyzer
Measurements performed					
pH/mV	✓	✓	✓	✓	✓
Ion (direct)				✓	
Ion (direct/addition)					✓
Number of methods			1	6	16
Measuring ranges					
pH	-9.00 to +23.00	-9.00 to +23.00	-9.00 to +23.00	-9.000 to +23.000	-9.000 to +23.000
mV	-1999 to +1999	-1999 to +1999	-1999.9 to +1999.9	-1999.9 to +1999.9	-1999.9 to +1999.9
Temperature (°C)	0.0 to +99.9	0.0 to +99.9	-9.9 to +99.9	-9.9 to +99.9	-9.9 to +99.9
Concentration				0.001×10^{-9} to 999.9×10^{9}	0.001×10^{-9} to 999.9×10^{9}
Measurement procedures					
Manual (stability indicator)	✓	✓	✓	✓	✓
AUTOREAD	✓	✓	✓	✓	✓
User-defined criterion			✓	✓	✓
At intervals			✓	✓	✓
High/low alarms			✓	✓	✓
Method linking					✓
Calibration procedures					
pH calibration	1 or 2 points	1 or 2 points	1 or 2 points	1 to 9 points	1 to 9 points
Ion calibration				1 or 2 points	1 to 9 points
AUTO buffer recognition	✓	✓	✓	✓	✓
FIXED buffer selection			✓	✓	✓
FREE buffer entry				✓	✓
Temperature compensation					
Without temperature sensor	✓	✓	✓	✓	✓
With temperature sensor	✓	✓	✓	✓	✓
GLP functions					
Date and time			✓	✓	✓
Calibrations stored	last 1	last 1	last 9	last 9 per method	last 9 per method
Calibration reminder			✓	✓	✓
Results storage			last 25 pH and mV	last 9 per method	last 9 per method
Sample ID number				✓	✓
Instrument ID on printout			✓	✓	✓
Connections					
Indicator electrode	1	1	1	1	2
Reference electrode		1	1	1	2
Temperature sensor	✓	✓	✓	✓	✓
Printer/PC		✓	✓	✓	✓
Recorder		✓*	✓	✓	✓
Sample changer				✓	✓
Other features					
Date format on printout	N.A.	N.A.	DD-MMM-YY	DD-MMM-YY	DD-MMM-YY
Error messages	✓	✓	✓	✓	✓
Audible prompts			✓	✓	✓
Autotest	✓	✓	✓	✓	✓

* Direct and calibrated signal.

For full specifications, please ask for a technical data sheet.

Automation

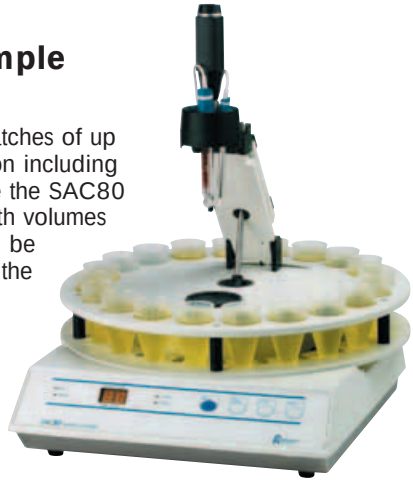
The SAC80 and SAC90 Sample Changers can be controlled directly by the PHM240 pH/Ion Meter and the PHM250 Ion Analyzer and used in PC-controlled setups with MeterMaster software.
They are also designed for use with titration systems.

Automation of impressive numbers of samples

For unattended pH, ion and conductivity measurements on **large sample batches**, the SAC90 Sample Changer is the perfect choice. Depending on the sample volume used, as many as 297 samples can be analysed in one cycle.
Contamination of samples is prevented by optimised electrode head movement as well as a reliable and effective rinse programme.

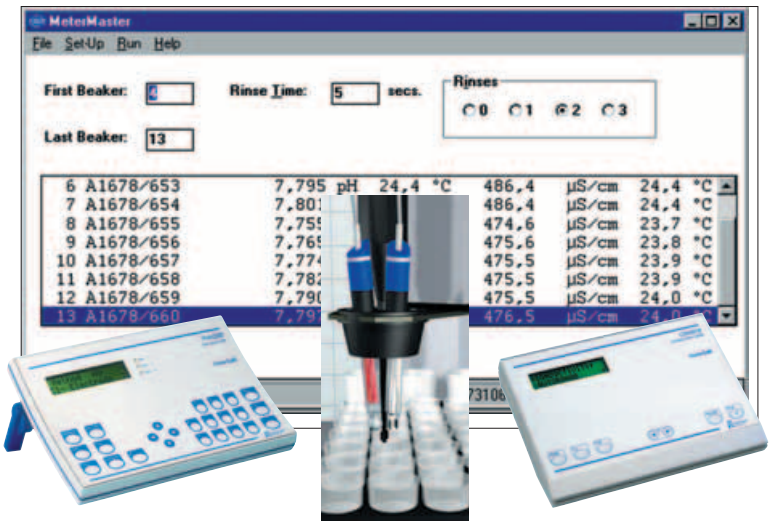
Highly flexible sample handling

For **automated handling** of batches of up to 20 beakers in one operation including calibration and rinses, choose the SAC80 Sample Changer. Samples with volumes varying from 8 to 300 ml can be analysed by simply changing the turntable and electrode head.



Automated pH and conductivity measurements

Where sample numbers are high, Radiometer Analytical meters can be integrated into reliable automated measuring setups combining sample changers and software, freeing operators for other tasks. MeterMaster, the **MeterLab Automation Program**, is designed to automate conductivity and/or pH measurements with temperature in conjunction with the SAC80 or SAC90 Sample Changers.
Easy to operate through a **user-friendly Windows® interface**, MeterMaster includes selectable Quality Control options to validate your results. Results can be printed and stored in data files and are easy to import into most spreadsheets, databases, wordprocessing programs or LIMS. If required, separate pH or conductivity measurements can be performed.



Schematic of MeterMaster setup

Sample Handling

Combined Electrode holder and magnetic stirrer

For totally reproducible stirring conditions, the SAM7 Sample Stand offers an innovative mechanism for keeping electrodes in a firm grip: the **Bayonet concept**. Special heads and accessories ensure the electrodes fit into place in one easy movement helping achieve identical positioning, reproducible results and safe handling.

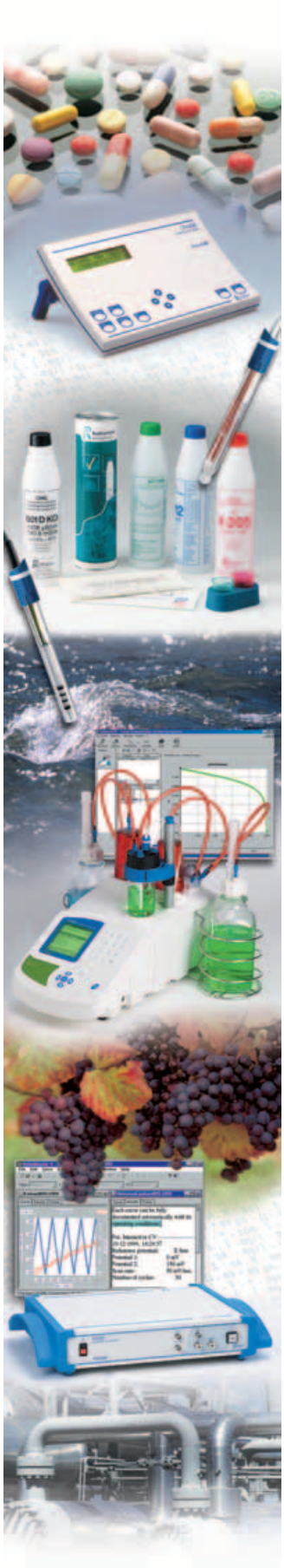
Simple electrode holder

The E190 Electrode Stand is a sturdy and flexible support which holds four electrodes and a delivery tip. The arm can move freely in all directions, making it easy to pass from one sample to another.

Sensors and Standards

The Radiometer Analytical electrode programme features over 100 combined, reference or glass pH electrodes, ion-selective electrodes, metal electrodes, conductivity cells or temperature sensors for **every laboratory application.**
For accurate pH and conductivity measurements, we offer certified standards traceable to the standard hydrogen electrode and NIST reference materials. To give you complete confidence in your solutions, our Reference Materials Laboratory is **accredited** for the calibration of reference materials in pH and conductivity by Cofrac*, the French national accreditation body recognised in more than 35 countries.
For full details of our standards and sensors and **advice** on how to get the best possible results, please ask for our **Guide to Reliable pH, Ion and Conductivity Measurements.**

* Comité Français d'Accréditation, Accreditation No. 2.1418



Leading the field in electrochemistry

Radiometer Analytical SAS develops, manufactures and distributes an extensive range of electrochemical systems dedicated for routine testing, research and teaching in the laboratory and on the plant.

By supplying instruments, software, sensors and calibration standards, Radiometer Analytical SAS masters the complete measuring chain. Our customers obtain a reliable result at reasonable cost thanks to all-in-one systems that are easy to use and maintain.

The company enjoys a reputation for excellence in the following fields:

pH, ion and conductivity measurements: complete systems for reliable measurements in the field and in the lab including a wide choice of instruments, sensors and standards.

Titration: workstations customised to individual applications including titrators, sample changers and dedicated software.

Voltammetry: all-in-one systems for electrochemical measurements including potentiostats, impedance meters and powerful software making use of techniques such as voltammetry, amperometry, coulometry, polarography and EIS.

Radiometer Analytical SAS has been building its expertise for more than sixty years since the company pioneered its very first pH meter in Copenhagen, Denmark. It was strengthened by the acquisition of Tacussel, another leading name in electrochemical instrumentation. More recently Radiometer Analytical SAS joined the Danaher Corporation.

Based in Lyon, France, Radiometer Analytical SAS is represented throughout the world by a network of experienced, factory-trained distributors, who can offer comprehensive applications and after-sales service.

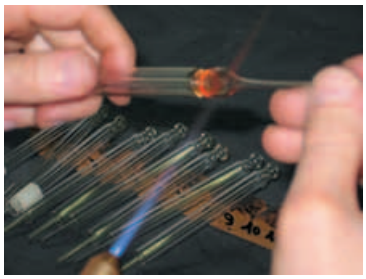
Radiometer Analytical SAS is ISO 9001 certified. In addition, our Reference Materials Laboratory is accredited by COFRAC (Comité Français d'Accréditation) for the calibration of reference materials in pH and conductivity (Accreditation No. 2.1418).

Reliable and longlasting electrodes – the Radiometer Analytical secret

Radiometer Analytical offers a range of more than 300 electrodes - combined pH, glass or reference electrodes, metal electrodes, ion-selective electrodes and conductivity cells - for every application and budget. Electrodes are manufactured on our premises in Villeurbanne, France using a combination of traditional know-how and state-of-the-art technology.

It takes between 2 and 11 days to manufacture a combined pH electrode, depending on the type. The most spectacular stage of the process is the blowing of the glass bulb from a blob of molten glass heated to 1200°C.

To explain just what goes on behind the scenes when a combined pH electrode is manufactured, Radiometer Analytical has produced an informative illustrated article. Ask for a free copy or download it from our web site: **www.radiometer-analytical.com / MTL4**.



Preparing the stem for dipping

Dipping in molten glass

Blowing the glass bulb

Approved Quality System

RADIOMETER ANALYTICAL SAS
72 rue d'Alsace, 69627 Villeurbanne Cedex, France
E-mail: radiometer@nalytical.com Web: www.radiometer-analytical.com
Tel. : +33 (0)4 78 03 38 38 - Fax : +33 (0)4 78 68 88 12