Electrode Holder
BF-[](R)/BS-1(T)

Complete Lineup for Use in High-temperature, High-pressure Environments or Where Exposed to Chemicals

- The BF-1 is ideal for liquids with low specific resistance, such as wastewater.
- The BF-[](R) is used when a strong mounting is required.
- The BS-1 is used when high-temperature, high-pressure resistant is required.
- The BS-1T is used when corrosion resistance is required.

Refer to Safety Precautions for Electrodes and Electrode Holders.

Ordering Information

■ Electrode Holders

<table>
<thead>
<tr>
<th>Application</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid with low specific resistance</td>
<td>BF-1</td>
</tr>
<tr>
<td>For 1-pole electrode</td>
<td></td>
</tr>
<tr>
<td>When sturdy mounting is required</td>
<td></td>
</tr>
<tr>
<td>For 3-pole electrode</td>
<td>BF-3</td>
</tr>
<tr>
<td>For 3-pole electrode (2-wire)</td>
<td>BF-3R</td>
</tr>
<tr>
<td>For 5-pole electrode</td>
<td>BF-5</td>
</tr>
<tr>
<td>For 5-pole electrode (2-wire)</td>
<td>BF-5R</td>
</tr>
<tr>
<td>Applications where resistance to high-temperature, high-pressure is required</td>
<td>BS-1</td>
</tr>
<tr>
<td>For 1-pole electrodes, 250°C, 1.96 MPa</td>
<td>BS-1S</td>
</tr>
<tr>
<td>BS-1S1</td>
<td>BS-1S2</td>
</tr>
<tr>
<td>High-pressure application where resistance to corrosion is required</td>
<td>BS-1T</td>
</tr>
<tr>
<td>For 1-pole electrode, SUS304 981 kPa</td>
<td>BS-1TS304</td>
</tr>
<tr>
<td>For 1-pole electrode, SUS316 981 kPa</td>
<td>BS-1TSUS316</td>
</tr>
<tr>
<td>For 1-pole electrode, Titanium 981 kPa</td>
<td>BS-1TCHITAN</td>
</tr>
<tr>
<td>For 1-pole electrode, Hastelloy B 981 kPa</td>
<td>BS-1THASB</td>
</tr>
<tr>
<td>For 1-pole electrode, Hastelloy C 981 kPa</td>
<td>BS-1THASC</td>
</tr>
</tbody>
</table>

■ Accessories (Order Separately)

<table>
<thead>
<tr>
<th>Application</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protective Cover (For PS-[]S and BF-3/-4/-5)</td>
<td>F03-11</td>
</tr>
<tr>
<td>M18 Nut (For BS-1)</td>
<td>F03-17</td>
</tr>
<tr>
<td>M18 Nut (For BS-1T)</td>
<td>F03-18</td>
</tr>
</tbody>
</table>

Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Model</th>
<th>BF-1</th>
<th>BF-3 (R) (See note 1.)</th>
<th>BF-5 (R) (See note 1.)</th>
<th>BS-1</th>
<th>BS-1T</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Electrodes</td>
<td></td>
<td>1</td>
<td>3</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulator material</td>
<td></td>
<td>Ceramic (Metallic section is SUS.)</td>
<td>Fluorocarbon polymer (PFA)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulation resistance</td>
<td></td>
<td>100 MΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating temperature</td>
<td></td>
<td>-10 to 150°C (with no icing)</td>
<td>250°C max.</td>
<td>180°C max.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating pressure</td>
<td></td>
<td>Atmospheric pressure</td>
<td>1.96 MPa (See note 2.)</td>
<td>981 kPa (See note 2.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applications</td>
<td></td>
<td>Liquids with low specific resistance, such as wastewater and cloudy water</td>
<td>General applications for purified water and wastewater</td>
<td>Boiler water level detection or high-temperature tanks</td>
<td>Acid or alkaline solution level detection</td>
<td></td>
</tr>
</tbody>
</table>

Note: 1. Two-wire Electrode Holders (R models) have a built-in resistance of 6.8 kΩ. They should be used with the Two-wire 61F Controllers.
2. There must be a sufficient ambient temperature in a high-pressure environment to prevent vapor leakage. Use the Electrode Holder according to the following pressure-temperature curve.
**BF-\(R\)/BS-1(T)**

---

### Appearance

**BF-1**
- Heat resistance: 70°C
- Heat resistance: 150°C

**BF-3(R)**  
**BF-5(R)**
- Heat resistance: 70°C
- Heat resistance: 150°C

**BS-1**
- Heat resistance: 150°C
- Heat resistance: 250°C
- Material at clamping section: iron (standard)
- SUS304 and SUS316 are also available.

**BS-1T**
- Hastelloy
- Titanium

---

**Model**  | **Material at tightening section**  | **Screws**
---|---|---
BS-1  | Iron  | M18 P = 1.5
BS-1S  | SUS304  | M18 P = 1.5
BS-1S1  | SUS304  | PT1/2
BS-1S2  | SUS316  | M18 P = 1.5

3. Clamp screws are not provided for hastelloy B, hastelloy C, or titanium Electrode Holders. When placing an order, specify the type of material from the following five: SUS304, SUS316, Hastelloy B, Hastelloy C, or Titanium.

---

### Accessories Required for Connecting Electrodes to the BF-\(R\) (Order Separately)

#### Electrode Shorter

- **Than 1 m**
  - The following items are required for each pole.
  - 1 × F03-01 Electrode
  - 1 × F03-03 Lock Nut
  - The Electrode can be cut anywhere to a desired control level.

**Note:**
1. The spring washer comes with the lock nut.
2. Refer to **F03-□** for details on Electrodes, Connecting Nuts, Lock Nuts, and Separators.

---

#### Electrode Longer

- **Than 1 m**
  - The following items are required for every additional meter of electrode for each pole.
  - 1 × F03-01 Electrode
  - 1 × F03-02 Connecting Nut
  - 2 × F03-03 Lock Nuts
  - Use F03-14 1P Separators to prevent the electrodes from touching each another.

---

**Example**
For a pressure of 1.6 MPa, the temperature inside the water tank must be at least 200°C.
Dimensions

Note: All units are in millimeters unless otherwise indicated.

**BF-1**

Weight: approx. 125 g

**BF-3(R)**

Weight: approx. 420 g
BF-3R: approx. 425 g

**BF-5(R)**

Weight: approx. 710 g
BF-5R: approx. 715 g

**BS-1(S)**

Weight: approx. 70 g

**BS-1**

**BS-1S**

Weight: approx. 70 g

**BS-1S1**

**BS-1S2**

Weight: approx. 70 g
**Safety Precautions**

Refer to Safety Precautions for All Level Controllers.

<table>
<thead>
<tr>
<th>Material</th>
<th>SUS304</th>
<th>SUS316</th>
<th>Titanium</th>
<th>Hastelloy B</th>
<th>Hastelloy C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>Approx. 55 g</td>
<td>Approx. 55 g</td>
<td>Approx. 45 g</td>
<td>Approx. 65 g</td>
<td>Approx. 60 g</td>
</tr>
</tbody>
</table>

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

In the interest of product improvement, specifications are subject to change without notice.
Safety Precautions for Electrodes and Electrode Holders

**WARNING**

Do not touch the terminals while power is being supplied. Doing so may possibly result in electric shock.

Do not attempt to disassemble, repair, or modify the Controller while power is being supplied. Doing so may occasionally result in electric shock.

**Precautions for Safe Use**

Do not use the Controller in locations subject to explosive or combustible dust, combustible gas, flammable vapors, corrosive gas, excessive dust, salt-water spray, or water drops.

**Electrode Precautions**

**Precautions for Correct Use**

- Always disconnect the 61F when a tester to perform insulation resistance tests on the Electrode circuit.
- If the Electrodes are to be cut, bevel the cut surface.
- Be careful of the distances between Electrodes.
  - Allow a sufficient distance (normally 1 m) between Electrodes if they are used in seawater or sewage. Use a low-sensitivity 61F-□□D-□□ND Level Controller if sufficient distance cannot be obtained.
- Make the common (ground) Electrode longer.
  - For a group of three Electrodes consisting of a short, a medium, and a long Electrode, connect the shortest Electrode to E1, the medium Electrode to E2, and the long Electrode to E3. The long Electrode (E3) must be at least 50 mm longer than the other Electrodes.
- Be careful of the operating level.
  - Changes in the type of liquid or the power supply voltage may cause the operating position to fluctuate somewhat even when the tip of the Electrode reaches the level of the liquid.
- Use separators.
  - When the required length of the Electrode is 1 m or more, use a Separator at each joint between two Electrodes to prevent the Electrodes from coming into contact each other in the water.
- Be careful of suspended matter causing Electrodes to come into contact with each other.
  - Use Tubing Electrodes if factors such as suspended matter cause Electrodes to come into contact with each other. To ensure conductivity, strip off at least 100 mm from the end of the Tubing and do not use Tubing on the common (earth) Electrode.
- Mount Electrodes vertically.
  - Water scum can easily accumulate on insulated parts and may cause insulation failure. Mount the Electrodes vertically.
  - Electrodes must be cleaned.
    - At about six months after installation, remove the Electrodes and use fine sandpaper to remove film from the surface. After that, clean the Electrodes once or twice a year. If the Electrodes are used in liquid with a lot of dirt or scum, insulating film may form, particularly on the surfaces of the Electrodes, and result in operating failures. Remove the insulating film once every three months or so. For sewage tanks, sewage, oil film, or other applications with a lot of waste material, use a pipe such as the one shown at the right.
      - Use a pipe with a diameter of at least four inches.
      - Install the pipe with a diagonal cut at the end as shown in the figure at the right according to the estimated waste material accumulation.
      - Provide an air ventilation hole with a diameter of approx. 10 mm on the upper part of the pipe.
- Breakwater Pipe Mounting Precautions
  - Install a breakwater pipe as shown in the figure at the right for applications with large waves or fast flow, such as for water purification.
    - Use a pipe with a diameter of at least four inches.
    - To improve the circulation of liquid inside the pipe, make at least four opposing holes with a diameter of 6 to 10 mm near the end of each Electrode.
    - Provide an air ventilation hole with a diameter of approx. 10 mm on the upper part of the pipe.
    - The procedures above also apply to using Electrode bands.

![Electrode Holder](image1)

![Separator](image2)

![Sewage tank and tank surface](image3)

![Air hole dia.: Approx. 10](image4)

![Pipe with diameter of approx. 4" min.](image5)

![Amount of Waste Material Accumulating between Periodic Cleanings](image6)

---

http://www.ia.omron.com/

© Copyright OMRON Corporation 2007 All Rights Reserved.
Electrode Holder Precautions

Precautions for Correct Use

- Never mount the Electrode Holder horizontally. Mounting the Electrode Holder horizontally may cause liquid to leak from the Electrode Holder and result in 61F reset failure.

Precautions for Tightening Torque and Work

<table>
<thead>
<tr>
<th></th>
<th>Wire installation section (M4) (See note 3.)</th>
<th>Electrode Holder installation section (M18) (See note 2.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS-1 (&lt;br&gt;Note 1.)</td>
<td>137.2 N·cm</td>
<td>6500.0 N·cm</td>
</tr>
<tr>
<td>BS-1T (&lt;br&gt;Note 1.)</td>
<td>137.2 N·cm</td>
<td>6500.0 N·cm</td>
</tr>
</tbody>
</table>

Note: 1. A gasket is supplied with the BS-1. A gasket is not required to mount the BS-1T. (One is not supplied.)
2. Wind commercially available sealing tape two or three times around the M18 screw section before tightening the screws.
3. When installing the wiring, secure nut 2 with a wrench so that no force is applied to the terminal bolt, and complete the tightening with nut 1 (as in the following figure). If nut 2 is not secured, the load on the terminal bolt may cause leakage of steam and pressure.

- Always use an F03-11 Protective Cover if the BF-3 (-4, -5) is used outdoors or in locations subject to water, dust, dirt, or other foreign matter. Foreign matter adhering to the electrode insulators may cause incorrect operation due to leaking.

Electrode Holder installation section (M18) 6500.0 N·cm

BS-1T (<br>Note 1.) Wire installation section (M4) (See note 3.) 137.2 N·cm

In the interest of product improvement, specifications are subject to change without notice.
Safety Precautions for All Level Controllers

Refer to the Safety Precautions section for each product for specific precautions applicable to that product.

⚠️ WARNING
Do not touch the terminals while power is being supplied. Doing so may possibly result in electric shock.
Do not attempt to disassemble, repair, or modify the product while power is being supplied. Doing so may occasionally result in electric shock.

■ Precautions for Safe Use

In order to ensure safe operation, be sure to observe the following points.
1. Use a power supply voltage within the specified range.
2. Do not use the Controller in locations subject to flammable gases or objects.
3. Insert the Socket until it securely clicks into place.
4. Do not short the load connected to the output terminals.
5. Do not connect the power supply in reverse.
6. Do not use the Controller in locations subject to explosive or combustible dust, combustible gas, flammable vapors, corrosive gas, excessive dust, salt water spray, or water drops.

■ Precautions for Correct Use

For details, refer to Technical Guide for Level Controllers.

In the interest of product improvement, specifications are subject to change without notice.
Read and Understand This Catalog

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

Warranty and Limitations of Liability

WARRANTY
OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

LIMITATIONS OF LIABILITY
OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS, OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

Application Considerations

SUITABILITY FOR USE
OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the product.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this catalog.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

Disclaimers

CHANGE IN SPECIFICATIONS
Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the product may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased product.

DIMENSIONS AND WEIGHTS
Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

ERRORS AND OMISIONS
The information in this catalog has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

PERFORMANCE DATA
Performance data given in this catalog is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

PROGRAMMABLE PRODUCTS
OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

COPYRIGHT AND COPY PERMISSION
This catalog shall not be copied for sales or promotions without permission.

This catalog is protected by copyright and is intended solely for use in conjunction with the product. Please notify us before copying or reproducing this catalog in any manner, for any other purpose. If copying or transmitting this catalog to another, please copy or transmit it in its entirety.