pH Meters

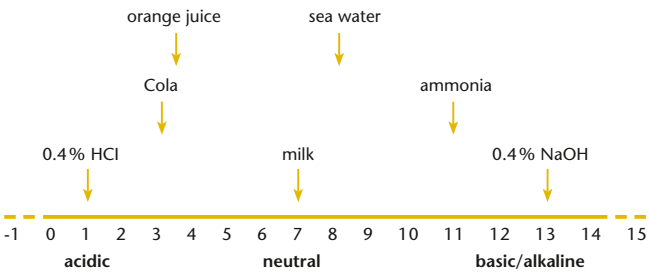
pH Value

The water molecule has the property of dissociating into two ionic components in aqueous solutions.

$H_2O \leftrightharpoons H^+ + OH^-$

The H^+ ion is termed hydrogen ion or proton, the OH^- ion hydroxide ion.

The pH value describes the activity of hydrogen ions in aqueous solutions on a scale of -1 to 15. Based on this scale, liquids are characterized as being acidic, alkaline or neutral: a solution which is neither acidic or alkaline is neutral. This corresponds to a value of 7 on the scale. Acidity indicates a higher activity of hydrogen ions and a pH value lower than 7. Alkaline solutions are characterized by a lower hydrogen ion activity or higher hydroxide ion activity, respectively, and a pH value above 7. The graph below uses examples to illustrate the pH scale.



The pH scale is logarithmic. A difference of one pH unit represents a tenfold, or ten times increase or reduction of hydrogen ion activity in the solution. This explains how a solution's aggressiveness increases with the distance from the neutral point.

The pH value can be measured using electrochemical measuring systems, litmus paper, indicators and colorimeters. Of these methods, electrochemical sensors provide the most accurate results.

The pH electrode is an electrochemical sensor that consists of a measuring electrode and a reference electrode. The measuring electrode is made of special glass which, due to its surface properties, is particularly sensitive to hydrogen ions. It is filled with a buffer solution which has a pH value of 7. When placing the pH electrode into a test solution, the change in voltage is measured by the electrode by comparing the measured voltage to the stable reference electrode. This change is recorded by the meter and converted into the pH value displayed. With modern IDS sensors the signal processing is performed inside the sensors providing better signal quality and additional documentation features.

HUBERLAB. AG
Industriestrasse 123
4147 Aesch

T 061 717 99 77
F 061 711 93 42

www.huberlab.ch
info@huberlab.ch

HUBERLAB.
committed to science

Application Range pH Measurement

● Recommended by WTW ❍ Conditionally applicable – Not recommended

Application range	inoLab®						Portable meters				
								ProfiLine			
	Multi IDS	pH 7110	pH 7310	pH/ION 7320	ProfiLine pH 1970i	VARIO® pH	MultiLine® IDS	pH 3110	pH 3210	pH 3310	pH/ION 340i
Routine measurement	❍	●	❍	❍	❍	●	❍	●	●	❍	❍
Routine measurement with documentation	●	–	●	●	●	–	●	–	–	●	●
AQA with documentation	●	–	●	●	●	–	●	–	–	●	●
R&D high resolution and precision	●	–	●	●	●	–	●	–	●	●	●
Control measurements	●	–	●	●	●	●	●	–	●	●	●
LIMS connection	●	–	●	●	❍	–	●	–	–	❍	❍
Quality assurance	●	–	●	●	●	–	●	–	❍	●	●
Training	❍	●	❍	●	❍	●	❍	●	●	❍	❍
Service	–	–	–	–	●	●	●	●	●	●	●
Laboratory measurements	●	●	●	●	●	●	❍	–	–	❍	❍
Field measurements	–	–	–	–	●	–	●	●	●	●	●
Depth measurements	–	–	–	–	●	–	●	–	–	–	–
External control/	–	–	–	–	●	–	–	–	–	–	●
PC connection/	●	–	●	●	●	–	●	–	–	●	●
PC control	–	–	–	–	–	–	–	–	–	–	–
pH/ISE function	–	–	–	●	–	–	–	–	–	–	●
Ion-specific measurement programs	–	–	–	●	–	–	–	–	–	–	–
see page	*30*	*33*	*32*	*49*	*38*	*39*	*34*	*37*	*36*	*35*	*51*

** North American version*

For pH measurement with multi-parameter instruments, see pages 14 and 18

Application range electrodes	Conventional			Digital		
	Gel electrode	Liquid electrolyte	Special electrode	Gel electrode	Liquid electrolyte	Special electrode with adapter
Chemical solutions	❍	●	●	❍	●	●
Ultrapure water (Pharmacopeia)	–	❍	●	–	❍	●
Ground water	●	❍	–	●	❍	–
Surface water	●	❍	–	●	❍	–
Depth measurements (barrages)	–	–	●	–	–	–
Laboratory measurements	❍	●	●	❍	●	●
Food industry	❍	●	●	❍	●	●
Swimming pools	●	–	–	●	–	–
Cosmetics/detergents	–	●	●	–	●	●
Semi-conductor industry	–	❍	●	–	❍	●
Paint/varnish (water-soluble)	❍	●	●	❍	●	●
Galvanic	●	❍	–	●	❍	–
applicable instruments	*all conventional instruments*			*all MultiLine® IDS and inoLab® IDS*		

NEW

Laboratory pH Meters

Along with weight and temperature measurements, pH is the most commonly measured parameter in the laboratory. With inoLab®, WTW offers a family of laboratory instruments that meet all application requirements from routine measurements to research applications.

inoLab®

pH measurements with the new digital multi-parameter benchtop meters inoLab® IDS
see page 14

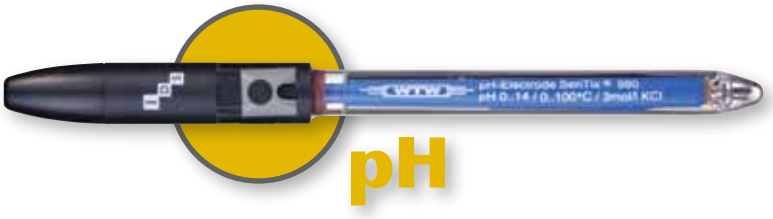
Measuring pH securely...

... with the innovative inoLab® Multi 9310 IDS

The new inoLab® Multi 9310 IDS is ideal for pH measurements in the laboratory. The IDS technology enables exceptional measuring quality and efficient documentation in the easiest way.

inoLab® Multi 9310 IDS

- Optimum measuring quality
- Digital sensor recognition
- Intelligent sensor rating



Measuring safety

- The digital signal transmission eliminates interferences, calibration data is allocated correctly, sensor data is easily transmitted.
- The intelligent sensor evaluation (QSC) gives information about the current condition of the electrode and therefore improves the operational reliability.
- The CMC function visualizes the optimal measuring range and supports a correct measuring.

GLP/AQA documentation

- Automatic, digital recording of all sensor data for traceability of measuring values
- User administration can be activated for allocation of user and measuring results
- Transfer of all data in .csv format via USB interface to PC, on demand formatted transfer into Excel (MultiLab® Importer, included in the delivery scope or as download).
- Data output via optional built-in printer possible.

Compatible for conventional pH measurements

- With the adapter ADA S7/IDS special pH electrodes with S7 plug head can be connected easily to the inoLab® Multi 9310 IDS.

Flexible and powerful

- 1- to 5-point calibration with calibration timer for all measuring tasks
- 22 stored buffer sets for easy calibration
- 1- to 5-point calibration with customized buffers
- Backlit graphic display with CMC and QSC display

Technical Data

Model	**inoLab® Multi 9310 IDS**
Measuring channel	1 (universal)
Display	LCD graphic, backlit
CMC/QSC	Yes/Yes
Data storage	Manual: 500 data sets/ Automatic: 5000 data sets
Logger	Manual/time-controlled
Interface	Mini USB
Printer (optional)	Thermo printer, width 58 mm
Power supply	**Universal power supply** 100 to 240 V, 50/60 Hz, 4 x 1,5 V AA or 4 x 1.2 V NiMH akku

Ordering Information

Digital inoLab® multi-parameter SETs		**Order No.**
inoLab® Multi 9310 IDS SET 1	Digital multi-parameter benchtop meter, set including IDS sensor, for measurements/documentation according GLP/AQA. With single channel input for pH/mV, dissolved oxygen and conductivity. Meter with universal power supply, stand and operation manual, digital IDS pH electrode SenTix® 940, buffer 4, 7 and 10.01, 3 mol/l KCl, software and USB cable.	1FD351
inoLab® Multi 9310 IDS SET 2	Meter see above, set with digital IDS pH electrode SenTix® 980.	1FD352

IP 43 CE cETLus 3 Year Warranty

For other SETs or electrodes in SET, see WTW Product Details

Reliable pH documentation...

... with the inoLab® pH 7310

The new inoLab® pH 7310 is the ideal instrument for precision measurements and automatic documentation complying with GLP/AQS in quality laboratories throughout all industries. Optional built-in printer available on demand.

inoLab® pH 7310

- USB interface for fast data transfer
- Data output in .csv format or via optional built-in printer
- CMC-function for monitoring the measuring range

Measuring reliability

- Repeatable measuring results provided by the active, automatic AutoRead function with recognition of stable end values
- The CMC function visualizes the optimal measuring range and supports correct measuring
- Graphic display with plain text menu for convenient and secure operation

GLP/AQA documentation

- Alphanumeric entry of electrode serial number
- Transfer of all data in .csv format via USB interface to PC, on demand formatted transfer into Excel (MultiLab® Importer, included in the delivery scope or as download).
- Data output via optional built-in printer possible

Flexible and powerful:

- 1- to 5-point calibration with calibration timer for all measuring duties
- 22 stored buffer sets for easy calibration
- 1- to 5-point calibration with customized buffers
- Backlit graphic display with CMC

Measuring pH precisely...

... with the inoLab® pH 7110

The new inoLab® pH 7110 is ideal for routine measurements in the laboratory where automatic documentation is not the priority.
With a smooth and easily cleaned surface.

inoLab® pH 7110

- Active AutoRead function
- Easy calibration with adjustable calibration timer
- Intuitive operation with clearly arranged keypad

Measuring reliability

- Repeatable measuring results provided by the active, automatic AutoRead function with recognition of stable end values
- Safe operation: Automized functions reduce the number of keys
- An adjustable timer recalls the next calibration and so with improves the measuring accuracy

Easy and reliable:

- 1- to 3-point calibration with calibration timer
- MultiCal® calibration system
- Automatic temperature compensation
- Large multi-functional display for pH value and temperature

Technical Data

Model		inoLab® pH 7110	inoLab® pH 7310
Range/ Resolution	pH	-2.0 ... 20.0 ±0.1 pH -2.00 ... 20.00 ±0.01 pH -2.000 ... 19.999 ±0.005 pH	-2.0 ... 20.0 ±0.1 pH -2.00 ... 20.00 ±0.01 pH -2.000 ... 19.999 ±0.005 pH
	mV	±(1200.0 ±0.3) mV	±(1200.0 ±0.3) mV
	Temperature	±(2000 ±1) mV	±(2500 ±1) mV
Accuracy (±1 digit)	pH	±0.005 pH ±0.01 pH	±0.005 pH ±0.01 pH
	mV	±0.3 mV, ±1 mV	±0.3 mV, ±1 mV
	Temperature	±0.1 K	±0.1 K
Calibration		1, 2 or 3-point calibration WTW technical buffers, DIN/NIST buffers	1, 2, 3, 4, 5-point calibration WTW technical buffers, DIN/NIST buffers plus 20 additional buffer sets

Ordering Information

inoLab® Labor-pH-Meter SETs		❑ Order No.	▲ Order No.
inoLab® pH 7110 SET 7/SET 2	Easy-to-operate basic pH/mV benchtop meter for routine measurement. Meter with universal power supply, stand and operation manual. Combined pH electrode SenTix® 42/41, buffer 4, 7 and 10.01, 3 mol/l KCl	1AA127	1AA112
inoLab® pH 7310 SET 4	Convenient, menu controlled pH/mV benchtop meter for measurements/documentation according GLP/AQA. Set including combined pH electrode. Meter with universal power supply, stand and operation manual. Combined pH electrode SenTix® 81, buffer 4, 7 and 10.01, 3 mol/l KCl, software and USB cable.	na	1AA314
inoLab® pH 7310P	Convenient, menu controlled pH/mV benchtop meter for measurements/documentation according GLP/AQA, with integrated thermal printer. Single meter with universal power supply, stand and operation manual. CD-ROM including software and USB cable.	1AA320P	1AA310P

IP 43 CE cETLus 3 Year Warranty

❑ *with BNC plug* ▲ *with DIN plug*

For other SETs or electrodes in SET, see WTW Product Details

NEW

Portable pH Meters

pH is a parameter that is also very important for on-site measuring. The application range reaches from determination of pH value in surface waters to process measurements in chemical factories.

MultiLine®

Measuring pH with the new MultiLine® multi-parameter portable meter

see page 18

MultiLine®

Determining pH securely...

... with the versatile Multi 3410

The single channel multi-parameter measuring instrument Multi 3410 is perfectly suited for portable pH measurements under all conditions in the field and during operation process. The IDS technology enables optimal measurements and efficient documentation in the easiest way. The Multi 3410 also allows measurements using additional sensors and parameters.

Multi 3410 IDS

- Measuring safety without compromises
- Digital sensor recognition
- Trouble-free pH measurements

Measuring safety

- The digital signal transmission eliminates interferences, calibration data is allocated correctly. Measurements with long cables for inaccessible locations are no problem.
- The intelligent sensor evaluation (QSC) gives information on the current condition of the electrode and improves the operational reliability.
- The CMC function visualizes the optimal measuring range and supports a correct measuring.

GLP/AQA documentation

- Automatic, digital recording of all sensor data for traceability of measuring values.
- User administration can be activated for correct allocation of user, measuring location and measuring results.
- Transfer of all data in .csv format via USB interface to PC or USB memory stick, on demand formatted transfer into Excel (MultiLab® Importer, included in the delivery scope or as download).

General Features

Model	**Multi 3410 IDS**
Data storage	Manual: 500 data sets/ Automatic: 10.000 data sets
Data logger	Manual/time-controlled
Interface	USB-A and Mini-USB
Power supply	Universal power supply with charging function or 4 x 1.2 V NiMH rechargeable batteries

Ordering Information

MultiLine® IDS		**Order No.**
Multi 3410 Set 1	Professional digital multi meter for portable field measurement. Case set with digital IDS pH electrode SenTix® 940, QSC Kit, short instruction manual, stand, beaker, CD-ROM, driver software for USB, rechargeable batteries, cable, universal power supply and accessories.	2FD 451

IP 67 CE cETLus **3 Year Warranty**

For other electrodes in Set see WTW Product Details

ProfiLine pH portable meters

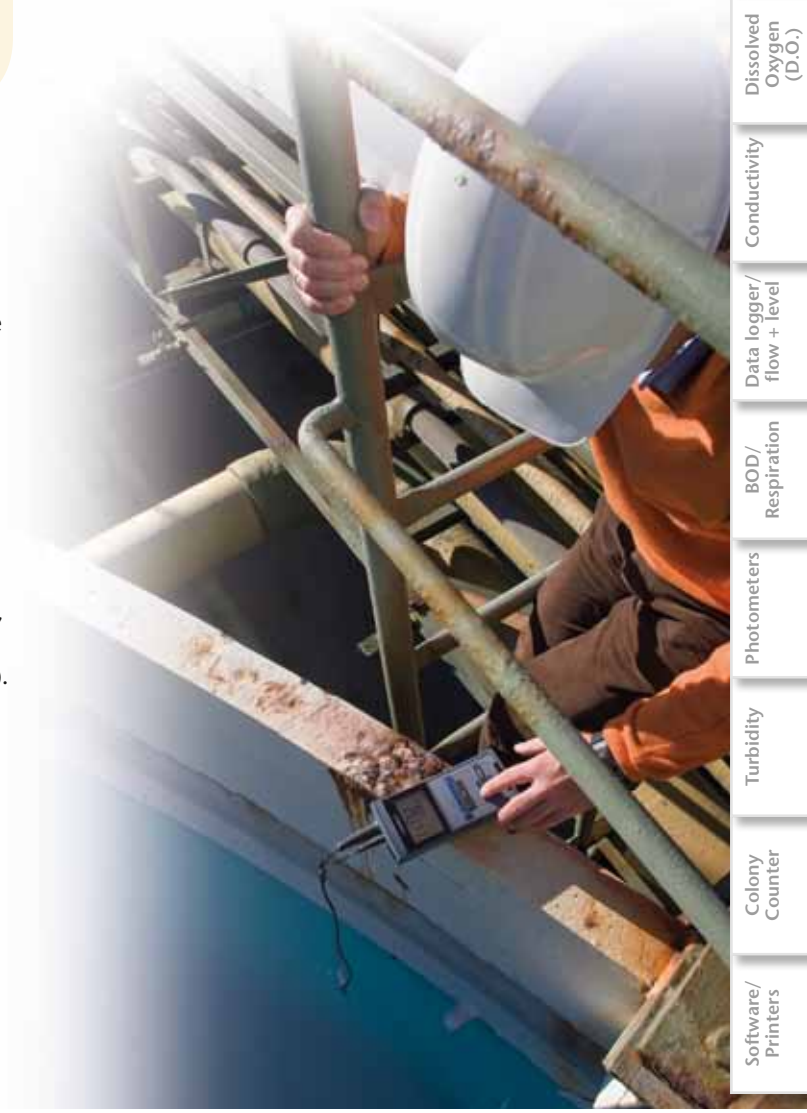
Reliable pH documentation...

... with the ProfiLine pH 3310

The pH 3310 is an elegant combination of a robust portable meter and a data logger for storing measuring batches and processing those in the following via PC.

ProfiLine pH 3310

- Waterproof USB interface for fast data transfer
- Data output in .csv format
- Data logger for up to 5000 recordings



Measuring safety

- Repeatable measuring results provided by the active, automatic AutoRead function with recognition of stable end values
- The CMC function visualizes the optimal measuring range and supports correct measuring.
- Graphic display with plain text menu for convenient and secure operation

GLP/AQA documentation

- Transfer of all data in .csv format via USB interface to PC, on demand formatted transfer into Excel (MultiLab® Importer, included in the delivery scope or as download).

Flexible and powerful

- 1- to 5-point calibration with calibration timer for all measuring duties
- 22 stored buffer sets for easy calibration
- Backlit graphic display with CMC

Measuring pH precisely...

... with the ProfiLine pH 3210

The ProfiLine pH 3210 is a convenient pH/mV all-rounder for many applications.

ProfiLine pH 3210

- Graphic display with plain text menu
- 1- to 5-point calibration
- CMC function for monitoring the measuring range

Measuring reliability

- Repeatable measuring results provided by the active, automatic AutoRead function with recognition of stable end values

Measuring values

- The CMC function visualizes the optimal measuring range and supports correct measuring.
- Silicone keypad with tangible key click, optional casing for field operation

Documentation

- Data output via display for occasional documentation

Flexible and powerful

- 1- to 5-point calibration with calibration timer for all measuring duties
- 22 stored buffer sets for easy calibration
- Backlit graphic display with CMC

pH measuring made easy...

... with the ProfiLine pH 3110

The pH 3110 is ideal for all seeking an easy, robust and waterproof instrument for portable pH measuring.

ProfiLine pH 3110

- pH or ORP measurements
- Easy 1- to 3-point calibration with adjustable calibration timer
- Robust and waterproof (IP 67)

Measuring safety

- Repeatable measuring results provided by the active, automatic AutoRead function with recognition of stable end values
- Safe operation: Automized functions reduce the number of keys (6)
- Waterproof DIN-socket enables measurements in humid environments

Easy and reliable:

- High-visibility display for measuring value and temperature
- Silicone key pad with tangible key click, can also be operated with gloves
- For field operation in a case set with proven electrodes

Technical Data

Model	ProfiLine pH 3110	ProfiLine pH 3210	ProfiLine pH 3310
Range/ pH	-2.000 ... +19.999 ±0.005 pH	-2.000 ... +19.999 ±0.005 pH	
Resolution mV	-1200.0 ... +1200.0 ±0.3 mV	-1200.0 ... +1200.0 ±0.3 mV	
Accuracy	-2000 ... +2000 ±1 mV	-2500 ... +2500 ±1 mV	
Temperature	-5.0 ... +105.0 ±0.1 °C (23 ... 221 °F)	-5.0 ... +105.0 ±0.1 °C (23 ... 221 °F)	
Calibration	1, 2 or 3-point calibration WTW technical buffers, DIN/NIST buffers	1, 2, 3, 4, 5-point calibration WTW technical buffers, DIN/NIST buffers plus 20 additional buffer sets	
Memory/Logger	–	Manual 200	Manual 500/5000 automatic
Display	7-Segment LCD, customized	LCD Graphic, backlit	
Continuous operation	Up to 2500 hrs.	Up to 1000 hrs. without/150 hrs. with backlight	

Ordering Information

ProfiLine Portable pH Meter SETs		Order No.
pH 3110 SET 2	Robust and waterproof portable pH meter, for battery operation, in portable case set with SenTix® 41	2AA112
pH 3210 SET 2	Robust and waterproof portable pH meter with data logger, for battery operation, in portable case set with SenTix® 41	2AA212
pH 3310 SET 2	Robust and waterproof portable pH meter with data logger and USB Mini-B interface, for battery operation, in portable case set with SenTix® 41	2AA312

IP 66 IP 67 | CE | cETLus | 3 Year Warranty

For other electrodes in Sets see WTW Product Details

ProfiLine pH Field Meters

All WTW meters in the ProfiLine pH 1970i series are both waterproof (IP 66) and submersible (IP 67). In addition, these units float, a convenient feature when used in field applications at lakes or streams. With GLP memory functions, real-time clock, a display corresponding to the recorder output, 800 data records memory capacity, a carry handle and strap.

ProfiLine pH 1970i

- Robust, shockproof
- Fully waterproof
- Standard pH measurement and pH measurement down to depths of 100 m (330 ft)

The ProfiLine 1970i, supplied with integrated powerful NiMH rechargeable batteries, is a complete pH measuring system. When used with the TA 197 pH Depth Armature, the ProfiLine 1970i, with its built-in preamplifier, is accurate to a depth of 100 m (330 ft).

Depth armature TA 197 pH

Technical Data

Model		ProfiLine pH 1970i
Range/ Resolution	pH	-2.00 ... +19.99 pH,
	mV	-199.9 ... +199.9 mV; -1999... +1999 mV
	Temp.	-5.0 ... +105.0 °C (23 ... 221 °F)
Accuracy (±1 digit)	pH	±0.01 pH,
	mV	±0.5 at +15 °C ... +35 °C (59 ... 95 °F), ±1 at +15 °C ... +35 °C (59 ... 95 °F)
	Temp.	±0.1 K
Calibration		**MultiCal® automatic calibration:** 1,2,3-point calibration, AutoCal, AutoCal-Tec and ConCal®

Ordering Information

ProfiLine pH Field Meter – with universal power supply 100-240 VAC (50/60 Hz) included		Order No.
ProfiLine pH 1970i	Robust, waterproof, submersible pH/mV meter	3A30-110

IP 66 IP 67 · CE · cETLus · 3 Year Warranty

For depth armatures for measurements down to depths of 100 m (330 ft) see WTW Product Details

VARIO®

You notice it immediately: in addition to its ergonomic form, the new VARIO® has no keys. The innovative touch screen allows access to all functions with one-touch simplicity.

VARIO® pH

- Compatible with most electrode types
- One-hand operation
- Twistable display

The VARIO® can operate continuously for 1500 hours on one easily replaced AA (1.5 V) battery.

VARIO® comes standard with a special glass electrode that is protected by a plastic casing. The conical protective cap does not require KCl – this prevents the electrode from dripping and protects it from drying out.

The VARIO® can do even more.

The adapter included in the VARIO® Set allows compatibility with commercially available precision electrodes. The VARIO® measures as accurately and reliably as any portable instrument.

The VARIO® is an essential tool whenever speed is required in the laboratory or in production.

Measuring in no time at all

Simply touch the display – and VARIO® is ready for use. Immersion in the solution starts the measurement automatically. The stable measurement can be read from the large display together with the temperature. Memory has capacity for up to 50 measured values which can be stored for later evaluation.

When the VARIO® is not being used for pH measurements, it can be used as a laboratory clock or timer.

Light, handy, rugged – it finds a place in every laboratory coat without dripping or leaving nasty stains, as it can be stored without KCl.

Technical Data

Model	VARIO® pH
pH range	-2.00 ... 16.00
pH accuracy	±0.01 pH
Temperature	-5.0 ... 100.0 °C (23 ... 212 °F)
Automatic buffer recognition	TEC/NIST
Calibration points	3 (MultiCal®)

Ordering Information

VARIO®		Order No.
VARIO® SET V	VARIO® in the portable case set, incl. short electrode with built-in temperature probe and technical buffer 4 and 7	2V00-001V

IP 65 CE 3 Year Warranty

For other electrodes, see WTW Product Details

SenTix® pH electrodes for every application

SenTix® quality electrodes by WTW – convenient measurement and precision.

- Low-resistance glass membranes guarantee stable measuring signals even at low temperatures.
- Silver ion-free reference electrolyte, together with the proven platinum wire diaphragm, prevent measurement problems by precipitating silver compounds.
- Functional slide for accessing the refill opening for electrodes with liquid electrolyte.
- Connectors: Waterproof DIN connector, BNC connector, fixed cable (1 or 3 m, 3 ft. or 9 ft.) or plug head (S7 or SMEK).

Electrodes

IDS pH/ORP electrodes
see page 10

Low-maintenance pH electrodes with gel electrolyte

Ideal for portable measurements, as well as for routine measurements in-the-laboratory. With or without built-in temperature probe all electrodes have robust plastic shafts and a low-maintenance gel reference system.

SenTix® pH Electrodes

Modell	SenTix® 20 103 630	SenTix® 21 103 631	SenTix® 21-3 103 632	SenTix® 22 103 633	SenTix® 41 103 635	SenTix® 41-3 103 636	SenTix® 42 103 637
Measuring range pH	0 ...14 pH				0 ...14 pH		
Operating range °C (°F)	0 … 80 °C (32 … 176 °F)				0 … 80 °C		
Reference electrolyte	Gel				Gel		
Membrane shape	Cylindrical				Zylinder		
Membrane resistance at 25 °C (77 °F)	<1 GΩ				<1 GΩ		
Diaphragm	Fiber				Fiber		
Shaft material	Plastic				Plastic		
Shaft length**	120 mm (4.72 in.)				120 mm (4.72 in.)		
Shaft Ø***	12 mm (0.47 in.)				12 mm (0.47 in.)		
Temperature probe	—				Built-in NTC (30 KΩ)		
Connection Electrode cable Electrode plug	① ③* ⑥/⑦	② ④ ⑥	② ⑤ ⑥	② ④ ⑦	② ④ ⑥+⑧	② ⑤ ⑥+⑧	② ④ ⑦+⑧

** not included*
*** ±2 mm/±0.08 in.*
**** ±0.5 mm/±0.02 in.*

①: Plug head, ②: Fixed cable, ③: AS/DIN, AS/DIN-3 or AS/BNC, ④: Cable length 1 m (3 ft), ⑤: Cable length 3 m (9 ft), ⑥: DIN plug, ⑦: BNC plug, ⑧: Banana plug

SenTix® Special Electrodes – pH electrodes for unique applications

Special samples need special electrodes.
SenTix® special electrodes can take on the challenges associated with measuring the pH value of surfaces, solids, suspensions, emulsions, low ionic samples, smallest volumes and more. For those who require a non-glass electrode: The SenTix® FET can be used with every WTW pH meter.

SenTix® pH Electrodes

Model	SenTix® 51 103 651	SenTix® 52 103 652	SenTix® 60 103 639	SenTix® 61 103 640	SenTix® 62 103 641	SenTix® 81 103 642	SenTix® 82 103 643	SenTix® 91 103 695	SenTix® 92 103 696	SenTix® L 103 655
Measuring range pH	0 ...14 pH		0 ...14 pH			0 ... 14 pH		0 ...14 pH		0 ... 14 pH
Operating range °C (°F)	0 ... 80 °C (32 ... 176 °F)		0 ...100 °C (32 ... 212 °F)			0 ...100 °C (32 ... 212 °F)		0 ...100 °C (32 ... 212 °F)		0 ...100 °C (32 ... 212 °F)
Reference electrolyte	KCl 3 mol/l, Ag^+-free		KCl 3 mol/l, Ag^+-free			KCl 3 mol/l, Ag^+-free		KCl 3 mol/l, Ag^+-free		KCl 3 mol/l, Ag^+-free
Membrane shape	Cylindrical		Conical			Conical		Spherical		Spherical
Membrane resistance at 25 °C (77 °F)	<1 GΩ bei 25 °C (77 °F)		<600 MΩ at 25 °C (77 °F)			<600 MΩ at 25 °C (77 °F)		<600 MΩ at 25 °C (77 °F)		< 600 MΩ at 25 °C (77 °F)
Diaphragm	Ceramics		Platinum			Platinum		Platinum		Platinum
Shaft material	Plastic		Glass			Glass		Glass		Glass
Shaft length**	120 mm (4.72 in.)		120 mm (4.72 in.)			120 mm (4.72 in.)		120 mm (4.72 in.)		425 mm (46.73 in.)
Shaft Ø***	12 mm (0.47 in.)		12 mm (0.47 in.)			12 mm (0.47 in.)		12 mm (0.47 in.)		12 mm (0.47 in.)
Temperature probe	Built-in NTC (30 KΩ)		–			Built-in NTC (30 KΩ)		Built-in NTC (30 KΩ)		Built-in NTC (30 KΩ)
Connection **Electrode cable** **Electrode plug**	② ④ ⑥+⑧	② ④ ⑦+⑧	① ③ * ⑥/⑦	② ④ ⑥	② ④ ⑦	② ④ ⑥+⑧	② ④ ⑦+⑧	② ④ ⑥+⑧	② ④ ⑦+⑧	① ⑨ * ⑥+⑧/⑦+⑧

** not included*
*** ±2 mm/±0.08 in.*
**** ±0.5 mm/±0.02 in.*

①: Plug head, ②: Fixed cable, ③: AS/DIN, AS/DIN-3 or AS/BNC, ④: Cable length 1 m (3 ft), ⑤: Cable length 3 m (9 ft), ⑥: DIN plug, ⑦: BNC plug, ⑧: Banana plug

Specialists for any event – pH electrodes for special applications

The consistencies of samples in which pH is measured are very different. Liquid or solid, low-ion medium or highly concentrated, aqueous or non-aqueous phases, with or without suspended solids. In some cases even smallest volumes have to be identified and sometime glass is not acceptable. All of this can be tackled using the specialists of WTW:

For measurements in or on solids, penetration or surface electrodes are recommendable. The split ring electrode with liquid filling is suitable for determining the pH value in low-ion or concentrated solutions and also for emulsions. Samples with suspended solids can be determined the easiest using a polymer electrode. Microelectrodes can help when there are only low volumes available. And when glass is not accepted, for example in the food industry: then the ISFET electrode is the right choice.

SenTix® Special pH Electrodes

Model	SenTix® H 103 644	SenTix® HW 103 650	SenTix® HWS 103 662	SenTix® SP 103 645	SenTix® SP-DIN 103 730	SenTix® Sur 103 646	SenTix® FET-D 103 700	.../-B 103 702
Measuring range pH	0 ...14 pH	0 ...14 pH	0 ... 14 pH	2 ...13 pH		2 ...13 pH	0 ... 14 pH	
Operating range °C	0 ... 80 °C (32 ... 176 °F)	0 ... 60 °C (32 ... 140 °F)	-5 ... 100 °C (23 ... 212 °F)	0 ... 80 °C (32 ... 176 °F)		0 ... 50 °C (32 ... 122 °F)	0 ... 60 °C (32 ... 140 °F)	
Reference electrolyte	KCl 3 mol/l, Ag⁺-free			Polymer		Polymer	KCl 3.3 mol/l, Ag⁺-free	
Membrane shape	Cylindrical	Cylindrical	Spherical	Spear		Flat	ISFET	
Membrane resistance at 25 °C (77 °F)	< 2 GΩ	< 800 MΩ	< 600 MΩ	< 400 MΩ		< 1 GΩ	—	
Diaphragm	Split ring	Split ring	Split ring	Hole		Split ring	Fritted polyethylene	
Shaft material	Glass	Glass	Glass	Plastic		Glass	Plastic	
Shaft length (±2 mm/±0.08 in.)	170 mm (6.69 in.)	170 mm (6.69 in.)	170 mm (6.69 in.)	65/25 mm (2.56/0.98 in.)		120 mm (4.72 in.)	86 mm (3.39 in.)	
Shaft Ø (±0.5 mm/±0.02 in.)	12 mm (0.47 in.)	12 mm (0.47 in.)	12 mm (0.47 in.)	15/5 mm (0.59/0.02 in.)		12 mm (0.47 in.)	17 ... 13 mm (0.67 ...0.51 in.)	
Temperature probe	—	—	Built-in NTC (30 KΩ)	—		—	NTC (30 KΩ)	
Connection	①	①	①	①	②	①	②	②
Electrode cable*	③ *	③ *	⑨ *	③ *	④	③ *	④	④
Electrode plug	⑥/⑦	⑥/⑦	⑥+⑧/⑦+⑧	⑥/⑦	⑥	⑥/⑦	⑥+⑧	⑦+⑧

** not included*
*** (±0.5 mm/±0.02 in.)*
**** from upper edge of ground*

①: Plug head, ②: Fixed cable, ③: AS/DIN, AS/DIN-3 or AS/BNC, ④: Cable length 1 m (3 ft), ⑤: Cable length 3 m (9 ft), ⑥: DIN plug, ⑦: BNC plug, ⑧: Banana plug, ⑨ AS S/D1 or AS S/D3 or AS S/B1 or AS S/B3, ⑩ AS S/R

SenTix® Special pH Electrodes

	SenTix®							
	Mic	Mic-D	Mic-B	SenTix® RJS	SenTix® pH	SenTix® R	SenTix® B	SenTix® V
Model	103 647	103 660	103 661	103 663	103 667	103 668	103 669	103 690
Measuring range pH	0 … 14 pH			2 … 13 pH	0 … 14 pH	–	–	0 … 14 pH
Operating range °C (°F)	0 … 100 °C (32 … 212 °F)	-5 … 100 °C (23 … 212 °F)		0 … 80 °C (32…176 °F)	0 … 80 °C (32…176 °F)	-5 … 100 °C (23 … 212 °F)	-5 … 100 °C (23 … 212 °F)	0 … 80 °C (32 … 176 °F)
Reference electrolyte	KCl 3 mol/l, Ag^+-free			Polymer	–	KCl 3 mol/l, Ag^+-free	Double electrolyte system	Gel
Membrane shape	Cylindrical			Calotte	Spherical	–	–	Flat
Membrane resistance at 25 °C (77 °F)	< 700 MΩ	< 1 GΩ		< 600 MΩ	< 600 MΩ	–	–	< 500 MΩ
Diaphragm	Ceramic	Platinum		Split ring	–	Platinum	Split ring	Fiber
Shaft material	Glass			Glass	Glass	Glass	Glass	Noryl
Shaft length (±2 mm/±0.08 in.)	40/80 mm (1.57/3.15 in.)	96 mm (3.78 in.) ***		120 mm (4.72 in.)	120 mm (4.72 in.)	120 mm (4.72 in.)	103 mm (4.06 in.) ***	31/20 mm (1.22/0.79 in.)
Shaft Ø **	12/5 mm (0.47/0.02 in.)	3 mm (0.12 in.)		12 mm (0.47 in.)	12 mm (0.47 in.)	12 mm (0.47 in.)	12 mm (0.47 in.)	17/19 mm (0.67/0.75 in.)
Temperature probe	—			Built-in NTC (30 KΩ)	–	–	–	NTC (30 KΩ)
Connection Electrode cable* Electrode plug	① ③ * ⑥/⑦	② ④ ⑥/⑦		① ⑨ * ⑥+⑧/⑦+⑧	① ③ * ⑥/⑦	① ⑩ * ⑧	① ⑩ * ⑧	—

** not included*
*** (±0.5 mm/±0.02 in.)*
**** from upper edge of ground*

①: Plug head, ②: Fixed cable, ③: AS/DIN, AS/DIN-3 or AS/BNC, ④: Cable length 1 m (3 ft), ⑤: Cable length 3 m (9 ft), ⑥: DIN plug, ⑦: BNC plug, ⑧: Banana plug, ⑨ AS S/D1 or AS S/D3 or AS S/B1 or AS S/B3, ⑩ AS S/R

Calibration and Maintenance Supplies

All WTW Technical Buffers are certified accurate and are NIST/DIN traceable.

(see page 150, Services).

Buffer bottles from WTW

- Easy-to-dispense
- Easy-to-clean
- Reliable calibration

QSC (Quality Sensor Control):

The QSC kit, consisting of three precision DIN buffers including pH 4.01, pH 6.87 and pH 9.18 with a deviation of ± 0.01 pH at 25 °C allows an initial calibration of the IDS pH electrodes. Ideal for quality control: All subsequent calibrations are compared with this calibration and therefore deliver the precise current state of the sensor.

Applicable buffers

	PL 4/7/9 DIN/NIST	STAPL 4/7/9 DIN/NIST	TEP 4/7 Trace	TEP 10 Trace	TEP 10	TPL 4/7 Trace	TPL 10 Trace	TPL 10
inoLab®, Multi 350i/3500i*	●	●	●	●	–	●	●	–
VARIO® pH	●	●	●	●	–	●	●	–
pH 3110, pH 3210, pH 3310, pH 315i/3150i*, 330i/3300i*, 340i/3400i*, pH/ION 340i/3400i*, pH 197i/1970i	●	●	●	●	–	●	●	–
pH/Cond 340i/3400i*, pH/Oxi 340i/3400i*, Multi 340i/3400i*, Multi 3410, 3420, 3430, Multi 197i/1970i	● **	● **	●	●	–	●	●	–
inoLab® Level 1, 2, 3/pH 197	●	●	●	–	●	●	–	●

For ordering information for calibration and maintenance supplies, see WTW Product Details

** North American version*

*** not Multi 340i/3400i*, Multi 197i/1970i*

Applications for SenTix® Electrodes

● Recommended by WTW ❍ Conditionally applicable * Only recommended for specified model

	SenTix® V	SenTix® 20 21-..., 22	SenTix® 41, 41-3, 42, RJS, 940	SenTix® 51, 52 950	SenTix® 60, 61 62	SenTix® 81, 82 980	SenTix® 91, 92, L	SenTix® H	SenTix® HW, HWS	SenTix® Sp, Sp-DIN	SenTix® Sur	SenTix® Mic, MIC-D, MIC-B	SenTix® FET	SenTix® ORP, ORP 900, PtR, Ag, Au
Acids					●	●	●		❍					Au, ORP*
Ammonia					❍	❍	❍	●						
Aquarium water	●	●	●	●	❍	❍	❍							ORP, PtR*
Beer				●	●	●			●					
Beverages				●	●	●	●	❍	❍				❍	
Bleach solution					❍	❍	❍	●	❍					
Boiler feedwater					❍	❍	❍		●					
Bread										●			●	
Cheese										●			●	
Coffee extract				❍	●	●	●		●				●	
Condensate									●					
Cosmetics	❍								●				●	
Demineralized water									●					
Developer			RJS*		❍	❍	❍	●	❍					
Dispersion colors	❍		RJS*						●					
Distilled water									●					
Drinking water	❍	❍	❍	●	●	●	●		❍					
Electroplating baths	❍		RJS*	●	●	●	●		❍					
Electroplating wastewater	●	●	●	❍	❍	❍	❍		❍					❍
Extracts					❍	❍	❍		●					
Fixing baths			RJS*	❍	❍	❍	❍	●	●					ORP, PtR*
Fruit										●			●	
Fruit juice	❍			●	●	●	●		❍				❍	
Ground water		●	●	❍	❍	❍	❍		❍					PtR*
Household cleaners	❍	❍	❍	❍	●	●	●	●	❍					
Juice	❍			●	●	●	●		❍				❍	
Leather	❍										●			
Lemonade				●	●	●	●		❍				❍	
Lyes								●						
Margarine										●			●	
Meat										●			❍	
Milk									●				❍	
Mineral water				❍	●	●	●		❍				❍	
Non-aqueous liquids				❍	❍	❍	❍		❍					
Oil/water emulsions			RJS*						●					
Paint, water-soluble	❍		RJS*						●				●	
Paper	❍										●			
Paper extract					●	●	●							
Protein-containing liquids					●	●	●		●			MIC-D/-B*		
Rainwater					❍	❍	❍		●					
Saliva	●										●	❍		
Salt solutions	❍	❍	❍	❍	●	●	●	❍	●					
Saltwater				❍	❍	❍	❍	❍	●					
Sausage										●			●	
Shampoo	❍								●				●	
Skin	❍										●			
Soil extract					●	●	●		●					
Solids (penetration)										●			❍	
Solids (surface)	❍										●			
Sulfide-containing liquids			RJS*						●					PtR*
Surface water	❍	●	●	●	●	●	●		❍					
Suspensions			RJS*						●					
Swimming pool water	●	●	●	●	❍	❍	❍							
Tap water	❍	❍	❍	●	●	●	●		❍					
Tris buffer solutions					●	●	●		●					
Vegetable juice					●	●	●		❍				❍	
Vegetables										●			●	
Wastewater	❍	●	●	❍	❍	❍	❍							PtR*
Wine				●	❍	●	●							
Yogurt					●	●	●		●	●			●	
	SenTix® V	SenTix® 20 21-..., 22	SenTix® 41, 1-3, 42, RJS 940	SenTix® 51, 52 950	SenTix® 60, 61 62	SenTix® 81, 82 980	SenTix® 91, 92, L	SenTix® H	SenTix® HW, HWS	SenTix® Sp, Sp-DIN	SenTix® Sur	SenTix® Mic, MIC-D, MIC-B	SenTix® FET	SenTix® ORP, ORP 900, PtR, Ag, Au

*** for ORP Measurement see page 46*