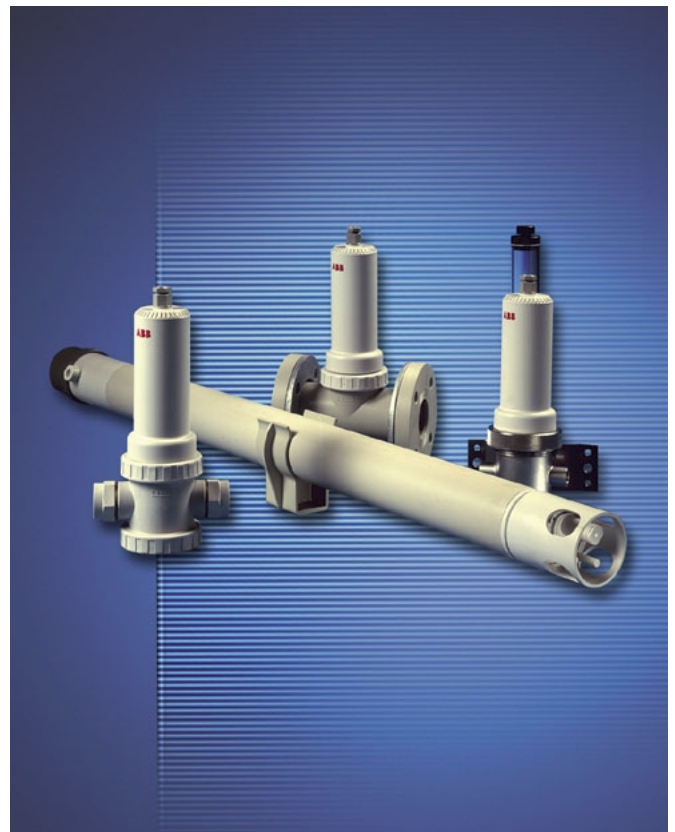


- **Detachable cable electrodes**
  - simplifies electrode replacement and reduces maintenance costs
- **Replaceable liquid junction and high capacity electrolyte reservoir**
  - cost effective and extends working life
- **Flow, in-line and dip versions available**
  - satisfies a wide range of applications
- **Stainless steel flow system with reservoir-fed reference electrode**
  - enables reliable pH measurement on low-conductivity waters
- **Optional in-line flow-powered, sensor cleaner**
  - optimizes electrode performance and reduces maintenance intervals



**Rugged and reliable performance  
in a wide range of harsh  
environments**

## General Information

The 7600 Series of electrode systems are the result of over fifty years experience of continuous on-line pH measurement. Flow, in-line and dip versions are available. All three types can be supplied in glass-coupled polypropylene.

A stainless steel version is available as a flow system which caters predominantly for low-conductivity and high-temperature applications.

## Sensors

A pH system is only as good as the sensors used to make the primary measurement. To satisfy a wide range of applications, and to meet the demands of modern processes, ABB have produced a range of electrodes to satisfy most requirements.

### pH Electrodes

There are a choice of five pH electrodes, including a high-temperature electrode for use with the stainless steel system.

### General Purpose Electrode

The general purpose electrode operates over 0 to 14pH, 0 to 100°C (32 to 212°F) and must be used when the mechanical wiper is employed. It is suitable for most industrial applications.

### Low Resistance Electrode

This unique low resistance membrane electrode is recommended for low-temperature, low-conductivity applications. It is used extensively throughout the water industry, where its speed of response on low-conductivity (thin) waters (less than 100 $\mu$ S/cm) and the sample temperature drops below 10°C (50°F). Its operating range is 0 to 10pH, 0 to 70°C (32 to 158°F).

**Note.** For conductivities less than 30 $\mu$ S/cm use the stainless steel electrode system – see page 6.

### High Temperature Electrode

This electrode is used only on high-temperature samples, i.e. above 50°C (122°F). The maximum operating temperature is 140°C (284°F). Primarily used on stainless steel systems.

### Platinum Electrode for Redox (ORP)

Enables Redox (ORP) measurements to be made using any of the electrode systems.

### Antimony pH Electrode

Designed to work in applications when Hydrofluoric Acid (HF) is present.

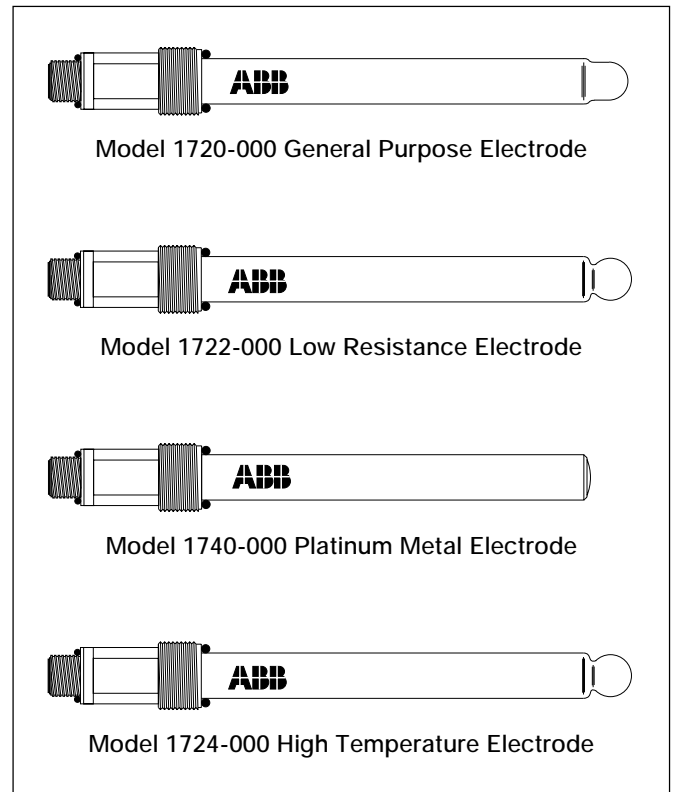
### Reference Electrodes

The key to success in many applications is the reference electrode. ABB have devised a unique approach to providing a choice of sealed or reservoir-fed reference electrodes using the same reference element. This is achieved by making the outer junction part of the electrode system, allowing the replaceable reference electrode to be significantly reduced in price and minimizing stock holding, as the same electrode is used for all three versions.

The sealed reference electrode satisfies most applications but where there is a fluctuating sample pressure, the reservoir-fed type is more suitable.

### Temperature Compensation

A three-wire PT100 temperature compensator is required to ensure high accuracy, especially where the sample temperature fluctuates widely.



*Typical Electrodes*

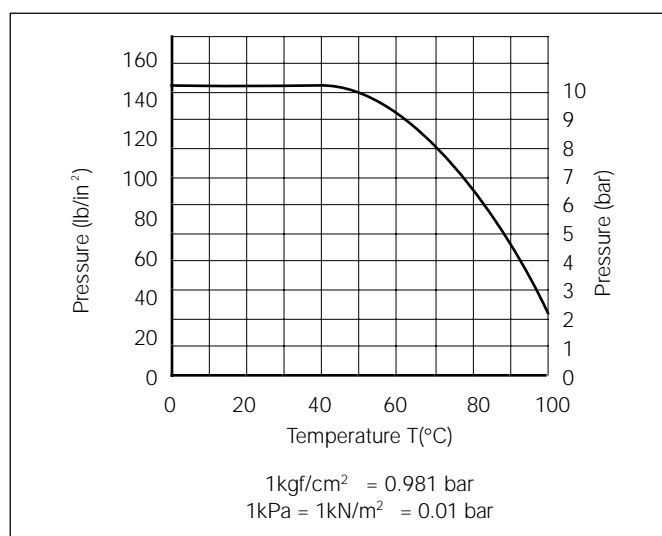
## Model 7651 – Flow Type

Model 7651 features a specially designed flowcell which permits operation in a wide variety of process installations. Its small cell volume ensures that representative readings are obtained at low flow rates, while the straight-through design minimizes silting or blocking from sample deposition. Process connections are 1 in. BSPT and 1/2 in. BSPT or NPT (adaptors for 1 in. BSPT and 1/2 in. BSPT/NPT are fitted into 1 in. BSPP, which may also be used with a bonded seal e.g. Dowty type).

1 in. flange connectors are also available manufactured in standard polypropylene which lowers the maximum operating temperature and pressure of the system.

## Cleaning Options

An in-line, flow-powered cleaner is available as an option. Process flow activates a sensor wiper and aids the reduction of sensor fouling.



Model 7651 Flow System Operating Pressure v Temperature

## Specification

### Body material

Coupled glass-reinforced polypropylene, ICI grade HW60 GR30/9897

### pH range

0 to 14

### Operating temperature range

-5 to 100°C (23 to 212°F)

### Maximum operating temperature

100°C at 2.1 bar (212°F at 30lb/in<sup>2</sup>), see graph for details

### Maximum operating pressure at 25°C (77°F)

10.6 bar (150lb/in<sup>2</sup>), see graph for details

### Process connections standard

- 1 in. BS10 flange
- 1/2 in. BSPT female, adaptors provided and
- 1 in. BSPP female

### Process connections optional

- 1 in. BS10 female
- 1/2 in. NPT female adaptors

### Mounting arrangements

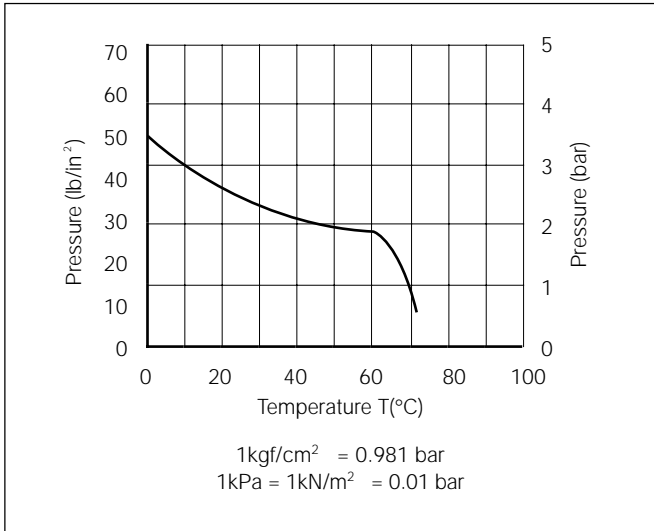
Panel- or wall-mounting, bracket supplied

### Model 7652 – In-line Type

Model 7652 is supplied with a flanged T-fitting for mounting directly in a 2 in. diameter pipeline. Standard flanges are 2 in. BS10 Table E, with other specifications available to order. The flanged-tee is manufactured in standard polypropylene, giving a more than adequate temperature/pressure specification although not permitting the extremes possible with 7651.

### Cleaning Options

There are no cleaning options available on Model 7652.



Model 7652 In-line System Operating Pressure v Temperature

### Specification

#### Body material

Polypropylene ICI 112/00/9897 and glass-reinforced polypropylene

#### pH range

0 to 14

#### Operating temperature range

-5 to 70°C (23 to 158°F)

#### Maximum operating temperature

70°C (158°F) with no pressure, see graph for details

#### Maximum operating pressure at 25°C (77°F)

2.6 bar (37lbf/in<sup>2</sup>), see graph for details

#### Process connections standard

2 in. BS10 Table E flanges

#### Process connections optional

2 in. ASA150 flanges

#### Mounting arrangements

In pipeline

## Models 7654, 7655 and 7656 – Dip Type Systems

Dip systems, for use in tanks and channels, are available with stem lengths as follows:

Model 7654	1m (39 in.)
Model 7655	2m (78 in.)
Model 7656	3m (118 in.)

Longer stem lengths can be produced to order, although it should be noted that systems in excess of 3m (118 in.) may produce handling difficulties. The stem tube is made of standard polypropylene and all other parts are made of glass-coupled polypropylene.

The skirt at the bottom of the tube protects the electrodes from solid debris and is rapidly removed for maintenance and cleaning.

All 7654/5/6 Dip systems are supplied with clip-on mounting brackets to aid fitting to walls of open channels or open tanks. Customer-supplied adjustable or weld-on flanges can be utilized for closed tank installations.

### Guide to Chemical Resistance of Glass-Coupled Polypropylene

Chemical	Glass Coupled Polypropylene – Sample Temperature	
	20°C	60°C
Ammonium Hydroxide	✓	✓
Calcium Hydroxide	✓	✓
Chlorine Gas (wet)	Degrades	Degrades
Hydrochloric Acid (20%)	✓	✓
Hydrochloric Acid (30%)	✓	—
Hydrochloric Acid (100%)	—	—
Milk Products	✓	✓
Nitric Acid (50%)	✓	(to 30°C)
Phosphoric Acid (50%)	✓	✓
Sodium Hydroxide (50%)	✓	✓
Sulphuric Acid (50%)	✓	Limited resistance

This information is intended as a guide only and is not necessarily applicable in all working conditions. Please contact ABB for detailed information regarding application suitability.

## Specification

### Body material

Polypropylene and coupled-glass reinforced polypropylene

### pH range

0 to 14

### Immersion length

1m (39 in.), 2m (78 in.) and 3m (118 in.)

### Operating temperature range

–5 to 80°C (23 to 176°F)

### Maximum operating temperature

80°C at 2.8 bar (176°F at 40lb/in<sup>2</sup>)

### Process connections standard

75mm OD dip tube; wall-mounting clamp(s) supplied

## **7660 Stainless Steel Flow System**

The 7660 stainless steel flow system, with reservoir-fed reference electrode, has been designed to achieve reliable and accurate results in low-conductivity waters (less than 5 $\mu$ S/cm) at atmospheric pressure.

A special version, with sealed reference electrode, is available to work in high-temperature/high-pressure applications.

Ease of maintenance is a major feature. The system is available with 3/8 in. NPT process connections.

The system has been evaluated extensively on low-conductivity waters and ammonia-dosed boiled feed water. When used with 4630/35 pH Monitors it provides accurate results, referenced back to 25°C (77°C). There are choices of glass and reference electrodes to satisfy the appropriate application.

## **Sensors**

### **pH Electrode**

The 1722-000 low resistance electrode provides a fast response on low-conductivity waters and is recommended for boiler water pH applications. Restricted to a maximum of 70°C (158°F) operating temperature and 0 to 10pH.

The 1720-000 general purpose electrode operates over the full 0 to 14pH range and 0 to 100°C (32 to 212°F).

Model 1724-000 high-temperature electrode enables pH to be measured up to a maximum temperature of 140°C (284°F).

### **Reference Electrode**

The unique ABB reference electrode plays a key role in the success of the measurement. This is particularly so on low-conductivity water applications as the 1730-000 has been designed to ensure that accurate and reliable readings are obtained when used on such samples. The use of a reservoir is essential and is supplied as standard with this system. As the reservoir feeds the electrode body rather than the electrode this means that customers with applications for both reservoir-fed and sealed reference applications need stock only one type of spare electrode.

### **Temperature Compensator 1750-000**

The system employs a 3-wire PT100 temperature compensator and operates over the range -10 to 110°C (14 to 230°F).

### **Connector Cable™**

The connector cable used with this system comprises a multi-core cable with three IP67 plug connectors at one end and tag connectors at the other end. There are standard cables of 3m (10 ft), 5m (16 ft), 10m (32 ft) and 20m (65 ft) lengths. Non-standard length cables can be made up to a maximum of 100m (325 ft). Alternatively a standard length, together with a junction box and a cable tagged at both ends, can be supplied.

## Specification

### Body material

Stainless steel

### Operating temperature range

0 to 100°C (32 to 212°F) – with appropriate electrodes

### Maximum operating pressure

Reservoir-fed reference electrode: Atmospheric

Sealed reference electrode: 2.1 bar (30 psi) at 100°C (212°F)

10.6 bar (150 psi) at 25°C (77°F)

### Process connections

$\frac{3}{8}$  in. NPT female

### Mounting arrangements

Wall-mounting brackets supplied.

## Accessories

There are a number of accessories which are available for use with the 7600 Series system:

1) Reservoir (part no. 7650-030) – used primarily with 7660 stainless steel system in low-conductivity water applications.

2) Junction Box (part no. 7650-045) – used when connecting cables longer than 20m (65ft) are required.

Order 1 x standard connector cable together with 7650-045 and the appropriate length of extension cable (part no. 0233-712).

3) Spares Kit – there are two spares kits available:

a) In-line/dip systems 7650-040

b) Stainless steel systems 7660-040.

and each comprises a complete set of 'O' rings.

4) Conversion Kits – it is possible to convert 7601, 7602, 7604 and 7605 systems to stainless steel version 7660.

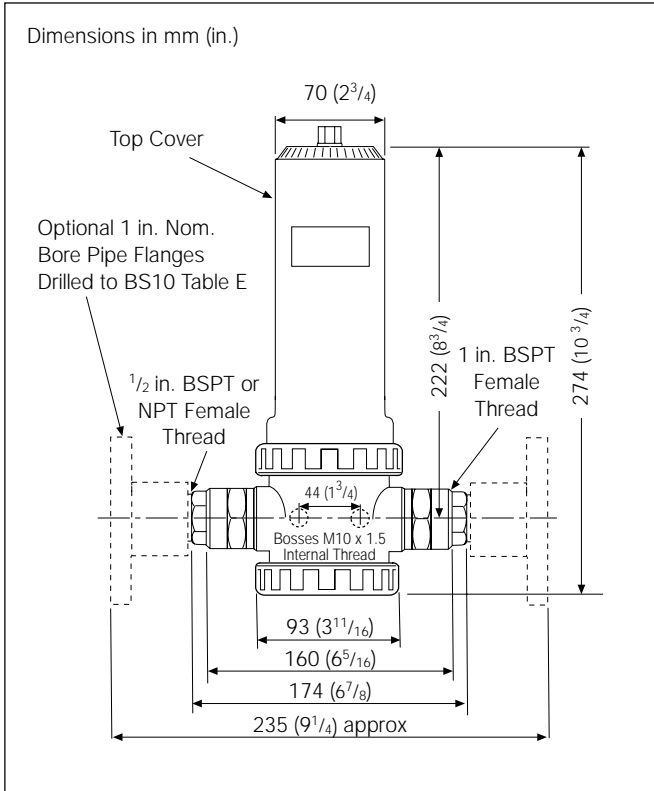
For 7601 and 7602 order the conversion kit – 7650-100

For 7604 and 7605 order the conversion kit – 7650-050

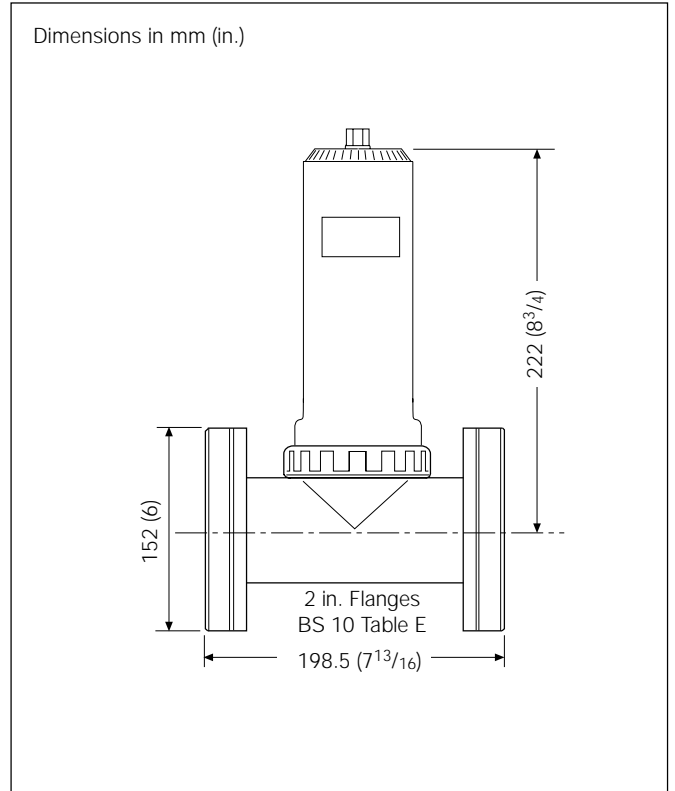
It is necessary to order a new connector cable and the appropriate electrodes.



**Overall Dimensions**

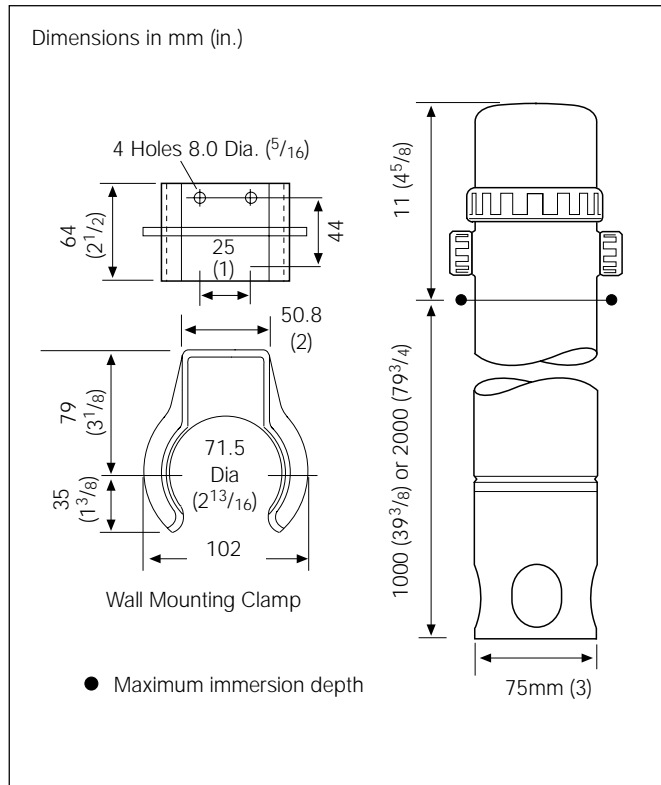


Model 7651

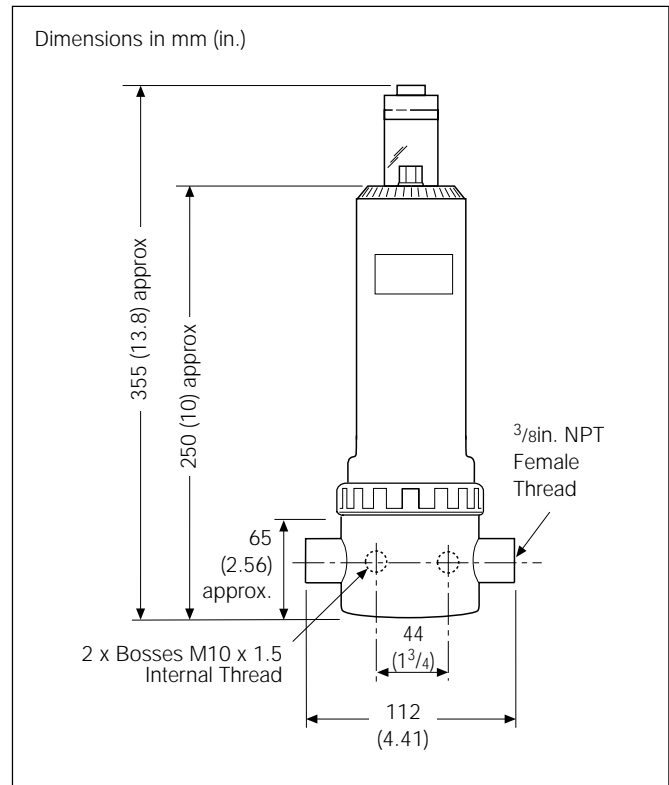


Model 7652

...Overall Dimensions



Models 7654/5/6



Model 7660

## Ordering Information

<b>7600 Series pH/Redox Electrode System</b>	<b>76</b>	<b>XX /</b>	<b>0</b>	<b>X</b>	<b>X</b>
<b>System Type and Material</b>					
<b>Polypropylene Systems</b>					
Flow system with 1/2 in. and 1 in. process connections	51				
Flow system with 2 in. process connections	52				
Dip system – 1m (39 in.)	54				
Dip system – 2m (78 in.)	55				
Dip system – 3m (118 in.)	56				
<b>Stainless Steel System</b>					
Flow system with 3/8 in. process connections (reservoir-fed reference version)	60				
<b>Connection Cable Length and Type</b>					
<b>With Automatic Temperature Compensation</b>					
No cable				0	
3m (10ft) length				1	
5m (16ft) length				2	
10m (32ft) length				3	
20m (65ft) length				4	
Special length				S	
<b>For Redox</b>					
No cable				0	
3m (10ft) length				5	
5m (16ft) length				6	
10m (32ft) length				7	
20m (65ft) length				8	
Special length				M	
<b>Sensor Types</b>					
No sensor					0
1720-000 all purpose glass electrode 1730-000 standard reference electrode 1750-000 PT100 temperature compensator Recommended for industrial process/waste water.					1
1722-000 low resistance glass electrode 1730-000 standard reference electrode 1750-000 PT100 temperature compensator Recommended for potable waters					2
1740-000 Platinum electrode (Redox/ORP) 1730-000 standard reference electrode For Redox/ORP applications.					5
1741-000 Antimony electrode (pH) 1730-000 standard reference electrode Recommended for pH applications where HF is present in the sample					6
1724-000 High temperature glass electrode 1730-000 standard reference electrode 1750-000 PT100 temperature compensator For high temperature applications.					7

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