

## 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

Application	Model
<ul style="list-style-type: none"> <li>• Liquid with low specific resistance For 1-pole electrode</li> </ul>	BF-1
<ul style="list-style-type: none"> <li>• When sturdy mounting is required For 3-pole electrode For 3-pole electrode (2-wire) For 5-pole electrode For 5-pole electrode (2-wire)</li> </ul>	BF-3 BF-3R BF-5 BF-5R
<ul style="list-style-type: none"> <li>• Applications where resistance to high-temperature, high-pressure is required For 1-pole electrodes, 250°C, 1.96 MPa</li> </ul>	BS-1 BS-1S BS-1S1 BS-1S2
<ul style="list-style-type: none"> <li>• High-pressure application where resistance to corrosion is required For 1-pole electrode, SUS304 981 kPa For 1-pole electrode, SUS316 981 kPa For 1-pole electrode, Titanium 981 kPa For 1-pole electrode, Hastelloy B 981 kPa For 1-pole electrode, Hastelloy C 981 kPa</li> </ul>	BS-1T SUS304 BS-1T SUS316 BS-1T CHITAN BS-1T HAS B BS-1T HAS C

### ■ Accessories (Order Separately)

Application	Model
Protective Cover (For PS-□S and BF-3/-4/-5)	F03-11
M18 Nut (For BS-1)	F03-17
M18 Nut (For BS-1T)	F03-18

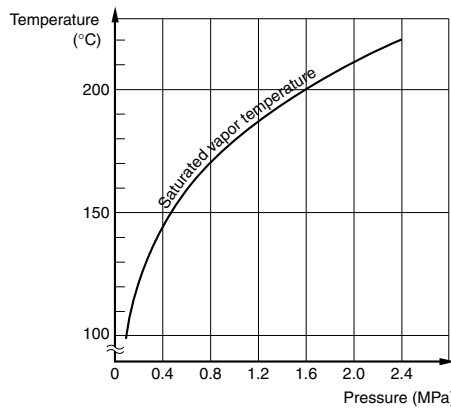
## Specifications

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

**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.

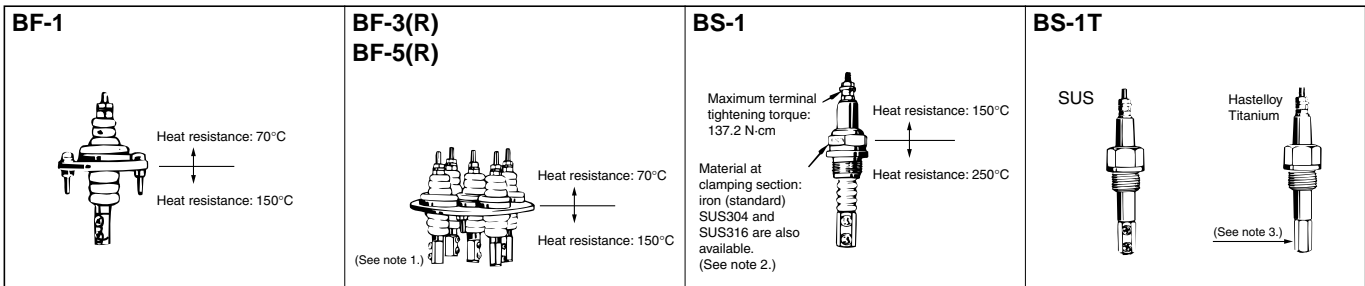
## Pressure-Temperature Curve



### Example

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

## Appearance



Note: 1. The F03-11 Protective Cover (sold separately) is available.

2.

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.

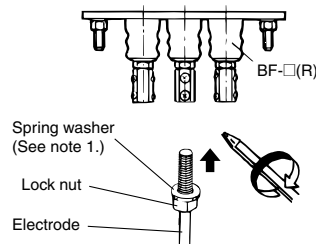
## Accessories Required for Connecting Electrodes to the BF-□(R) (Order Separately)

### 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.

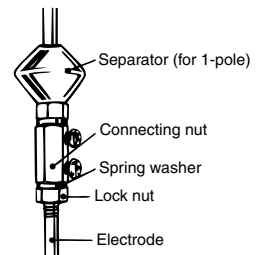


### Electrode Longer Than 1 m

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 other.



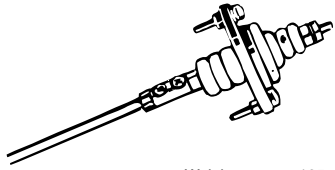
Note: 1. The spring washer comes with the lock nut.

2. Refer to F03-□ for details on Electrodes, Connecting Nuts, Lock Nuts, and Separators.

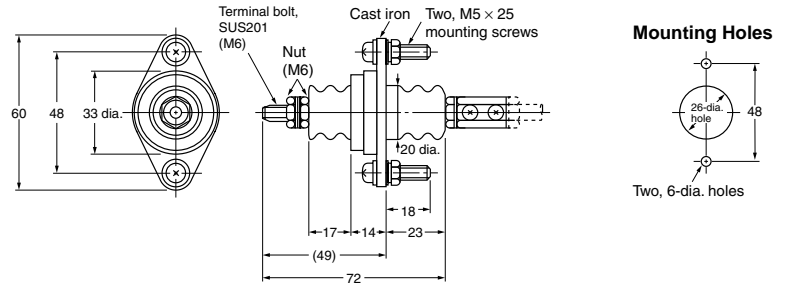
# Dimensions

Note: All units are in millimeters unless otherwise indicated.

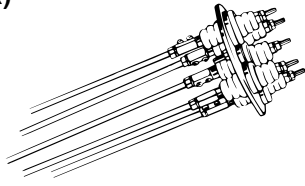
## BF-1



Weight: approx. 125 g

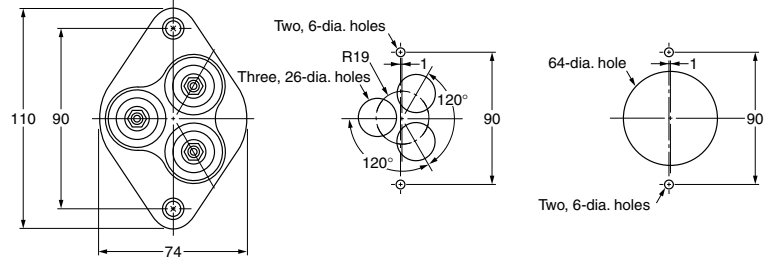


## BF-3(R) BF-5(R)



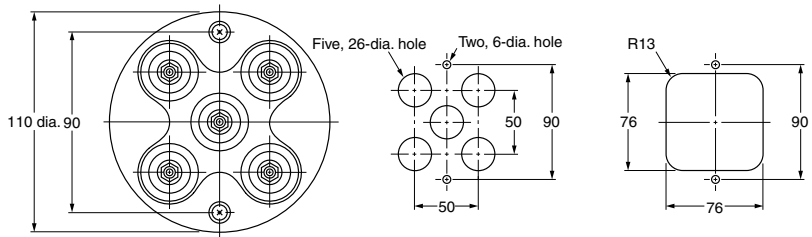
### BF-3(R)

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

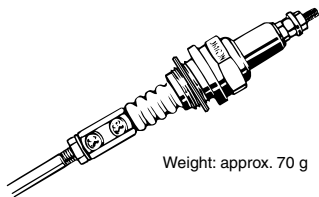


### BF-5(R)

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

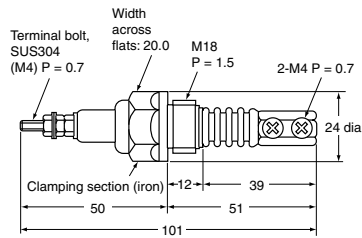


## BS-1(S)

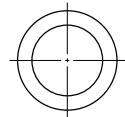


Weight: approx. 70 g

### BS-1

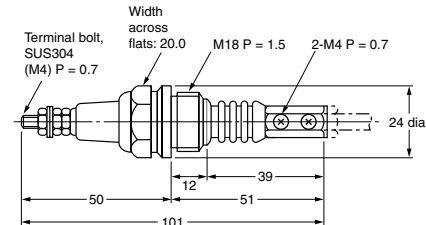


### Mounting Holes

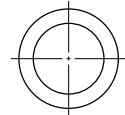


M18 P = 1.5 (fine screw thread)

### BS-1S BS-1S1 BS-1S2

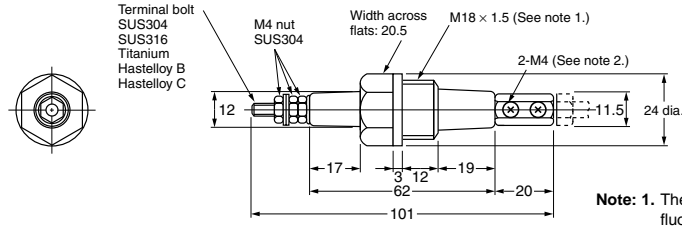
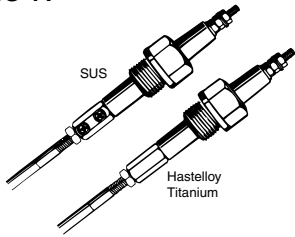


### Mounting Holes

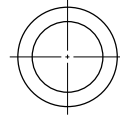


M18 P = 1.5 (fine screw thread)

## BS-1T



## Mounting Holes



M18 P = 1.5 (fine screw thread)

**Note: 1.** The clamping section is made of fluororesin.

**Note: 2.** Connecting Nuts made of hastelloy B, hastelloy C, or titanium are not supplied with two M4 screws or holes for such screws.

<b>Material</b>	SUS304	SUS316	Titanium	Hastelloy B	Hastelloy C
<b>Weight</b>	Approx. 55 g	Approx. 55 g	Approx. 45 g	Approx. 65 g	Approx. 60 g

## ■ Safety Precautions

Refer to *Safety Precautions for All Level Controllers*.

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.

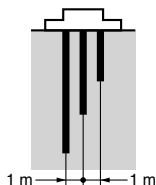
## Electrode Precautions

### 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.

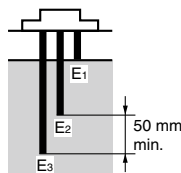
#### ● Be careful of the distances between Electrodes.

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 E<sub>1</sub>, the medium Electrode to E<sub>2</sub>, and the long Electrode to E<sub>3</sub>. The long Electrode (E<sub>3</sub>) must be at least 50 mm longer than the other Electrodes.

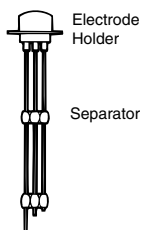


#### ● Be careful of the operating level.

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.

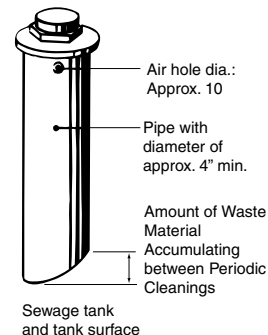
Use Tubing Electrodes if factors such as suspended matter cause Electrodes to come into contact with each other. To ensure conductivity, strip off at least 100 mm from the end of the Tubing and do not use Tubing on the common (earth) Electrode.

#### ● 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.

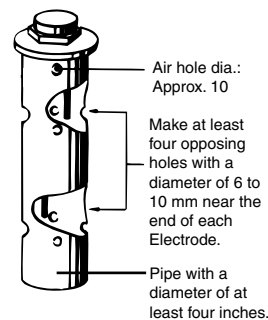


- Use a pipe with a diameter of at least four inches.
- Install the pipe with a diagonal cut at the end as shown in the figure at the right according to the estimated waste material accumulation.
- Provide an air ventilation hole with a diameter of approx. 10 mm on the upper part of the pipe.

#### ● 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 Precautions

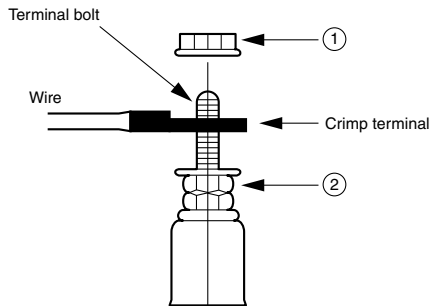
## Precautions for Correct Use

- 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

<b>BS-1</b> (See note 1.)	Wire installation section (M4) (See note 3.)	137.2 N-cm
	Electrode Holder installation section (M18) (See note 2.)	6500.0 N-cm
<b>BS-1T</b> (See note 1.)	Wire installation section (M4) (See note 3.)	137.2 N-cm
	Electrode Holder installation section (M18) (See note 2.)	196.1 N-cm

- 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.

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 All Level Controllers

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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.

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