

How to Determine if an Electric Heater is Good or Bad Using an Ohmmeter

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(abcimg://ohm%20meter)

Your Watlow® [electric heater](/en/products/heaters) is designed to hold up to years of use in some harsh industrial conditions. Over time, the electric insulation may deteriorate and you may experience performance issues. Both heaters and power and temperature controllers are subject to performance issues, so it is important to inspect both for signs of wear and breakdown. Here we will cover all you need to know about ohms, ohmmeters and signs that your electric heater needs to be repaired or replaced with a new Watlow unit.

Understanding ohms

Before you check your heating products to see whether they are working effectively, it is important to understand ohms, watts, volts and amps. These electrical units allow you to compare the output of various heaters and identify signs of an inefficient or failing heater. According to Ohm's Law the current is equal to the voltage divided by the resistance. This can also be expressed in the following equation:

$$I = V/R \text{ (where } I = \text{current, } V = \text{voltage and } R = \text{resistance)}$$

The current of a [thermocouple](/en/products/sensors/thermocouples) or other electrical device is measured in amps, the voltage is measured in volts and the resistance is measured in ohms. A high

level of resistance is necessary to transform electrical energy into heat energy. The thickness, material and other factors of the conductor affect its efficiency and available temperature range.

Resistors are made of materials that have a high level of electrical resistance. This means that these materials are inefficient at conducting electricity, but it also means that they convert a large amount of the electrical energy into heat energy, which makes them effective heating devices.

Calculating the resistance of an electric heater

Electric heaters and other advanced thermal products have a specific resistance level where they operate efficiently. Too much resistance will prevent any electric load to pass through the heating element, while too little resistance creates an overload, typically a short circuit in the wiring or another breakdown of resistance. The ideal resistance is different for every heating situation, so it is important to review your current heater setup before testing the ohms.

How electric heaters are made

Electric heaters use the same basic technology as light bulbs. If you have ever burned your hand on an incandescent light bulb, you understand how similar the two electrical processes can be. Both incandescent lighting and electric heaters take advantage of resistors, which result in heat.

Industrial electric heaters need to deliver consistent heat in a variety of working conditions. Immersion, circulation and flexible heaters are just a few options that deliver consistent heat while still protecting the wiring from corrosion, short-circuiting and other faults.

Basic components

Your Watlow heater uses ceramic, glass, steel or other materials to deliver an electric current. The resistance of the material alters the amount of electrical energy that is converted into heat energy, while your power and temperature controllers adjust the voltage sent to an electric heater.

Once the electrical energy is converted, it needs to be delivered to your product. Heat can be transferred in three basic ways:

- Radiation
- Conduction
- Convection

Radiation is the process of heat transfer through electromagnetic waves. Conduction heating occurs when the heating element is physically in contact with a solid material and transfers heat. Finally, convection transfers heat energy through liquids or gases. Watlow offers industrial heaters that use one or more of these heat transfer types to create an efficient heating operation.

Some heaters use a straight line of material to deliver heat energy, while others use a formed piece of material to increase the surface area. Depending on the application, OEMs may require insulating materials to direct the heat or protect the heating element from corrosion and other issues.

The Watlow difference

When you choose Watlow heating products, you are choosing industry-leading heating technology. The basic way that our heating products work is the same, but our commitment to quality materials, low tolerances and innovative designs provides a wide array of electric heating products that fit your industrial application.

Using an ohmmeter

Even the best heating products break down over time, so design engineers need a reliable way to troubleshoot damaged heaters and maximize heater performance. Use an ohmmeter to measure the resistance between two components and determine the source of the heater breakdown issue.

All ohmmeters work in the same basic way, but the particular steps can vary. Here are the typical steps to using an ohmmeter for your electric heater:

1. Plug in or install a battery in your ohmmeter.
2. Zero the meter by touching the leads together and adjusting the reading to zero ohms.
3. Disconnect your electric heater to avoid any damage or risk of electrocution.
4. Adjust the scale of your ohmmeter, selecting tens, hundreds or thousands as necessary.
5. Touch the probes to opposite ends of the circuit and compare the reading with your heater's expected resistance.

The user manuals of your Watlow heating products offer the ideal ohm reading of your particular heater. Troubleshoot your heater issue depending on the reading. If your ohm reading is correct, look to your [PID controller \(/en/products/controllers/temperature-and-process-controllers\)](/en/products/controllers/temperature-and-process-controllers) for another possible solution.

Ohm vs. megohm testing

An electrical conductivity issue may be found in an ohm. Another reason your heater may not be heating properly is a breakdown in insulation. Use a megohm test to check the insulation integrity of your heating system. Both ohm and megohm tests are important, as they test different possible issues with your electric heater.

Excessive corrosion, old age, improper installation and other features can compromise the insulation of your wiring. A megohm test uses direct current voltage to test the resistance of the setup. Ideally, there will be complete resistance between the inside and outside of the wiring insulation. Any conductivity between the two is a sign of wiring breakdown.

Further troubleshooting

If it is time to replace your heater, use our application assistance to find the ideal Watlow replacement. Discover how our electric heaters, power and temperature controllers and other systems compare to your existing setup. Receive professional advice on ohm testing, heater maintenance and installation of new heating elements from your customer service team at Watlow.