

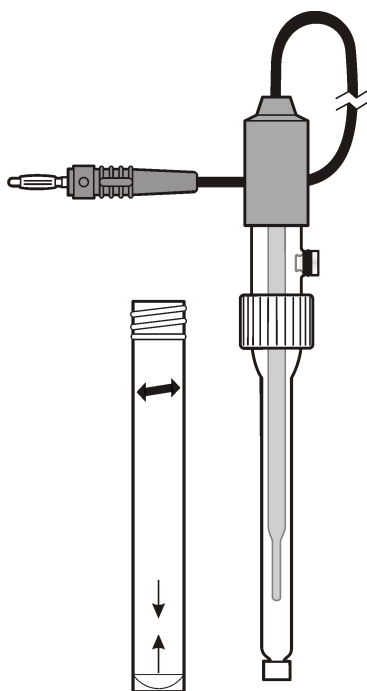


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# symphony™ Reference Electrodes

07/2012, Edition 1

**User Manual**





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## Safety information

### Precautionary labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed. A symbol on the instrument is referenced in the manual with a precautionary statement.

	<p>Electrical equipment marked with this symbol may not be disposed of in European public disposal systems after 12 August of 2005. In conformity with European local and national regulations (EU Directive 2002/96/EC), European electrical equipment users must now return old or end-of-life equipment to the Producer for disposal at no charge to the user.</p> <p><b>Note:</b> For return for recycling, please contact the equipment producer or supplier for instructions on how to return end-of-life equipment, producer-supplied electrical accessories, and all auxiliary items for proper disposal.</p>
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## Specifications

Specifications are subject to change without notice.

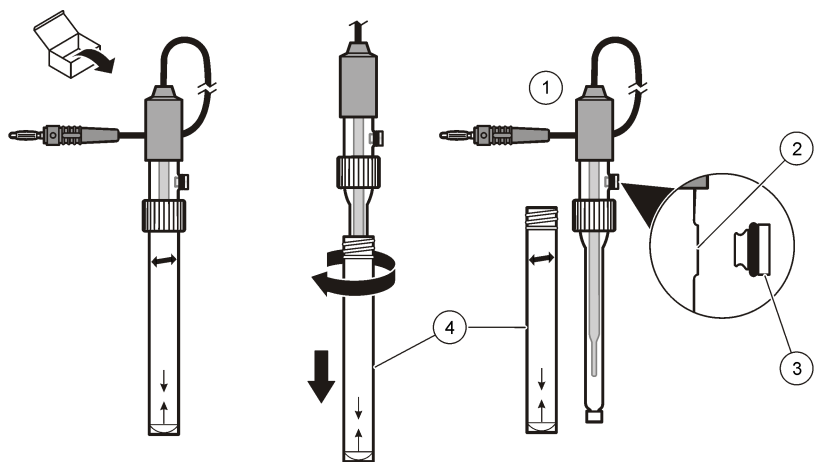
Specification	89231-646	89231-648
Temperature range	-10 to 100 °C (14 to 212 °F)	-10 to 100 °C (14 to 212 °F)
Reference type	Red Rod	Double-junction Red Rod
Junction type	Porous pin	Porous pin (2x)
Electrolyte	Refillable	Refillable
Filling solution	Saturated KCl	Saturated KCl
Body material	Glass	Glass
Length	103 mm	103 mm
Diameter	7.5 mm	12 mm
Cable	1 m	1 m
Connector	Banana	Banana

## Product overview

The reference electrodes are used with an indicator electrode to measure parameters in general aqueous samples. Refer to [Figure 1](#). Refer to [Sample requirements](#) on page 5. A bottle of filling solution is supplied with each reference electrode.

These reference electrodes are used with sympHony meters. Refer to [Meter compatibility](#) on page 4.

**Figure 1 Electrode overview**



1 Refillable electrode	3 Filling hole plug
2 Filling hole	4 Electrode storage tube

**Meter compatibility**

The reference electrodes are compatible with the symphony benchtop meter models: B10P, B10C, B20PI, B30PCI and B40PCID.

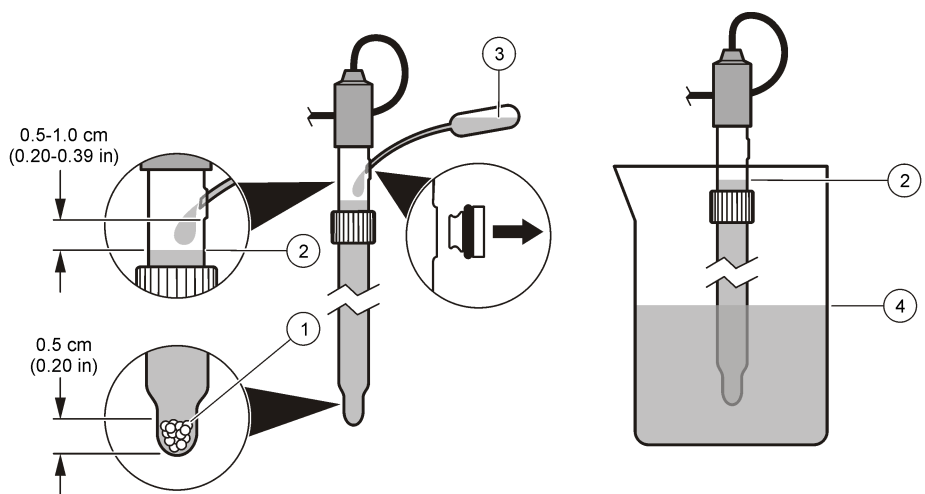
**Preparation for use**

<b>⚠ CAUTION</b>	
	Personal injury hazard. Broken glass can cause cuts. Use tools and personal protective equipment to remove broken glass.

To prepare the electrode for sample measurement:

1. Turn the electrode storage tube and remove it from the electrode. Keep the electrode storage tube.
2. Rinse the electrode thoroughly with deionized water to fully remove the storage solution or any KCl salt buildup. Blot dry with a lint-free cloth.
3. Remove the filling hole plug and keep it for storage. The filling hole must be open when the electrode is in use.
4. Add the applicable filling solution to the electrode until the filling solution is above the standard solution or sample level when in use (approximately 0.5–1.0 cm below the filling hole). Refer to [Figure 2](#). Refer to [Fill the electrode](#) on page 6.
5. Make sure that there is approximately 0.5 cm (0.2 in.) of KCl crystals in the filling solution in the electrode. Refer to [Figure 2](#). For measurements at temperatures higher than 60 °C (140 °F), add KCl crystals through the filling hole. Refer to [Table 1](#) to calculate the amount of KCl crystals to add. The amount of KCl crystal necessary increases linearly from 60 to 100 °C.
6. Make sure that the KCl crystals move freely through the liquid when the electrode is inverted. If necessary, shake the electrode to loosen the crystals.
7. Shake the electrode downwards (like a thermometer) to remove any air bubbles in the bulb or between the KCl crystals. Air bubbles can cause slow responses or errors in measurement.

**Figure 2 Filling solution level**



1 KCl crystals	3 Filling solution
2 Filling solution level	4 Standard solution or sample level

**Table 1 KCl crystal level for Red Rod reference electrodes**

Temperature	Amount of KCl crystals	Add	Temperature	Amount of KCl crystals	Add
60 °C (158 °F)	0.5 g (0.5 cm)	0 g	90 °C (194 °F)	0.875 g	0.375 g
70 °C (158 °F)	0.625 g	0.125 g	100 °C (212 °F)	1.0 g (1.0 cm)	0.5 g
80 °C (176 °F)	0.750 g	0.25 g			

## Measurement

- Make sure that the internal and external ceramic diaphragms are in the sample.
- Rinse the electrode with deionized water between measurements.
- Keep the electrode in a sample between measurements for a maximum of 2 hours if the sample pH is not too high.
- When measurements are done, prepare the electrode for storage. Refer to [Storage](#) on page 7.

## Sample requirements

Some electrodes are not compatible with specific sample types. Electrode damage can occur.

- Samples should be aqueous. Measurements may be made in partially aqueous or some water-miscible solvents. The results must be interpreted with caution as the full pH scale is shifted when the solvent system changes.
- Red Rod reference electrodes are compatible with solutions that contain silver complexing or binding agents such as TRIS, proteins and sulfides as they have an encapsulated reference system.
- Proteins can collect on the sensing bulb. Make sure the electrode stays clean when these types of samples are measured.
- Do not use electrodes in solutions that are outside the temperature range of the electrode.

## Maintenance

### Clean the electrode

Clean the electrode when there is contamination on the sensor. Symptoms of contamination are:

- Readings are not accurate or consistent.
- The stabilization time is slow.
- Contamination is visible on the electrode (i.e., dirt).

1. Rinse the electrode with deionized water. Blot dry with a lint-free cloth.
2. Soak the electrode tip in the applicable cleaning agent. Refer to [Table 2](#).  
**Note:** KCl salt buildup can be removed from the electrode with warm deionized water.
3. Rinse or soak the electrode for 1 minute in deionized water.
4. Blot dry with a lint-free cloth.

**Table 2 Cleaning agent**

Contaminant	Cleaning agent	Soak time
General contaminants	Electrode cleaning solution	12–16 hours
Mineral deposits	0.1 N HCl solution	10–15 minutes
Fats, grease and oils	Warm, mild detergent solution	2 hours (maximum)

### Replace the filling solution

Replace the filling solution and KCl crystals when either occurs:

- The filling solution becomes contaminated.
  - The KCl crystals no longer move freely through the liquid when the electrode is inverted.
1. Use a syringe or small pipette to remove as much filling solution from the electrode as possible.
  2. If KCl crystals are still in the electrode:
    - a. Fill the electrode half full with the filling solution.
    - b. With a finger over the filling hole, shake the electrode until the crystals become loose.
    - c. If the crystals will not loosen, fill the electrode with filling solution. Put the electrode into a warm water bath for approximately 10 minutes (up to 60 °C (140 °F)).
    - d. Do step 1 again.
  3. Add approximately 0.5 cm (0.2 in.) of KCl crystals to the electrode through the filling hole.
  4. Fill the electrode. Refer to [Fill the electrode](#) on page 6.
  5. Soak the electrode in filling solution for 30 minutes.

### Fill the electrode

Add filling solution to the electrode when the filling solution level is low or is replaced. Refer to [Specifications](#) on page 3 for the applicable filling solution.

1. Remove the filling hole plug from the filling hole.
2. Remove the cap from the tip of the filling solution bottle.  
**Note:** If the tip of the filling solution bottle becomes clogged, remove the tip and soak it in warm water. Dry the tip fully.
3. Hold the bottle so that the tip is down. Put the tip of the bottle in the filling hole.
4. Slowly squeeze the bottle until the filling solution level is approximately 0.5–1.0 cm below the filling hole.

5. If the electrode will not be used immediately, put the electrode in storage. Refer to [Storage](#) on page 7.
6. Install the cap on the filling solution bottle.

## Storage

For the best performance, do not let the reference junction become dry. The electrode can be kept in a sample for a maximum of 2 hours if the sample pH is not too high.

1. Put the filling hole plug in the filling hole.
2. Rinse the electrode with deionized water. Blot dry with a lint-free cloth.
3. Put filling solution in the electrode storage tube. Refer to [Specifications](#) on page 3 for the applicable filling solution.
4. Put the electrode in the storage tube and turn to tighten.
5. Make sure that the ceramic diaphragm of the electrode is fully in the solution in the storage tube.

## Rehydrate the electrode

If the glass bulb becomes dry, rehydrate the electrode. A dry bulb will not operate correctly.

1. Soak the electrode in dilute HCl for several hours.
2. Rinse the electrode with deionized water. Blot dry with a lint-free cloth.









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