AP200 series
Rugged pH/Redox (ORP) sensor systems with rapid temperature response for critical processes

Introduction
The pH / redox (ORP) sensor AP200 provides high reliability and withstands the toughest environments for process monitoring and control. The rugged assembly is built to bear the rigors of weather and process. Parts in contact with the process comprise chemically-resistant PPS Ryton™ and stainless steel, or PPS Ryton™ and Hastelloy C. Flow-through holders are available in polypropylene, while the PPS Ryton™ insertion adapter enables installation in alternative material pipelines. Insertion and Flow-through systems tolerate temperatures up to 130 °C (266 °F) and pressures up to 6 bar (90 psi). The inner electrode connections are ingress-protected to IP 67 / NEMA 6P (exceeds NEMA 4X).

For more information
Further publications are available for free download from:
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or by scanning this code:
The Company

We are an established world force in the design and manufacture of instrumentation for industrial process control, flow measurement, gas and liquid analysis and environmental applications.

As a part of ABB, a world leader in process automation technology, we offer customers application expertise, service and support worldwide.

We are committed to teamwork, high quality manufacturing, advanced technology and unrivalled service and support.

The quality, accuracy and performance of the Company’s products result from over 100 years experience, combined with a continuous program of innovative design and development to incorporate the latest technology.
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1 Description

1.1 Introduction
This manual describes the installation and maintenance of the AP200 Series Process pH and Redox (ORP) Electrode Holder Systems.

1.2 Systems

1.2.1 Typical Systems
- AP201 Insertion system
- AP202 In-line, flow-through system
- AP203 Dip (immersion) system

1.2.2 AP120 Series Electrodes Used with Holders
- AP121/11000 General process 0 to 14 pH, 0 to 100°C
- AP121/21000 High temperature 0 to 14 pH, 0 to 130°C
- AP121/31000 Low temperature 0 to 10 pH, –5 to +50°C
- AP121/60000 Redox (ORP) platinum 0 to 100°C

See Section 6, page 15 for full details.

Fig. 1.1 System Schematics
2 Mechanical Installation

2.1 Installing the Systems

2.1.1 Model AP201 Insertion System
This system is designed to mount directly into a pipeline or tank. Mounting adaptors are available:

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7690 130</td>
<td>PPS Ryton™ R 1 ¼ in. adaptor</td>
</tr>
<tr>
<td>7690 134</td>
<td>Polypropylene 1 ¼ in. NPT adaptor</td>
</tr>
<tr>
<td>7690 129</td>
<td>Polypropylene R 1 ¼ in. adaptor</td>
</tr>
<tr>
<td>7690 131</td>
<td>1 in. NPT Stainless steel adaptor</td>
</tr>
<tr>
<td>7690 128</td>
<td>R 1 in. Stainless Steel adaptor</td>
</tr>
<tr>
<td>7690 132</td>
<td>DN25 Straight-weld socket</td>
</tr>
<tr>
<td>7690 133</td>
<td>DN25 Angled-weld socket</td>
</tr>
</tbody>
</table>

Dimensions in mm (in.)

![Diagram of Model AP201 Insertion System]

**Note.** When installing the Model AP201 insertion system, ensure that the electrode is fully immersed in sample under all operating conditions.
2.1.2 Model AP202 Inline System
This system is supplied with an inline tee-piece for mounting the system directly into a pipeline. Allow sufficient height above the system to enable the sensor to be withdrawn from the tee-piece.

Dimensions in mm (in.)

![Diagram of Model AP202 Inline System]

**Note.** Refer to Section 6, page 15 for information about the different versions.

![Typical Installation Diagram]

*Fig. 2.2 Model AP202 Inline System*
2.1.3 Model AP203 Flanged Dip (Immersion) System

This system is designed to be installed over an unpressurized tank or channel. A sliding flange is supplied to enable adjustment of the immersion depth. A suitable mounting bracket or support must be supplied by the user.

**Dimensions in mm (in.)**

![Dimensions Diagram]

**Note.** Ensure the thumb-screws compress the insert when clamping the flange to the dip tube.

![Typical Installation Diagram]

*Fig. 2.3 Model AP203 Flanged Dip (Immersion) System*
2.2 Removing the Sensor Holder

2.2.1 Models AP201 Insertion and AP202 Inline Systems

Fig. 2.4 Models AP201 and AP202 – Removing the Sensor Holder

Open cover and detach cables and jetwash tubing (if fitted) from cap

Twist cable shroud counter-clockwise and remove

Unscrew sensor holder retaining nut and remove sensor holder from in-line adaptor

Check O-ring is in position, located on underside of electrode holder
2.2.2 Model AP203 Flanged Dip (Immersion) System

Open cover and detach cables and jetwash tubing (if fitted) from cap.

1. Unscrew sensor guard from dip tube (see Note below).

2. Remove the sensor holder from the dip tube using the sensor guard as a tool. Engage the sensor guard lugs in the sensor holder slots. Twist the sensor holder counter-clockwise to disengage the bayonet lugs from the slots in the dip tube and withdraw the sensor holder. Ensure the O-ring remains clean.

Note.

- Before refitting the sensor guard, clean and regrease the threads and O-ring.
- Do not overtighten the sensor guard.

Fig. 2.5 Model AP203 – Removing the Sensor Holder
2.3 System Assembly

**Note.** Model AP201 shown. When assembling Models AP202 and AP203, refit the Tee piece to the sensor holder (AP202) or the sensor guard to the dip tube (AP203) – see Figs. 2.4 and 2.5.

1. Route cables and jetwash tube (if required) through cable shroud
2. Ensure support washer and O-ring are fitted to electrode
3. Insert sensor in holder
4. Tighten to recommended torque value of 125cNm
5. Locate sensor cable connector over keyway
6. Connect earth (ground) terminal to rod
7. Connect jetwash supply tube (if required – see Section 2.5, page 10) and tighten to recommended torque value of 60cNm
8. Locate cable shroud over sensor holder and twist clockwise to engage bayonet lugs in slots
9. Clip cables and jetwash tube (if required) into slots in protective cover
10. Close cover

**Fig. 2.6 System Assembly**
2.4 Jetwash System

The jetwash system enables automatic cleaning of both the measuring element and the reference junction by spraying either water or a cleaning solution at them in situ, thus reducing system maintenance requirements.

An external pump or solenoid valve is required, controlled by a pH analyzer with auto-cleaning control functions.

**Note.** For optimal performance, the pressure of the jetwash system should be 2 to 3 bar (30 to 45 psi) greater than the process pressure.

### Cleaning Solutions

The spray jet tube is available in 316 stainless steel. Some typical cleaning solutions are:

<table>
<thead>
<tr>
<th>Coating</th>
<th>Cleaning Agent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grease and Oils</td>
<td>Alkaline detergents or water-soluble solvents such as alcohols</td>
</tr>
<tr>
<td>Resins</td>
<td>Dilute alkalis</td>
</tr>
<tr>
<td>Limestone/Carbonates</td>
<td>1M nitric acid</td>
</tr>
<tr>
<td>Metal hydroxides</td>
<td></td>
</tr>
<tr>
<td>Cyanides</td>
<td>1M sulphuric or nitric acid</td>
</tr>
<tr>
<td>Heavy biological</td>
<td></td>
</tr>
<tr>
<td>Proteins</td>
<td>Mixture of 1M sulphuric or nitric acid and pepsin (saturated)</td>
</tr>
<tr>
<td>Fibres</td>
<td>Pressurized water with or without wetting agents</td>
</tr>
<tr>
<td>Light biological</td>
<td>Pressurized water</td>
</tr>
</tbody>
</table>
| Latex (see Note below) | Pressurized cold water | **Note.** If removed from the process the latex must be completely removed quickly before it hardens.

**Note.** Installation must be carried out in accordance with local water company and council bylaws.
2.5 Jetwash System Assembly

The system is supplied with a blanking plug fitted to the jetwash tubing connector. If the jetwash system is to be used, remove the plug and fit the jetwash supply tube as shown in Fig. 2.9.

**Note.** Recommended tubing is 6mm OD semi-rigid polyethylene tube (part no. 0212035).

Remove jetwash port sealing nut and retain for further use

(See **Note** below)

1. Slide connector onto tubing
2. Slide ferrule onto tubing
3. Push tubing onto jetwash port, screw connector onto jetwash port and tighten to recommended torque of 60cNm

**Note.** The seal nut must be fitted when the jetwash tubing is not being used.
3 Electrical Installation

3.1 Analyzer Connections
System cable connections are identified in Fig. 3.1 to enable connection to the appropriate terminal on the analyzer.

![Fig. 3.1 Cable Termination](image)

**Key**
- **A** Temperature compensator
- **B** Measuring electrode
- **C** Screen
- **D** Reference electrode
- **E** Solution earth (see Note below)
- **F** Measuring electrode
- **G** Reference electrode

**Note.** The sensor is equipped with a solution earth (ground) which is designed to provide full sensor diagnostics when connected to a suitable analyzer. If sensor diagnostics are not required, it is not necessary to connect the solution earth (ground).

![Fig. 3.2 Shortening the Connection Cable](image)

**Key**
- **A** Transparent
- **B** Blue

**Note.** Cut off and discard remaining unused cores.

3.2 Shortening the Connection Cable
The connection cable is supplied in various standard lengths. If it is necessary to shorten the cable, prepare the cable ends as shown in Fig. 3.2.

The cable comprises:
1. an outer insulating layer
2. an inner braided shield
3. a shielded coaxial core
4. four insulated wires

**Note.** Do not allow the shielding to contact any other bare wires.

- Measure the required length from connector to transmitter and cut accordingly.
- Slit open and trim away the outer cable insulation to expose braiding.
- Undo the braiding along the complete exposed length and twist into a single strand.
- Shorten the twisted strand to about 5mm (0.20 in.) and solder on the insulated ground lead extension (70mm [2.76 in.], yellow/green). Protect the connection with insulating tape.
- Slit open and trim away the insulation of the coaxial core.
  - a) Undo the exposed braided shielding and twist into a single strand.
  - b) Remove the black semiconductor layer to expose the pH signal conductor.
  - a) Strip away the insulation from the ends of the leads over a length of 10mm (0.39 in.) and fit end sleeves on the individual wires.
  - b) Fit a heat-shrink sleeve or insulating tape over the cable end where the cable leads emerge.
3.3 Extending the Connection Cable

If it is necessary to extend the cable, a suitable junction box and the correct length of 6-core cable are required. Connect the junction box as shown in Fig. 3.3.

**Note.**
- Junction box (part no. 7690/049) is recommended.
- 6-core cable, part no. 7690054/XX (where XX is the cable length, from 5 to 50 meters, in 5 meter increments) is recommended.
- Cable 7690054 is identical to that fitted to the sensor. See Fig. 3.2 for cable end preparation instructions.

![Fig. 3.3 Extending the Connection Cable](image)

### Table 3.1 Detachable Cables

<table>
<thead>
<tr>
<th>Cable Length</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 m (16 ft)</td>
<td>7690050</td>
</tr>
<tr>
<td>10 m (33 ft)</td>
<td>7690051</td>
</tr>
<tr>
<td>15 m (49 ft)</td>
<td>7690052</td>
</tr>
<tr>
<td>20 m (60 ft)</td>
<td>7690053</td>
</tr>
</tbody>
</table>

3.4 Jetwash System Connections

The electrical supply to the jetwash system pump or solenoid valve is connected to the analyzer relay used for automatic cleaning – see Fig. 3.4. The analyzer controls the frequency of the wash sequence and the duration for which the cleaning solution flows.

The analyzer outputs are held during a cleaning sequence.

![Fig. 3.4 Electrical Connections for Jetwash Systems](image)
4 Calibration

4.1 Method
When the electrode system has been correctly connected and all electrical connections made to the associated pH analyzer, the system is ready for calibration by immersing the sensor (using suitably sized beakers) either:

1. in a calibration solution (buffer) of known pH value for a single-point calibration,
   or
2. in two separate calibration solutions of known pH values for a two-point calibration.

For sensors already in use:

1. Remove the electrode from the process or sample.
2. Wash the visible electrode surface with demineralized water.
3. Proceed as described in the paragraph above.

To have agreement with a measured sample, there may be times when a process calibration is necessary.

1. Perform a buffer calibration.
2. Ensure that the electrode is returned to the process for at least 10 minutes before performing a process calibration.
3. To minimize solution temperature effects, measure the sample at the same temperature as the process.

Refer to the instruction manual for the pH analyzer for full details of the calibration procedures.

Warning. Close all isolating valves before removing an electrode from a flow line.

4.2 Buffer Solutions
Recommended buffer solutions are shown in Table 4.1.

<table>
<thead>
<tr>
<th>Buffer Solution</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4pH 0.05M potassium hydrogen phthalate</td>
<td>0400 110</td>
</tr>
<tr>
<td>7pH Disodium hydrogen phosphate/monopotassium dihydrogen phosphate mix</td>
<td>0400 120</td>
</tr>
<tr>
<td>9pH 0.05M borax</td>
<td>0400 130</td>
</tr>
</tbody>
</table>

Table 4.1 Recommended Buffer Solutions

Note.
- Ensure that the visible surface of the electrode has been cleaned using demineralized water.
- When moving from one buffer solution to the next, wash the electrode using demineralized water and dry it carefully using a soft tissue.

Table 4.2 shows the change in pH value that occurs with a change in the temperature of the recommended 4, 7, and 9 pH buffer solutions.

<table>
<thead>
<tr>
<th>°C</th>
<th>pH 4</th>
<th>pH 7</th>
<th>pH 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4.00</td>
<td>7.11</td>
<td>9.48</td>
</tr>
<tr>
<td>10</td>
<td>4.00</td>
<td>7.06</td>
<td>9.35</td>
</tr>
<tr>
<td>20</td>
<td>4.00</td>
<td>7.01</td>
<td>9.23</td>
</tr>
<tr>
<td>25</td>
<td>4.01</td>
<td>7.00</td>
<td>9.18</td>
</tr>
<tr>
<td>30</td>
<td>4.03</td>
<td>6.98</td>
<td>9.13</td>
</tr>
<tr>
<td>40</td>
<td>4.05</td>
<td>6.97</td>
<td>9.05</td>
</tr>
<tr>
<td>50</td>
<td>4.08</td>
<td>6.97</td>
<td>9.05</td>
</tr>
<tr>
<td>60</td>
<td>4.12</td>
<td>6.97</td>
<td>9.05</td>
</tr>
<tr>
<td>70</td>
<td>4.16</td>
<td>7.03</td>
<td>9.05</td>
</tr>
<tr>
<td>80</td>
<td>4.21</td>
<td>7.08</td>
<td>9.05</td>
</tr>
<tr>
<td>90</td>
<td>4.21</td>
<td>7.08</td>
<td>9.05</td>
</tr>
</tbody>
</table>

Table 4.2 Buffer pH Value / Temperature (°C)

4.3 Redox (ORP Sensor)
When the sensor has been correctly connected and all electrical connections have been made to the associated Redox (ORP) analyzer, it is ready for calibrating. Follow the calibration procedure in the analyzer User Guide.

For sensors that are connected to analyzers that do not have Redox (ORP) sensor calibration capabilities, it is possible to check the response as follows:

1. Prepare standard 4 and 7 pH buffer solutions. Add one gram (heaped spatula) of analar quinhydrone to 100 ml (3.5 Flu oz.) of each buffer solution. Let them stand for 30 minutes.
2. Immerse the sensor in each solution in turn and note the mV value when stable.

The values obtained should be within ±15 mV of the following:

<table>
<thead>
<tr>
<th>pH Buffer</th>
<th>mV</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>+259</td>
</tr>
<tr>
<td>7</td>
<td>+82</td>
</tr>
</tbody>
</table>
5 Maintenance

5.1 General Cleaning

To ensure accurate monitoring, keep the electrodes free of contaminants by periodic cleaning. The frequency of cleaning depends on the particular application.

Automatic cleaning using the optional jetwash system and controlling the cleaning solution using a suitable controller or analyzer, will reduce the amount of manual cleaning.

Methods of removing various types of deposit are detailed below. Replace the sensor if the performance of the sensor does not improve after cleaning.

5.1.1 General Sludge and Loosely Adhering Matter
Rinse off the excess matter and wipe the sensor with a soft cloth or tissue before calibrating.

5.1.2 Heavy, Non-Greasy Deposits
For example: lime, salts, etc.
Immerse the sensor in 1 to 2 M hydrochloric acid until the deposit has dissolved. Rinse with demineralized water before calibrating.

5.1.3 Greasy or Organic Deposits
Wipe the glass membrane with a detergent or acetone-based solvent. Rinse with demineralized water before calibrating.

5.2 Fault Finding
Listed below are some common symptoms of sensor malfunction together with possible cures.

Short scaling (Low Slope) or sluggish response
1. Glass sensor membrane dirty or coated – refer to Section 5.1 for cleaning.
2. Poor insulation on cable connectors, possibly due to moisture – dry connectors with warm air.

Replace sensor if no improvement is seen. (It may also be necessary to replace the extension cable if used.)

No response to pH buffer or sample
1. Sensor incorrectly connected – see Section 3.1, page 11 and the analyzer user guide for connection details.
2. Glass sensor membrane broken or cracked – replace sensor.

Unstable readings or drift
1. Sensor incorrectly connected – see Section 3.1, page 11 and the analyzer user guide for connection details.
2. Dry or dirty reference junction – clean junction as detailed in Section 5.1. Leave to soak in a buffer solution for several hours.

Replace sensor if no improvement is seen.

Stable but incorrect readings
1. Incorrect calibration – recalibrate using fresh buffer solutions.
2. Incorrect temperature compensation settings – enter correct manual temperature or check that automatic temperature compensation is reading correctly.
3. Sensor responds correctly to pH changes, but there is an offset of <1.0 pH and >0.2 pH – perform a one-point process calibration – see Section 4.1, page 13.

Note. All the above symptoms could be caused by a faulty extension cable. Check and replace it, if necessary.

5.3 Storing the Electrode

Note. Allowing the glass membrane and reference junction to dry out irreversibly affects the response of the electrode.

If it is necessary to remove the electrode from the sample line, fill the retained protective cap with buffer solution and cotton wool, or equivalent, and fit it to the sensor.
6 Specification

All Systems

Materials

- Shaft and cap: Polypropylene
- Sensor body: Ryton™ PPS
- Ground rod/Spray tube: 316 Stainless steel

Jet-wash facility

- Non-return function: Integral one-way valve
- Spray tube connection: 6mm compression fitting
- Recommended operating pressure: Min. 1 bar (15 psi) over process pressure

Certification

The systems comply with SEP (Safe Engineering Practice) level Pressure Equipment Directive 97/23/EC

AP201 Insertion System

Maximum Temperature

- 130 °C (266 °F) PPS and steel adapters
- 90 °C (194 °F) Polypropylene adapter

Maximum Pressure

- 6 bar (90 psi) @ 25°C (77°F)

Process Connections

- Union nut: 1¼ in. (BSP)
- PPS process adapter: R1¼ in. (tapered BSP male)
- PP process adapters: R1¼ in., 1¼ in. NPT
- Stainless steel adapters: R1 in. (tapered BSP male), 1 in. NPT
- Stainless steel sockets: Angled DN25, Straight DN25

AP202 Flow-through System

Materials

- Flow-cells: Polypropylene, Stainless steel

Maximum Temperature

- 90 °C (194 °F) Polypropylene flow cell
- 130 °C (266 °F) Stainless steel flow cell

Maximum Pressure

- 6 bar (90 psi) @ 25°C (77°F)

Process Connections

- Union nut: G1¼ in. (BSP)
- Flow-cell inlet & outlet: Rp1 in. (BSP female) or 1 in. NPT

AP203 Immersion (Dip) System

Materials

- Guard, shaft and cap: Polypropylene

Maximum Temperature

- 90 °C (194 °F)

Maximum Pressure

- Not applicable

Process Connections

- Sliding flange: Composite DIN & ANSI DN50 / ANSI 2 in.
- Immersion lengths:
  - 1 m (3.3 ft)
  - 2 m (6.6 ft)
  - 3 m (10 ft)

AP120 Combination Sensor

Measuring Ranges

- AP121/0 General Process 0 to 14 pH 0 to +100 °C (32 to 212 °F)
- AP121/1 High Temp/Alkali 0 to 14 pH 10 to 130 °C (50 to 266 °F)
- AP121/2 Low Resistance 0 to 10 pH –5 to 50 °C (23 to 122 °F)
- AP121/6 Pt Redox (ORP) ± 2000mV 0 to 130 °C (32 to 266 °F)

Reference Electrode System

- Primary Electrolyte: Solid, Ag-free Gel with KCl charge
- Inner reference system: Ag/AgCl
- Junction: Annular PTFE, sterilizable
- Nominal zero point, E0: 7 pH
- Minimum Conductivity: > 50 µS/cm

General Data

- Temperature Sensor: (pH only) Integral Pt100
- Temperature response: T<sub>so</sub> < 70s
- Electrode Shaft Length: 120 mm
- Max. Pressure: 6 bar (90 psi)
- Ingress Protection: IP67/NEMA 6P (exceeds NEMA4X)
- Connection head: Sterilizable VP (VarioPin) connector with PG13.5 thread

DS/AP200–EN Rev. I
### 7 Spares

#### 7.1 Model AP201 Insertion System

* Fitted on water wash option only

![Model AP201 Insertion System Spares](image)

<table>
<thead>
<tr>
<th>Item</th>
<th>Part No.</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7690130</td>
<td>1¼ in. BSP Adaptor</td>
<td>1</td>
</tr>
<tr>
<td>5**</td>
<td>7690043</td>
<td>Sensor Holder (non water wash only)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>or 7690041</td>
<td>Sensor Holder (water wash only)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>7690160</td>
<td>Cable Shroud</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>7690218</td>
<td>Protective Cover Adaptor Sleeve</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>7690140</td>
<td>Protective Cover</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>7690145</td>
<td>Protective Lid</td>
<td>1</td>
</tr>
</tbody>
</table>

** Comprises items 2, 3, and 4

---

<table>
<thead>
<tr>
<th>Item</th>
<th>Part No.</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>2*</td>
<td>7690040</td>
<td>Cleaning Screw (water wash only)</td>
<td>1</td>
</tr>
<tr>
<td>3*</td>
<td></td>
<td>O-Ring 3 mm ID x 1.5 mm CH Viton (water wash only)</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>O-Ring 1 ¼ in. ID x 0.103 in. CH Viton</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>O-Ring 11.6 mm ID x 2.4 mm CH Viton</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>O-Ring Support Washer</td>
<td></td>
</tr>
</tbody>
</table>

The following are also supplied in the Service Pack but not used on the AP201 Insertion System:

- O-Ring 37.77 mm ID x 2.62 mm CH Viton | 2
- O-Ring 46 mm ID x 2 mm CH Viton | 2

* Fitted on water wash option only
### 7.2 Model AP202 Inline System

#### Fig. 7.2 Model AP202 Inline System Spares

<table>
<thead>
<tr>
<th>Item</th>
<th>Part No.</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7690150</td>
<td>Tee-piece</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>7690130</td>
<td>1(\frac{1}{4}) in. BSP Adaptor</td>
<td>1</td>
</tr>
<tr>
<td>3**</td>
<td>7690043</td>
<td>Sensor Holder (non water wash only)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>or 7690041</td>
<td>Sensor Holder (water wash only)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>7690160</td>
<td>Cable Shroud</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>7690218</td>
<td>Protective Cover Adaptor Sleeve</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>7690140</td>
<td>Protective Cover</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>7690145</td>
<td>Protective Lid</td>
<td>1</td>
</tr>
</tbody>
</table>

** Comprises items (3), (4) and (5)

<table>
<thead>
<tr>
<th>Item</th>
<th>Part No.</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7690040</td>
<td>Service Pack Comprising:</td>
<td></td>
</tr>
<tr>
<td>3*</td>
<td></td>
<td>Cleaning Screw (water wash only)</td>
<td>1</td>
</tr>
<tr>
<td>4*</td>
<td></td>
<td>O-Ring 3 mm ID x 1.5 mm CH Viton (water wash only)</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>O-Ring 1(\frac{1}{4}) in. ID x 0.103 in. CH Viton</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>O-Ring 11.6 mm ID x 2.4 mm CH Viton</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>O-Ring Support Washer</td>
<td>1</td>
</tr>
</tbody>
</table>

The following are also supplied in the Service Pack but not used on the AP202 Inline System:

<table>
<thead>
<tr>
<th>Item</th>
<th>Part No.</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>O-Ring 37.77 mm ID x 2.62 mm CH Viton</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>O-Ring 46 mm ID x 2 mm CH Viton</td>
<td>2</td>
</tr>
</tbody>
</table>

* Fitted on water wash option only
**7.3 Model AP203 Flanged Dip (Immersion) System**

* Fitted on water wash option only

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**Fig. 7.3 Model AP203 Flanged Immersion (Dip) System Spares**

<table>
<thead>
<tr>
<th>Item</th>
<th>Part No.</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7690210</td>
<td>Protective Skirt</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>7690042</td>
<td>Sensor Holder</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>7690212</td>
<td>Non-Seal Flange</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>7690044</td>
<td>Scalloped Knob spare M5 x 15 mm (pack of 2)</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>7690213</td>
<td>Ind Dip Flange Insert</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>7690218</td>
<td>Protective Cover Adaptor Sleeve</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>7690140</td>
<td>Protective Cover</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>7690145</td>
<td>Protective Lid</td>
<td>1</td>
</tr>
</tbody>
</table>

**Item**  | **Part No.** | **Description**                                                                 | **Qty** |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>7690040</td>
<td>Service Pack Comprising:</td>
<td></td>
</tr>
<tr>
<td>2*</td>
<td></td>
<td>Cleaning Screw (water wash only)</td>
<td>1</td>
</tr>
<tr>
<td>3*</td>
<td></td>
<td>O-Ring 3 mm ID x 1.5 mm CH Viton (water wash only)</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>O-Ring 37.77 mm ID x 2.62 mm CH Viton</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>O-Ring 46 mm ID x 2 mm CH Viton</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>O-Ring 11.6 mm ID x 2.4 mm CH Viton</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>O-Ring Support Washer</td>
<td>2</td>
</tr>
</tbody>
</table>

The following is also supplied in the Service Pack but not used on the AP203 Flanged Immersion (Dip) System:

<table>
<thead>
<tr>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>O-Ring 1 1/8 in. ID x 0.103 in. CH Viton</td>
<td>2</td>
</tr>
</tbody>
</table>

* Fitted on water wash option only
AP200 series
Rugged pH/Redox (ORP) sensor systems with rapid temperature response for critical processes
Client Warranty

Prior to installation, the equipment referred to in this manual must be stored in a clean, dry environment, in accordance with the Company’s published specification.

Periodic checks must be made on the equipment’s condition. In the event of a failure under warranty, the following documentation must be provided as substantiation:

- A listing evidencing process operation and alarm logs at time of failure.
- Copies of all storage, installation, operating and maintenance records relating to the alleged faulty unit.