

SenTix[®] ORP
SenTix[®] PtR
SenTix[®] Au
SenTix[®] Ag

ORP electrodes

**Accuracy when
going to press**

The use of advanced technology and the high quality standard of our instruments are the result of continuous development. This may result in differences between this operating manual and your combination electrode. Also, we cannot guarantee that there are absolutely no errors in this manual. Therefore, we are sure you will understand that we cannot accept any legal claims resulting from the data, figures or descriptions.

**Note**

The latest version of this operating manual can be found on the Internet at www.WTW.com.

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Technical data

General data

WTW model	Reference electrolyte	Electrode material and shape	Junction
SenTix [®] ORP	3 mol/l KCl, Ag ⁺ -free	Platinum / Round piece	Ceramic
SenTix [®] PtR	Polymer	Platinum / Round piece	Split ring
SenTix [®] Au	3 mol/l KCl, Ag ⁺ -free	Gold / Cylinder cap	Ceramic
SenTix [®] Ag	2 mol/l KNO ₃ + 0.001 mol/l KCl	Silver / Cylinder cap	Ceramic

Measurement and application characteristics

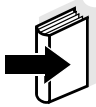
WTW model	Allowed temperature range	Typical application
SenTix [®] ORP	0 ... 100 °C	Laboratory
SenTix [®] PtR	-5 ... 100 °C	Laboratory / Emulsions and Suspensions
SenTix [®] Au	-5 ... 100 °C	Laboratory / Oxidizing solutions without chloride
SenTix [®] Ag	-5 ... 100 °C	Laboratory / Argentometry

Shaft dimensions, shaft material, electrical connection

WTW model	Shaft			Electrical connection		
	Length [mm]	Ø [mm]	Material	Combination electrode connection	Meter connection	Cable length
SenTix [®] ORP	120	12	Glass	S7 plug-in connector	depending on S7 cable*	
SenTix [®] PtR	120	12	Glass	S7 plug-in connector	depending on S7 cable*	
SenTix [®] Au	120	12	Glass	S7 plug-in connector	depending on S7 cable*	
SenTix [®] Ag	120	12	Glass	S7 plug-in connector	depending on S7 cable*	

* Connection cable not included in the scope of delivery of the combination electrode

Commissioning, measuring, testing



Commissioning

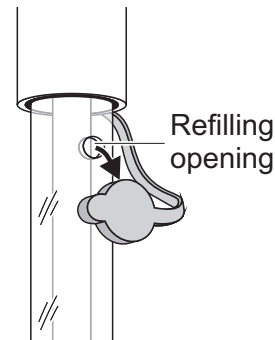
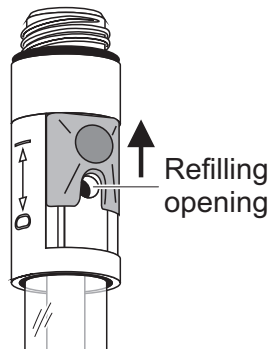
Note

For ORP electrodes with platinum electrode, please observe the instructions in section ACTIVATING PLATINUM ELECTRODES.

Prepare the combination electrode for measuring as follows:

- SenTix® ORP, SenTix® Au and SenTix® Ag: Open the refilling opening for the reference electrolyte solution. Depending on the model, the stopper of the refilling opening is an elastomer stopper or a slider.

The refilling opening must always be open during measurement!



- Remove the watering cap from the electrode tip. Possible salt deposits in the area of the watering cap do not affect the measuring characteristics and can easily be removed with deionized water.



Note

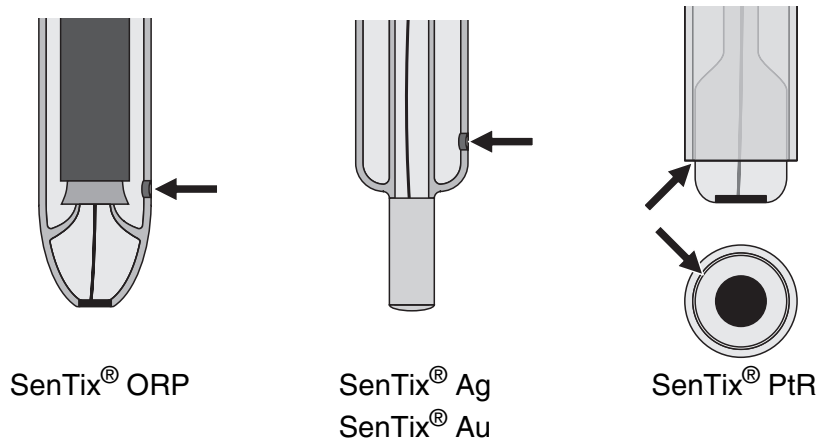
Please keep the watering cap. It is required for storing the combination electrode. Always keep the watering cap clean.

- Connect the combination electrode to the meter.
- Measure with the combination electrode according to the operating manual of the meter and observe the following rules while doing so:

General rules for measuring

- SenTix® ORP, SenTix® Au and SenTix® Ag: Make sure the refilling opening for the reference electrolyte solution is open.
- Avoid displacement of the sample solution from one measurement to the next by taking the following measures:
 - Briefly rinse the calibration beakers with the solution the beakers are to be filled with next.
 - Between measurements, rinse the combination electrode with the solution specified below. Alternatively, you can also rinse the combination electrode with deionized water and then carefully dab it dry.
- Immerse the combination electrode in the solution in a vertical or slightly tilted position.

- Make sure the immersion depth is correct. The junction must be completely submersed in the solution. The junction is in the area of the bottom end of the shaft (see arrow).



At the same time the level of the reference electrolyte in SenTix® ORP, SenTix® Au and SenTix® Ag electrodes must be at least 2 cm above the level of the solution.

Conversion to the standard hydrogen electrode potential

$$U_H = U_{\text{Meas}} + U_{\text{Ref}}$$

where: U_H = ORP voltage, relative to the standard hydrogen electrode

U_{Meas} = measured ORP voltage

U_{Ref} = voltage of the reference system relative to the standard hydrogen electrode

U_{Ref} is temperature dependent and can be taken from the following table (also refer to DIN 38404-6):

T (°C)	U_{Ref} [mV]		T (°C)	U_{Ref} [mV]	
	SenTix® ORP SenTix® Au	SenTix® PtR		SenTix® ORP SenTix® Au	SenTix® PtR
0	+224	+221	35	+200	+187
5	+221	+216	40	+196	+181
10	+217	+212	45	+192	+176
15	+214	+207	50	+188	+171
20	+211	+202	55	+184	+165
25	+207	+197	60	+180	+160
30	+203	+192			

Storage

During short measuring breaks

Immerse the electrode in the reference electrolyte with the refilling opening open.

Combination electrode	Reference electrolyte	WTW Model (see page 19)
SenTix [®] ORP, SenTix [®] PtR, SenTix [®] Au	3 mol/l KCl, Ag ⁺ -free	KCl-250 (250 ml)
SenTix [®] Ag	2 mol/l KNO ₃ + 0.001 mol/l KCl	ELY/ORP/AG (250 ml)

Prior to the next measurement, briefly rinse the combination electrode with the test sample or deionized water.

Overnight or longer

Insert the clean electrode into the watering cap filled with reference electrolyte and shut the refilling opening.



Note

During longer storage periods, salt deposits may develop on the watering cap. They do not affect the measuring characteristics and can easily be removed with deionized water when the combination electrode is put into operation again.

Aging

Every ORP combination electrode undergoes a natural aging process. Extreme operating conditions can considerably shorten the lifetime of the combination electrode. These are:

- Strong acids or lyes, hydrofluoric acid, organic solvents, oils, fats, bromides, sulfides, iodides, proteins
- High temperatures
- Great changes in pH and temperature.

The warranty does not cover failure caused by measuring conditions and mechanical damage.

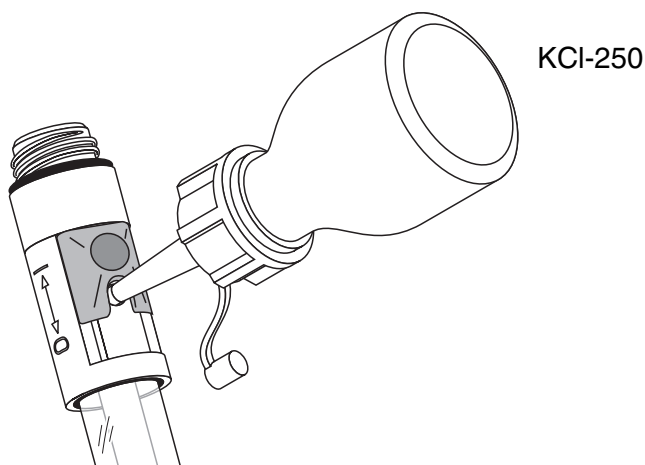
Maintenance and cleaning

During operation, a small amount of reference electrolyte leaks through the junction from the combination electrode into the test sample. If the level of reference electrolyte becomes too low with time, refill it through the refilling opening.

Refilling reference electrolyte (SenTix® ORP and SenTix® Au)

Refilling is very easy using a dropper bottle. To do so, proceed as follows:

- Cut off the tip of the dropping bottle at a right angle until the opening in the tip can be seen
- Open the refilling opening of the combination electrode
- Press the tip of the dropper bottle into the refilling opening while turning it slightly
- Pump several small quantities of the reference electrolyte into the stem using the dropper bottle
- Pull the dropper bottle out of the refilling opening while turning it slightly if necessary.



Refilling reference electrolyte (SenTix® Ag)

The special ELY/ORP/AG reference electrolyte is required for the SenTix® Ag. To refill, open the refilling opening and fill the reference electrolyte into the stem using a suitable pipette.

Cleaning
(SenTix® ORP,
SenTix® Ag,
SenTix® Au)

Remove water-soluble contamination by rinsing with deionized water. Remove other contamination as follows:

Contamination	Cleaning procedure
Fat and oil	Rinse with water containing household washing-up liquid
Lime and hydroxide deposits	Rinse with citric acid (10 % by weight)
Proteins	Immerse in pepsin cleaning solution PEP/pH for approx. 1 hour. <u>Note:</u> Make sure the level of the reference electrolyte is above that of the cleaning solution.

Cleaning
(SenTix® PtR)

Remove water-soluble contamination by rinsing with deionized water. Other types of contamination have to be removed as follows while the contact time with the detergents should be kept as short as possible:

Contamination	Cleaning procedure
Fat and oil	Rinse with water containing household washing-up liquid
Lime and hydroxide deposits	Rinse with citric acid (10 % by weight)

After cleaning

Rinse the combination electrode with deionized water.

Activating platinum electrodes

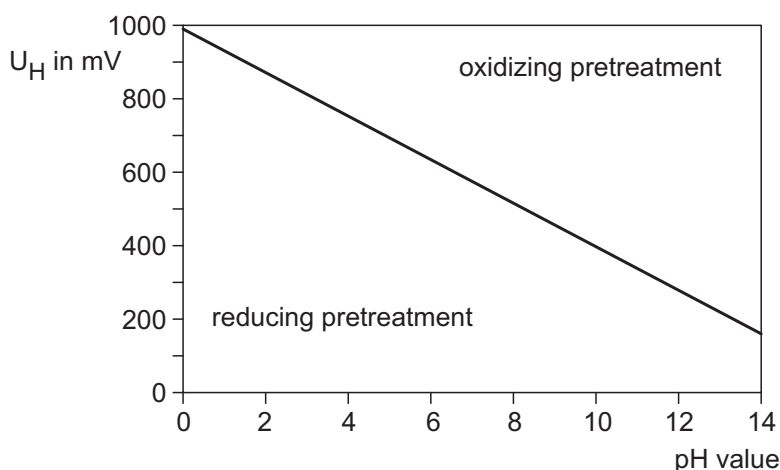
**First-time
activation during
installation and as
required**

For the first-time activation use the activation powder from the SORT/RH reagent set (component of the SORT/RH reagent set). Immerse the moist (but not dripping) platinum electrode into the activation powder and rotate the electrode several times in the powder. Then remove the activation powder under flowing water with a soft brush (e.g. toothbrush).

**Activation during
very long
set-up times**

When changing from oxidizing to reducing test solutions and vice versa this can result in set-up times that can take significantly more than an hour. In this case pretreatment (activation) of the platinum surface can shorten the set-up time. The type of pretreatment (reducing or oxidizing) is based on the pH value and the ORP voltage (U_H) of the test solution where the latter must be estimated for the first measurement.

The type of pretreatment can then be determined using the following diagram where U_H is based on the normal hydrogen electrode:



Oxidizing pretreatment

Immerse the platinum electrode for two to three days in a sulfuric acid chlorine solution. Chlorine powder for producing the solution is included in the SORT/RH reagent set.

Note: The diaphragm must not be immersed in the chlorine solution!

Reducing pretreatment

When the electrode is ready for the test immerse it in the RH 28 ORP buffer solution and wait for a stable measured value.



Note

Detailed information on activating platinum electrodes, such as how to produce the chlorine solution, is given in the WTW application report entitled REGENERATING ORP ELECTRODES. The application report is included in the SORT/RH reagent set.

Wear parts and accessories

Description	Model	Order no.
Reference electrolyte solution 3 mol/l KCl, Ag ⁺ -free (250 ml)	KCI-250	109 705
Reference electrolyte solution 2 mol/l KNO ₃ + 0.001 mol/l KCl (250 ml)	ELY/ORP/AG	109 735
Reagent set for regenerating ORP platinum electrodes, consisting of 10 g activation powder and 30 g chlorine powder	SORT/RH	109 730
ORP buffer solution for checking ORP electrodes, $U_H = 427$ mV, bottle of 250 ml	RH 28	109 740
Pepsin cleaning solution, 3 bottles of 250 ml	PEP/pH	109 648

