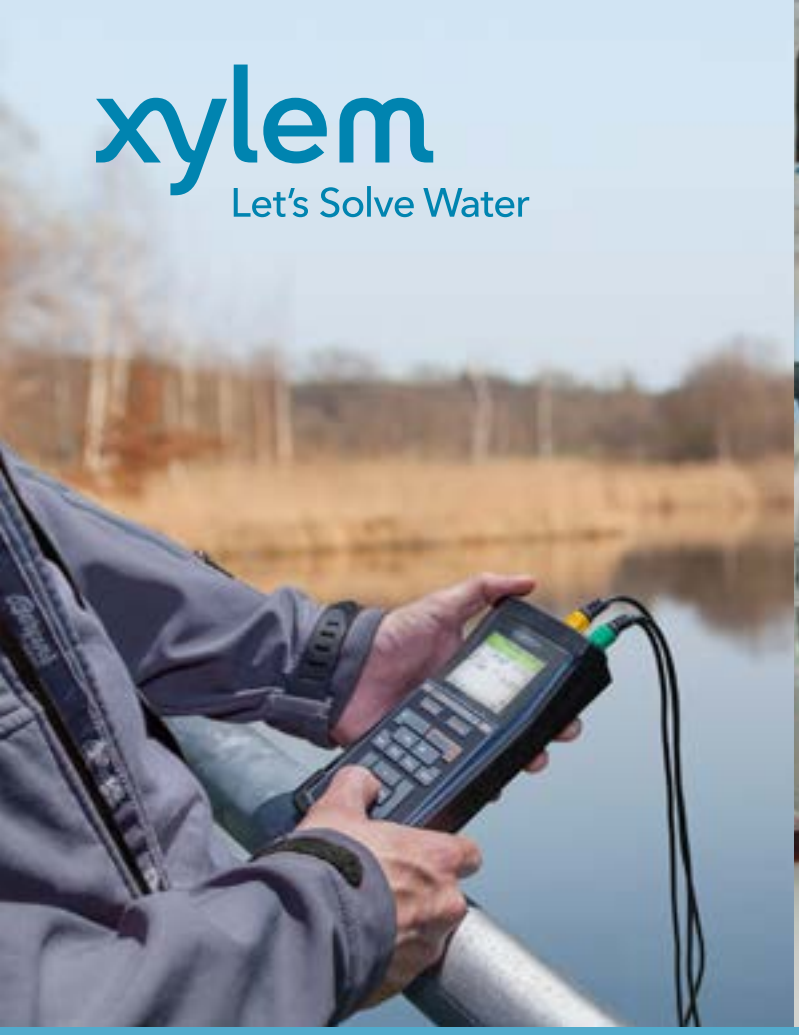
xylem
Let's Solve Water



Lab and Field Instrumentation

pH · ORP · ISE · DISSOLVED OXYGEN · CONDUCTIVITY·
MULTI-PARAMETER · BOD/RESPIRATION · PHOTOMETRY · TURBIDITY

WTW
a xylem brand

pH electrodes

IDS electrodes - digital

Digital measurement of pH with integrated electrode quality monitoring - can be used in all areas of laboratory and field measurement also for special applications.
Also as fixed cable variants and wireless ready.

see "IDS pH electrodes" on page 28

from left to right: the digital IDS sensors (1) SenTix® 940, (2) SenTix® 945, (3) SenTix® 950, (4) SenTix® 980; the IDS special electrodes (5) SenTix® HW-T 900, (6) SenTix® Sp-T 900, (7) SenTix® Micro 900; the wireless ready IDS plug head electrodes (8) SenTix® 940-P, (9) SenTix® 945-P, (10) SenTix® 950-P, (11) SenTix® Sp-T 900-P, (12) SenTix® 980-P, (13) SenTix® HW-T 900-P, (14) SenTix® Micro 900-P and (15) SensoLyt® 900-P

Applications for SenTix® electrodes

Our pH electrodes are optimised for measurement in aqueous systems. In addition, there is the possibility to also measure samples of a different consistence. The following table provides information about other application fields and electrodes suitable therefor.

● recommended by WTW
❍ can be used for this application
* only recommended for the mentioned model

	SenTix® ...											
	20 21-..., 22	41, 41-3, 42, RJD, 940, 940-P	51, 52, 950, 950-P	60, 61 62	81, 82, 980, 980-P, 945, 945-P	91	H	HW, HWD, HW-T 900, HW-T 900-P	Sp, Sp-DIN, Sp-T 900, Sp-T 900-P	Sur	Mic, MIC-D, MIC-B, Micro 900, Micro 900-P	ORP**, ORP-T 900**, ORP-T 900-P**, PtR, Ag, Au
Aquarium water	●	●	●	❍	❍	❍						ORP...*, PtR*
Beer			●	●	●			●				ORP...*
Beverages				●	●	●		❍				
Bleaching lye			❍	❍	❍	❍	●	❍				
Boiler feed water				❍	❍	❍		●				
Bread									●			
Cheese (punch possibly necessary)									●			
Coffee extract			❍	●	●	●		●				
Condensate								●				
Cosmetics								●	●	●		
Diluted acids				●	●	●		❍				Au, ORP...*
Diluted alkalis							●					
Dispersion colors		RJD*						●				
Distilled water								●				
Drinking water	❍	❍	●	●	●	●		❍				
Electroplating waster water	●	●	❍	❍	❍	❍		❍				❍
Fruit									●			
Fruit juice			●	●	●	●		❍				
Fruit juice			●	●	●	●		❍				
Fully demineralised water								●				
Galvanic baths		RJD*	●	●	●	●		❍				●
Groundwater	●	●	❍	❍	❍							PtR*
H_2S-containing liquids		RJD*						●				PtR*
Household cleaners	❍	❍	❍	●	●	●	●	❍				
Leather										●		
Lemonade			●	●	●	●		❍				
Measurement in Eppendorf or NMR vessels											●	
Meat (punch possibly necessary)									●			
Milk				●	●	●		●				
Mineral water	❍	❍	●	●	●	●		❍				
Oil/water emulsions		RJD*						●				
Paints and coatings, water soluble		RJD*						●				
Paper										●		
Paper extract				●	●	●						
Protein-containing liquids				●	●	●		●			MIC-D/-B* Micro 900*	
Rain water				❍	❍	❍		●				
saline solutions	❍	❍	❍	●	●	●	❍	●				ORP...*
saliva										●	❍	
Sausage (punch possibly necessary)									●			
Seawater				❍	❍	❍	❍	●				
Shampoo								●				
Skin										●		
Soil extract				●	●	●		●				
Solids (insertion)									●			
Solids (surface)										●		
Surface water	●	●	●	●	●	●		❍				
Suspensions		RJD*						●				ORP...*
Swimming pool water	●	●	●	❍	❍	❍						
Tris buffer solutions				●	●	●		●				
Vegetable juice			❍	●	●	●		❍				
Vegetables									●			
Waste water	●	●	❍	❍	❍	❍						PtR*
Wine			❍	●	●	●		●				
Yoghurt				●	●	●		●	●			
	20 21-..., 22	41, 41-3, 42, RJD, 940, 940-P	51, 52, 950, 950-P	60, 61 62	81, 82, 980, 980-P, 945, 945-P	91	H	HW, HWD, HW-T 900, HW-T 900-P	Sp, Sp-DIN, Sp-T 900, Sp-T 900-P	Sur	Mic, MIC-D, MIC-B, Micro 900, Micro 900-P	ORP**, ORP-T 900**, ORP-T 900-P**, PtR, Ag, Au

1 year warranty for material damages for all pH sensors as per § 10 Terms and Conditions
*** for ORP measurement*

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SenTix® pH electrodes analogue

WTW SenTix® quality electrodes – measurement convenience and precision in one.

- Low-resistance membrane glasses warranty stable measurement signals even at low temperatures
- Silver ion-free reference electrolyte together with the proven platinum wire junction prevents measurement problems due to precipitating silver compounds
- Functional slider for opening and safe closing of the refill opening with electrodes with liquid electrolyte.
- Connection possibilities: waterproof DIN plug, BNC plug, fixed cable (1 or 3 m) or plug head (S7)

Technical specifications: SenTix® pH electrodes analogue

Models	pH electrodes with gel electrolyte							pH electrodes with liquid electrolyte							
SenTix® ...	20	21	21-3	22	41	41-3	42	51	52	60	61	62	81	82	91
Measurement Range pH	0 ...14 pH				0 ...14 pH			0 ...14 pH		0 ...14 pH			0 ...14 pH		0 ...14 pH
Application area temp.	0 … 80 °C				0 … 80 °C			0 … 80 °C		0 ...100 °C			0 ...100 °C		0 ...100 °C
Reference electrolyte	Gel							KCl 3 mol/l, Ag^+-free							
Membrane shape	Cylinder				Cylinder			Cylinder		Cone			Cone		sphere
Membrane resistance	<1 GΩ				<1 GΩ			<1 GΩ		<600 MΩ			<600 MΩ		<600 MΩ
Diaphragm	Fibre				Fibre			Ceramics		Platinum			Platinum		Platinum
Shaft material	Plastic				Plastic			Plastic		Glass			Glass		Glass
Shaft length (±2 mm)	120 mm				120 mm			120 mm		120 mm			120 mm		170 mm
Shaft-Ø (±0.5 mm)	12 mm				12 mm			12 mm		12 mm			12 mm		12 mm
Temperature sensor	–				integr. NTC (30 KΩ)			integr. NTC (30 KΩ)		–			integr. NTC (30 KΩ)		integr. NTC (30 KΩ)
Connection	①	②	②	②	②	②	②	②	②	①	②	②	②	②	②
Electrode cable	③*	④	⑤	④	④	⑤	④	④	④	③*	④	④	④	④	④
Electrode plug	⑥/⑦	⑥	⑥	⑦	⑥+⑧	⑥+⑧	⑦+⑧	⑥+⑧	⑦+⑧	⑥/⑦	⑥	⑦	⑥+⑧	⑦+⑧	⑥+⑧

Models	pH electrodes for special applications									
SenTix® ...	H	HW	HWD	SP	SP-DIN	Sur	Mic	Mic-D	Mic-B	RJD
Measurement Range pH	0 … 14 pH	0 … 14 pH	0 … 14 pH	2 … 13 pH		2 … 13 pH	0 … 14 pH	0 … 14 pH		2 … 13 pH
Application area temp.	0 ... 80 °C	0 ... 60 °C	-5 ... 100 °C	0 ... 80 °C		0 ...50 °C	0 ... 100 °C	-5 ... 100 °C		0 ... 80 °C
Reference electrolyte	KCl 3 mol/l, Ag^+-free			Polymer			KCl 3 mol/l, Ag^+-free			Polymer
Membrane shape	Cylinder	Cylinder	Sphere	Spear		Flat	Cylinder	Cylinder		Calotte
Membrane resistance	< 2 GΩ	< 800 MΩ	< 600 MΩ	< 400 MΩ		< 1 GΩ	< 700 MΩ	< 1 GΩ		< 600 MΩ
Diaphragm	Split ring	Split ring	Split ring	Hole		Split ring	Ceramics	Platinum		Split ring
Shaft material	Glass	Glass	Glass			Glass	Glass	Glass		Glass
Shaft length (±2 mm)	170 mm	170 mm	170 mm	65/25 mm		120 mm	40/80 mm	96 mm **		120 mm
Shaft-Ø (±0.5 mm)	12 mm	12 mm	12 mm	15/5 mm		12 mm	12/5 mm	3 mm		12 mm
Temperature sensor	–	–	integr. NTC (30 KΩ)	–		–	–	–		integr. NTC (30 KΩ)
Connection	①	①	②	①	②	①	①	②	②	②
Electrode cable	③*	③*	④	③*	④	③*	③*	④	④	④
Electrode plug	⑥/⑦	⑥/⑦	⑥+⑧	⑥/⑦	⑥	⑥/⑦	⑥/⑦	⑥	⑦	⑥+⑧

* not contained in the scope of delivery
** from grinding upper edge

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

Low maintenance analogue pH electrodes with gel electrolyte

Ideal for portable measurement but also for routine measurement in the laboratory. With or without built-in temperature sensor All electrodes have robust plastic shafts and a low-maintenance gel reference system.

SenTix® 20

SenTix® 21

SenTix® 41

Quick and precise analogue pH electrodes with liquid electrolyte

For demanding measurements in the laboratory: SenTix® Electrodes with liquid electrolyte, easy to clean glass shaft and platinum diaphragm. Can also be used in difficult samples. And who needs an electrode with liquid electrolyte for portable measurement: The SenTix® 51/52 with plastic shaft, integrated temperature sensor and ceramic diaphragm masters nearly every measuring task.

SenTix® 52

SenTix® 60

SenTix® 61

SenTix® 81

SenTix® 91

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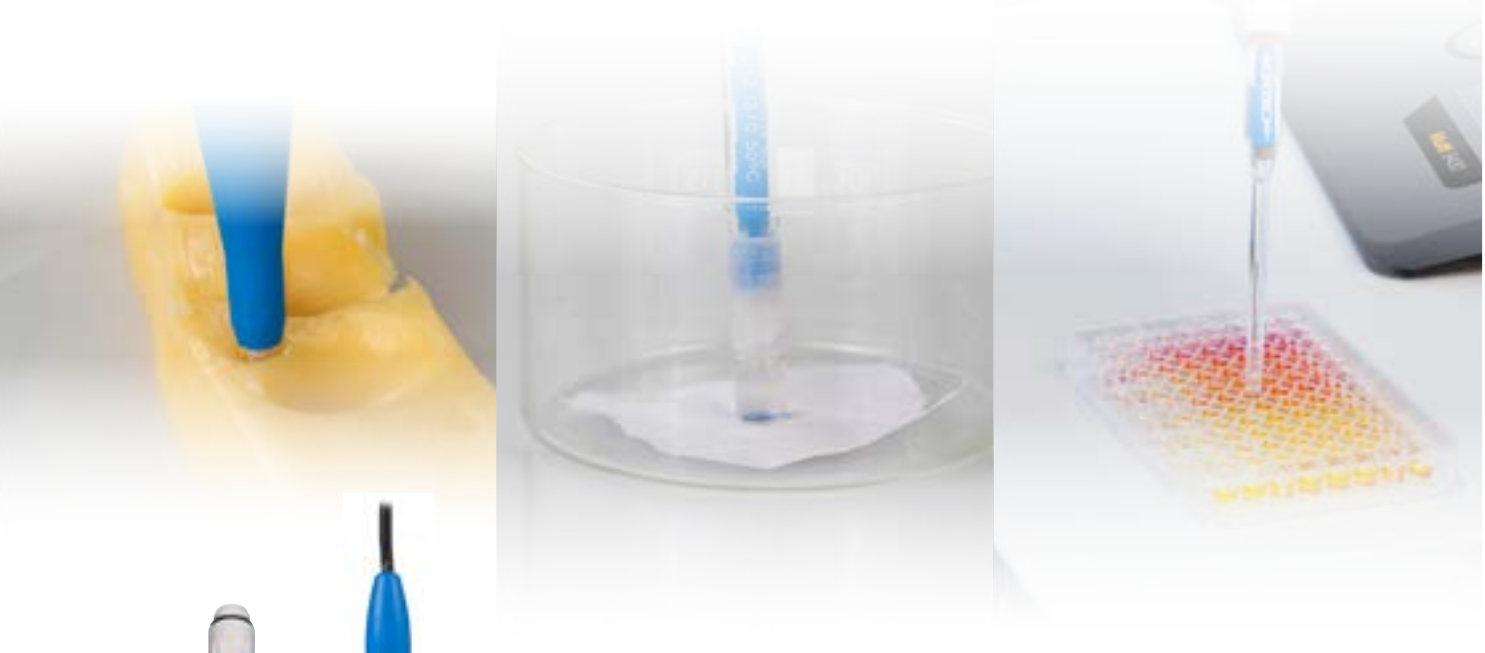
Analogue pH electrodes for special applications: Specialists for all cases

The consistencies of samples in which pH is measured are very different. Liquid or solid, low in ions or highly concentrated, aqueous and non-aqueous phases, with and without suspended solids. Sometimes the smallest volumes have to be determined. All this can be handled easily together with our specialists.

For measurements in or on solids, spear-type and surface electrodes are recommended. pH value measurements in ion-poor or concentrated solutions can be mastered with ground electrodes, as well as in emulsions. Samples with suspended solids can most easily be measured with polymer electrodes. Micro-electrodes help when there is little volume available.



SenTix® HW | SenTix® HWD | SenTix® SP | SenTix® Sur | SenTix® Mic | SenTix® Mic-D | SenTix® RJD

Order information: Analogue SenTix® pH electrodes

Model	Description	Order no.
pH electrodes with gel electrolyte		
SenTix® 20	Gel electrode, S7 plug head	103630
SenTix® 21	Gel electrode, DIN cable	103631
SenTix® 21-3	Gel electrode, DIN cable, 3 m	103632
SenTix® 22	Gel electrode, BNC cable	103633
SenTix® 41	Gel electrode with temperature sensor, DIN cable	103635
SenTix®41-3	Gel electrode with temperature sensor, DIN cable, 3 m	103636
SenTix®42	Gel electrode with temperature sensor, BNC cable	103637
pH electrodes with liquid electrolyte		
SenTix® 60	Precision electrode, S7 plug head	103639
SenTix® 61	Precision electrode, DIN cable	103640
SenTix® 62	Precision electrode, BNC cable	103641
SenTix® 81	Precision electrode with temperature sensor, DIN cable	103642
SenTix® 82	Precision electrode with temperature sensor, BNC cable	103643
SenTix® 51	Plastic shaft, temperature sensor, DIN cable	103651
SenTix® 52	Plastic shaft, temperature sensor, BNC cable	103652
SenTix® 91	Precision electrode 170 mm, with temperature sensor, DIN cable	103695
pH electrodes for special applications		
SenTix® H	pH electrode for highly alkaline solutions, S7 plug head	103644
SenTix® Sp	pH spear-type electrode, S7 plug head	103645
SenTix® Sur	pH surface electrode, S7 plug head	103646
SenTix® Mic	pH-micro electrode, 5 mm membrane	103647
SenTix® HW	pH electrode for low-conducting samples, S7 plug head	103650
SenTix® Mic-D	pH micro electrode, 3 mm membrane, DIN cable	103660
SenTix® Mic-B	pH micro electrode, 3 mm membrane, BNC cable	103661
SenTix® Sp-DIN	pH spear-type electrode, DIN cable	103730
SenTix® HWD	pH electrode for emulsions etc. with temperature sensor, DIN cable	103731
SenTix® RJD	pH electrode low maintenance, polymer electrolyte, temperature sensor, DIN cable	103732

Accessories & cables see price list or www.WTW.com

Calibration and maintenance accessories

In practice, work reference buffer solutions are used, which are obtained by comparison with primary or secondary material. Common WTW-pH buffers correspond to these requirements. Certificates document the respective pH value uncertainty of the solution.

Buffer bottles by WTW

- **Standard (DIN/NIST) buffer solutions PL 2/4/7/9/12** (250 ml container)
- Technical buffer solutions **TEP** (1 litre), **TPL** (250 ml): pH buffer by WTW - precise and traceable to PTB/NIST in two container sizes with built-in dosing vessel standard buffer

- **Easy to dose**
- **Easy to use**
- **Safe calibration**

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Usable Buffers

		PL 4/7/9 DIN/NIST	STAPL 4/7/9 DIN/NIST	TEP 4/7 Trace	TEP 10 Trace	TPL 4/7 Trace	TPL 10 Trace
Benchtop meters							
inoLab®		●	●	●	●	●	●
Portable meters							
ProfiLine	**pH 3110, pH 3210, pH 3310**	●	●	●	●	●	●
	pH/Cond 3320, Multi 3320, pH/ION 3310	●*	●*	●	●	●	●
	pH 315i, pH 330i, pH 340i, pH/ION 340i	●	●	●	●	●	●
	pH/Cond 340i, pH/Oxi 340i, Multi 340i, Multi 350i,	●*	●*	●	●	●	●
MultiLine®	**Multi 3410 IDS, Multi 3420 IDS, Multi 3430 IDS, Multi 3510 IDS, Multi 3620 IDS, Multi 3630 IDS**	●*	●*	●	●	●	●
VARIO® pH		●	●	●	●	●	●
Field meters ProfiLine							
pH 197i/1970i		●	●	●	●	●	●
Multi 197i/1970i		●*	●*	●	●	●	●

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

Buffer solutions in glass ampoules

- **STAPL-4/7/9 precision DIN / NIST buffer in ampoules with +/- 0.01 pH accuracy**
- QSC (Quality Sensor Control): With the **QSC Kit** consisting of three precision DIN buffers (pH 4.01, pH 6.87 and pH 9.18 with an accuracy of respectively ± 0.01 pH at 25 °C) in glass ampoules, an initial calibration can be carried out with IDS pH electrodes. Ideal for quality control: All following calibrations are compared with this calibration and thereby exactly deliver the current state of the sensor.

- **Single use portions**
- **Steam sterilised and 5 year shelf life**
- **Precision buffer with an accuracy of ± 0.01 pH**

Model	Description	Order no.
TEP 4	Technical buffer solution, 1 bottle with 1 l: pH 4.01	108700
TEP 7	Technical buffer solution, 1 bottle with 1 l: pH 7.00	108702
TEP 10 Trace	Technical buffer solution, 1 bottle with 1 l: pH 10.01	108703
TPL 4	Technical buffer solution, 1 bottle with 250 ml: pH 4.01	108800
TPL 7	Technical buffer solution, 1 bottle with 250 ml: pH 7.00	108802
TPL 10 Trace	Technical buffer solution, 1 bottle with 250 ml: pH 10.01	108805
STAPL-4/7/9	Assortment of working reference buffer solutions pH 4.01, pH 6.87, pH 9.18. Traceable to NIST / PTB standards. Steam sterilized, 10 x 6 glass ampoules of 20 ml each.	109020
PL 4	Standard (DIN/NIST) buffer solution, 1 bottle with 250 ml: pH 4.006 /4.01	109110
PL 7	Standard (DIN/NIST) buffer solution, 1 bottle with 250 ml: pH 6.865 /6.87	109120
PL 9	Standard (DIN/NIST) buffer solution, 1 bottle with 250 ml: pH 9.180 /9.18	109130
KCl-250	Reference electrolyte, 1 bottle with 250 ml KCl solution 3 mol/l	109705

Further accessories see price list or www.WTW.com

ORP measurement

Content

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Applications and meters overview

The ORP measurement maps the intensity of oxidation and reduction reactions proceeding in aqueous solution. The resulting voltage signal is for example used as a measure of the cleaning power of disinfectants such as chlorine or ozone in the swimming pool.

✓ yes
● yes
✓ recommended
✓ recommended for some applications
– not recommended

	Digital			Analogue			Digital			Analogue					
	Laboratory ORP meters						Portable ORP meters								
	inoLab® IDS			inoLab®			MultiLine® IDS			ProfiLine					
	Multi 9630	Multi 9620	Multi 9310	pH/ION 7320	pH 7310	pH 7110	Multi 3630	Multi 3620	Multi 3510	Multi 3320	pH/Cond 3320	pH/ION 3310	pH 3310	pH 3110	pHotoFlex® pH
2 parameters simultaneously*	✓	✓		✓			✓	✓		✓	✓				
3 parameters simultaneously	✓						✓								
ORP	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Additional parameters	●	●	●	●			●	●	●	●	●	●			●*
Routine measurements	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Routine measurements with documentation	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓	✓	–	✓
AQA with documentation	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓	✓	–	✓
R&D High resolution and precision	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓	✓	–	✓
Control measurements	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓	✓	–	✓
LIMS connection	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓	✓	–	✓
Quality assurance	✓	✓	✓	✓	✓	–	✓	✓	✓	✓	✓	✓	✓	–	✓
Education	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Service	–	–	–	–	–	–	✓	✓	✓	✓	✓	✓	✓	✓	✓
Laboratory measurements	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Field measurements	–	–	–	–	–	–	✓	✓	✓	✓	✓	✓	✓	✓	✓
Depth measurements	–	–	–	–	–	–	✓	✓	✓	–	–	–	–	–	–
PC connection	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓
Memory	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		
USB interface	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		
Graphic display			✓	✓	✓				✓	✓	✓	✓	✓		✓
Color graphic display	✓	✓					✓	✓							
Compatible sensors															
Digital IDS electrodes															
IDS ORP electrodes 72	✓	✓	✓				✓	✓	✓						
Analogue electrodes															
ORP electrodes 73	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Multi 9630	Multi 9620	Multi 9310	pH/ION 7320	pH 7310	pH 7110	Multi 3630	Multi 3620	Multi 3510	Multi 3320	pH/Cond 3320	pH/ION 3310	pH 3310	pH 3110	pHotoFlex® pH
see page	40	40	41	56	56	57	44	45	46	49	50	47	61	62	145

* see chapter "Photometric determination" on page 130

ORP measurements can be carried out with all WTW pH/mV meters.

ORP electrodes

All ORP electrodes consist of a metal electrode made of a precious metal and a reference electrode. As with all SenTix® and SensoLyt® electrodes, the reference system is silver/silver chloride, typically with a platinum electrode.

WTW meters with pH function also measure the ORP voltage

IDS ORP electrodes - digital

- **Short response time due to ideal contact to the sample**
- **Precise measurement results due to liquid electrolyte**
- **Refillable for a long life**
- **Platinum electrode for universal application**

SenTix® ORP-T900 (-P)

ORP electrodes with liquid electrolyte and ceramic diaphragm

- **No maintenance due to life-long KCl supply**
- **Insensitive to soiling due to open connection**
- **Wide application range due to universal platinum metal electrode**

SensoLyt® ORP 900-P

ORP electrodes with polymer electrolyte and split ring or hole junction

Technical data and order information:

see page 32

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SenTix® ORP electrodes – analogue

Technical data and order information: SenTix® ORP electrodes – analogue

	SenTix® ORP	SenTix® Ag*	SenTix® Au	SenTix® PtR
Order no.	103648	103664	103665	103666
working temperature °C	0 … 100 °C	-5 … 100 °C	-5 … 100 °C	-5 … 100 °C
Reference electrolyte	KCl 3 mol/l	ELY/ORP/Ag	KCl 3 mol/l	Gel
Sensor	Platinum	Silver	Gold	Platinum
Sensor form	(4 mm)	Cylinder cap	Cylinder cap	(6 mm)
Diaphragm	Ceramics	Ceramics	Ceramics	Split ring
Shaft material	Glass	Glass	Glass	Glass
Shaft length (±2 mm)	120 mm	120 mm	120 mm	120 mm
Shaft-Ø (±0,5 mm)	12 mm	12 mm	12 mm	12 mm
Temperature sensor	–	–	–	–
Connection	AS/DIN, AS/DIN-3, AS/BNC	AS/DIN, AS/DIN-3, AS/BNC	AS/DIN, AS/DIN-3, AS/BNC	AS/DIN, AS/DIN-3, AS/BNC

* for argentometry

SenTix® ORP

Universal ORP electrode with platinum round, glass shaft

SenTix® Ag

Combined Ag electrode (argentometry)

SenTix® Au

Au ORP electrode with AU cap, liquid electrolyte

SenTix® PtR

Maintenance-free Pt ORP electrode with polymer electrolyte

Order information: Test and maintenance agents for the ORP measurement

Model	Description	Order no.
RH 28	ORP buffer solution, 1 bottle with 250 ml: pH 7, U_H = 427 mV	109740
ELY/ORP/AG	Electrolyte with 2 mol/l KNO_3 + 0.001 mol/l KCl for combined ORP electrode with silver electrode	109735
Accessories & cables see price list or www.WTW.com		

Application table

Ion type	Application
Ammonium (NH_4^+)	Wastewater
Bromide (Br^-)	Wine, plants
Calcium (Ca^{2+})	Milk products
Chloride (Cl^-)	Drinking water, diet foods, mineral water
Copper (Cu^{2+})	Galvanic baths
Fluoride (F^-)	Toothpaste, drinking water, cement
Nitrate (NO_3^-)[S]	Baby food, fertiliser, wastewater
Potassium (K^+)[S]	Wine, fertiliser
Silver (Ag^+)[S]	Galvanic baths
Sodium (Na^+)[S]	Boiler feed water, diet foods, wine
Sulphide (S^{2-})[S]	Proteins, sediments

Ion-selective electrodes

Ion-selective and gas-sensitive electrodes are used for measuring the dissolved concentration of specific ions or gases in water. Similar to the pH electrode, the membrane interacts with the dissolved ions and delivers a concentration-dependent voltage signal that is converted to the corresponding measurement result.

Combined ISE and GSE electrodes

- **Space-saving through integrated reference electrode**
- **11 different types available - broad selection of applications including ammonium measurement**
- **Slim and space-saving design with 12 mm shaft diameter**
- **Series 800 with 1 m fixed cable and DIN or BNC plug**

Technical specifications and order information: inoLab® analogue Ion-selective electrodes

	Combined ISE and GSE electrodes				
					
	NH 500/2	**Ca 800**	**Ag/S 800**	**Cl 800**	**CN 800**
Determinable ions	Ammonium	Calcium, Magnesium	Silver, Sulphide	Chloride	Cyanide
Membrane	–	L	S	S	S
Contains reference electrode	Yes	Yes	Yes	Yes	Yes
Measuring range	0.02 to 900 mg/l, With 3 exchange heads and 50 ml electrolyte solution	0.02 ... 40000 mg/l 5 x 10^{-7} ... 1 mol/l	0.01 ... 108000 mg/l 10-7 ... 1 mol/l 0.003 ... 32000 mg/l 10^{-7} ... 1 mol/l	2 ... 35000 mg/l 5 x 10^{-5} ... 1 mol/l	0.2 ... 260 mg/l 8 x 10^{-6} ... 10^{-2} mol/l
Bridge electrolyte		ELY/BR/503	ELY/BR/503	ELY/BR/503	ELY/BR/503
Ionic strength-adjusting solution	MZ/NH3/CN	ISA/Ca	ISA/FK (Ag) or according to the operating instructions for sulphide measurement	ISA/FK	
Standard solutions (conc. 10 g/l)	ES/NH_4	ES/Ca	Standard solutions must be prepared freshly③	ES/CI	MZ/NH3/CN Standard solutions must be prepared freshly
pH range	4–12	2.5–11	2–12	2–12	0–14
Order No. DIN variant	106395 (S7 plug head)	106655	106651	106661	106663
Order No. BNC variant		106654	106650	106660	106662
Order no. Exchange head		106656			

① S = Solid electrode, L = Matrix electrode, G = Glass electrodes
② Titration
③ Preparation according to operating manual
④ Recipes for additionally required solutions are specified in the application reporst and operating manuals.

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Combined ISE and GSE electrodes					ISE half cell
					
Cu 800	**K 800**	**Br 800**	**F 800**	**NO 800**	
Copper, Nickel[2]	Potassium[4]	Bromide	Fluoride, Aluminium, Phosphate[2], Lithium[2]	Nitrate	Sodium
S	L	S	S	L	G
Yes	Yes	Yes	Yes	Yes	requires reference electrode R 503/D
0.0006 ... 6400 mg/l 10^{-8} ... 10^{-1} mol/l	0.04 ... 39000 mg/l 10^{-6} ... 1 mol/l	0.4 ... 79000 mg/l 5 x 10^{-6} ... 1 mol/l	0.02 ... sat. mg/l 10^{-6} ... sat. mol/l	0.4 … 62000 mg/l,	0.05 … 23000 mg/l
ELY/BR/503	ELY/BR/503/K	ELY/BR/503	ELY/BR/503	ELY/BR/503/N	ELY/BR/503
ISA/FK	ISA/K	ISA/FK	TISAB	TISAB/NO_3	ISA/Na
ES/Cu	ES/K	ES/Br	ES/F	ES/NO_3	ES/Na
2–6	2–12	1–12	5–7	2.5–11	>10
106665	106671	106653	106667	106675	106375 (S7 plug head)
106664	106670	106652	106666	106674	
	106672			106676	

Dissolved oxygen sensors

IDS optical dissolved oxygen sensor– digital

Optical measurement is the most advanced method of determining dissolved oxygen. Using fluorescence quenching as described in DIN ISO 17289, the fluorescence signal of special dyes changes as a function of the oxygen concentration. This is measured, and converted to dissolved oxygen concentration. The method is described in DIN ISO 17289.

The optical dissolved oxygen sensor is only available in the IDS system, and is described in the multi-parameter measurement chapter.

see page 33

FDO® 925/FDO® 925-P

Galvanic dissolved oxygen sensors – analogue

The electrochemical method is the second currently used method for measuring the dissolved oxygen. It measures oxygen proportional to the current signal of a polarographic or galvanic dissolved oxygen sensor according to DIN ISO 5814.

- **Universal application due to wide measuring range between 0 and 50 mg/l**
- **Easy handling through proven technology**
- **Sensors available for special applications (fish farming, BOD measurement)**
- **Simple calibration in water vapour saturated air (calibration vessel included)**

Technical specifications: Galvanic dissolved oxygen sensors - analogue

		CellOx® 325	DurOx® 325-3	StirrOx® G
Order no.		201533	201570	2013425
Method		Electrochemical/galvanic	Electrochemical/galvanic	Electrochemical/galvanic
Response time T99 (20 °C)		< 60 s	< 125 s	< 45 s
Measuring range	**Concentration**	0 … 50 mg/l	0 … 50 mg/l	0 … 50 mg/l
	Saturation	0 … 600 %	0 … 600 %	0 … 600 %
	Partial pressure	0 … 1250 hPa	0 … 1250 hPa	0 … 1250 hPa
Temperature		0 … 50 °C	0 … 50 °C	0 … 50 °C
Shaft material		POM, stainless steel	POM, stainless steel	POM, stainless steel
Shaft length		145 mm	110 mm	49 (83) mm
Diameter		15.3 mm	17.5 mm	12 mm
Cable length		1.5 m (further cable lengths see price list)	3 m	2 m

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CellOx® 325

DurOx® 325

StirrOx® G

CellOx® 325

This universal galvanic dissolved dissolved oxygen sensor with IMT temperature compensation can be used both in the laboratory and in the field. It is available in versions with cable lengths up to 20 m.

DurOx® 325

Thanks to a special membrane technology, this well-priced galvanic dissolved dissolved oxygen sensor is particularly insensitive to strongly fluctuating measured values, for example when testing stationary oxygen meters in the wastewater process. Also suitable for training purposes.

StirrOx® G

Special dissolved oxygen sensor for the BOD (biochemical oxygen demand) measurement. With a motor-operated stirring paddle for mixing the samples and flow to the sensor. This probe features extremely low intrinsic oxygen consumption and built-in membrane monitoring.

Order information: Accessories for analogue galvanic dissolved oxygen sensors

Model	Description	Order no.
ZBK-D	Accessories box with replacement and maintenance kit for DurOx® sensors.	201578
ZBK 325	Replacement and maintenance kit for dissolved oxygen sensors CellOx® 325	202706
ZBK ST	Accessories box with replacement and maintenance kit for dissolved oxygen sensors StirrOx® G.	202710
WP 90/3	3 changeable membrane heads suitable for all dissolved oxygen sensors, except StirrOx® G, DurOx® 325	202725
WP3-ST	3 changeable membrane heads for StirrOx® G	202738
WP3-D	3 changeable membrane heads for DurOx® sensors.	202740
RL-G	Cleaning solution for galvanic dissolved oxygen sensors StirrOx® G, CellOx® 325, DurOx® 325 and TA 197 Oxi, 1 bottle of 30 ml	205204
ELY/G	Electrolyte for galvanic dissolved oxygen sensors StirrOx® G, CellOx® 325, DurOx® 325	205217
SC-FDO® 925	Replacement membrane cap for optical dissolved oxygen sensor	201310
For additional products, see price list or www.WTW.com		

Conductivity cells

Depending on the application, we provide electrodes made of graphite or stainless steel to ensure that they do not chemically react with the measured sample.

Four electrode conductivity cells

- Universal application area due to wide measuring range between 1 µS/cm and 2000 mS/cm
- Only one calibration point required due to linearity over the entire measuring range
- Measuring cells in different designs for almost all applications
- Highest accuracy through high-precision manufacturing
- Large application range in aqueous solutions through unique electrode technology

Two electrode measuring cells made of stainless steel

- Optimised measuring cells, especially for use in ultra-pure water measurement
- No disturbances due to CO_2 introduction with stainless steel measuring cells with flow-through vessels
- Precise measurement in the lower measuring range due to optimised geometry
- Suitable for ultra-pure water measurement according to pharmacopoeia

Two electrode measuring cell made of graphite

- Robust measuring cell for simple measurements and in teaching and training
- Robust design with durable epoxy shaft
- For all aqueous samples
- For all current conductivity meters

IDS Conductivity cells – digital

A selection of two electrode and four electrode conductivity cells for covering a wide range of applications, from ultra-pure water to viscous samples can be found in the chapter “Multi-parameter measurement”.

see page 34

from left to right: the digital IDS sensors (1) TetraCon® 925, (2) LR 925/01, (3) TetraCon® 925 / C, (4) TetraCon® 925 / LV; the wireless ready IDS plug head electrodes (5) TetraCon® 925-P, (6) TetraCon® 925 / LV-P, (7) LR 925/01-P

Conductivity cells – analogue
For every application

Technical specifications: Conductivity cells - analogue

Universal applications

	TetraCon® 325	TetraCon® 325-3	TetraCon® 325-6	TetraCon® 325-10	TetraCon® 325-15	TetraCon® 325-20
Order no.	301960	301970	301971	301972	301973	301974
Type	4 electrode	4 electrode	4 electrode	4 electrode	4 electrode	4 electrode
Electrode material	Graphite	Graphite	Graphite	Graphite	Graphite	Graphite
Flow-through vessel	-	-	-	-	-	-
Shaft material	Epoxy	Epoxy	Epoxy	Epoxy	Epoxy	Epoxy
Shaft length	120 mm	120 mm	120 mm	120 mm	120 mm	120 mm
Cell constant	0.475 cm^{-1}	0.475 cm^{-1}	0.475 cm^{-1}	0.475 cm^{-1}	0.475 cm^{-1}	0.475 cm^{-1}
Diameter	15.3 mm	15.3 mm	15.3 mm	15.3 mm	15.3 mm	15.3 mm
Cable length	1.5 m	3 m	6 m	10 m	15 m	20 m
Measuring range	1 µS/cm to 2000 mS/cm	1 µS/cm to 2000 mS/cm	1 µS/cm to 2000 mS/cm	1 µS/cm to 2000 mS/cm	1 µS/cm to 2000 mS/cm	1 µS/cm to 2000 mS/cm
Temperature sensor	0 to 100 °C	0 to 100 °C	0 to 100 °C	0 to 100 °C	0 to 100 °C	0 to 100 °C
min./max. immersion depth	36/120 mm	36/120 mm	36/120 mm	36/120 mm	36/120 mm	36/120 mm

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Special applications

	TetraCon® 325/C	TetraCon® 325/S
Order no.	301900	301602
Type	4 electrode	4 electrode
Electrode material	Graphite	Graphite
Shaft material	Epoxy	Epoxy
Shaft length	120 mm	120 mm
Cell constant	0.475 cm^{-1}	0.491 cm^{-1}
Diameter	15.3 mm	15.3 mm
Cable length	1.5 m	1.5 m
Measuring range	1 µS/cm ... 2000 mS/cm	1 µS/cm ... 2000 mS/cm
Temperature range	0 ... 100 °C	0 ... 100 °C
Temperature probe	NTC 30 kOhm	NTC 30 kOhm
min./max. immersion depth	36/120 mm	40/120 mm

Low conductivities

	LR 325/01	LR 325/001
Order no.	301961	301963
Electrode material	Stainless steel	Stainless steel
Flow-through vessel	Glass	Stainless steel
Shaft material	Stainless steel	Stainless steel
Shaft length	120 mm	120 mm
Cell constant	0.1 cm^{-1}	0.01 cm^{-1}
Diameter	12 mm	20 mm
Cable length	1.5 m	1.5 m
Measuring range	0.001 ... 200 µS/cm	0.0001 µS ... 30 µS/cm
Temperature range	0 ... + 100 °C	0 ... + 100 °C
Temperature probe	NTC 30 kOhm	NTC 30 kOhm
Filling volume	17 ml (without sensor)	Approx. 10 ml (without sensor)
min./max. immersion depth	30/120 mm	40/120 mm

Simple applications and flow-through measurement in the laboratory

	KLE 325	TetraCon® DU/T or DU/TH
Order no.	301995	301252 or 301254
Type	2 electrode	4 electrode
Electrode material	Graphite	Graphite
Flow-through vessel	-	Epoxy
Shaft material	Epoxy	-
Shaft length	120 mm	-
Cell constant	0.84 cm^{-1}	0.778 cm^{-1}
Diameter	15.3 mm	-
Cable length	1.5 m	-
Measuring range	1 µS/cm to 20 mS/cm	10 µs/cm to 1000 mS/cm
Temperature range	0 to 80 °C	0 to 60 °C
Temperature probe	NTC 30 kOhm	NTC 30 kOhm
min./max. immersion depth	36/120 mm	-

Four-electrode conductivity cells

TetraCon® 325

TetraCon® S

TetraCon® 325/C

Graphite measuring cells for universal use

- TetraCon® 325

Suitable for almost all conductivity measurements in aqueous samples; for outdoor use available with cable lengths up to 20 m.

Graphite measuring cells for special applications

- TetraCon® 325 S

With shovel-shaped electrode holder, especially suitable for measuring in pasty samples.

Graphite measuring cells for special applications

- TetraCon® 325/C

This measuring cell is designed for measurement in acidic samples.

Flow-through measuring cells in the laboratory

- TetraCon® 325 DU

Four-electrode flow-through conductivity cell, (also with Hansen connector, DU / TH), for standard applications. Requires separate connection cable KKDU 325.

TetraCon® DU, DU/TH

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Two-electrode conductivity cells with stainless steel and graphite electrodes

LR 325/01

LR 325/001

KLE 325

Two electrodes ultra-pure water measuring cells

- LR 325/01

Two electrode measuring cell with concentric stainless steel electrodes and glass flow-through vessel for measuring low conductivities up to 200 µS/cm.

Two electrodes pure-water measuring cells

- LR 325/001

Two electrode measuring cell with concentric stainless steel electrodes and glass flow-through vessel for measuring trace conductivities up to 30 µS/cm.

Simple two electrode graphite LF measuring cell

- KLE 325

Graphite-based two-electrode measuring cell for medium measuring ranges up to 20 mS/cm for simple applications, also in training and education.

Calibration and test means

6R/SET/Lab 1 Test resistance set

Kit for pure water measurement according to pharmacopoeia

This kit includes LR 325/01 ultra-pure water cell, flow-through vessel D 01 / T made of glass (USP-KIT 1) or stainless steel (USP-KIT 2) NIST traceable 5 µS standard with accuracy ± 2% and 6R/SET/Lab 1 test resistance set.

Calibration standard 5 µS/cm

Calibration standard 100 µS/cm

Shelf life 2 years, NIST traceable with accuracy ±3%

Calibration standard 5 µS/cm

Shelf life 1 year, NIST traceable with accuracy ±2%

Order information: Calibration and test means

Model	Description	Order no.
USP Kit 1	Kit for conductivity measurement according to pharmacopoeia, consisting of: LR 325/01 Purest water cell, D 01/T flow-through vessel, NIST traceable 5 µS/cm standard with accuracy ±2 % and 6R/SET/Lab 1 testing resistance set	300569
USP Kit 2	as USP Kit 1, but stainless steel flow-through vessel instead of D 01/T	300568
Calibration means		
KS 100µS	Calibration standard 100 µS/cm, shelf life 2 years, NIST traceable with accuracy ±3 % (300 ml)	300578
KS 5µS	Calibration standard 5 µS/cm, shelf life 1 year, NIST traceable with accuracy ±2 % (300 ml)	300580
E-SET Trace	Calibration set (6 bottles at 50 ml calibration and control standard, KCl 0.01 mol/l), NIST traceable with accuracy ±0.5%	300572

For accessories & cables, see price list or www.WTW.com/de

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Flow-through vessels

With WTW conductivity cells, there are different possibilities to measure in the flow.

Ultra-pure water measuring cells are offered with a compatible measuring vessel, as impurities by introducing carbon dioxide must also be absolutely excluded.

For conductivity cells with a diameter of 12 mm, a flow-through measuring vessel is also available. For standard measuring cells with a diameter of 15.3 mm, there is the D 201, which ensures a trouble-free conductivity measurement.

Trace conductivity cell LR 325/001
with stainless steel flow-through vessel

Flow-through measuring cell for four pole
conductivity cell

Order information: Flow-through vessels

Model	Description	Order no.
D 201	Flow-through vessel of PMMA, internal diameter 18 mm, V*=13 ml (To TetraCon® 325)	203730
D 01/T	Flow-through vessel of glass, internal diameter 18 mm, V*=17 ml (Replacement measuring vessel for LR 325/01)	302750

For accessories & cables, see price list or www.WTW.com

V* = Filling quantity without sensor