onset®

HOBO® Data Loggers

onset®

CLEAR

72.54°F

MEMORY

LOGGING

HOBO® temp logger

Choosing a Temperature Data Logger:
5 Things You Need to Know

Introduction

The measurement accuracy offered by today's most advanced data loggers rivals the performance of many higher priced, computer-based data acquisition systems.

Battery-powered temperature data loggers are widely used by performance contractors, service technicians, and engineers responsible for monitoring indoor environmental conditions, investigating occupant comfort complaints, adjusting temperature setbacks, and evaluating HVAC/R (Heating/Ventilation/Air Conditioning/Refrigeration) systems. Data loggers, in most cases, are easy to deploy, and can be used as stand-alone devices without a computer. More importantly, the measurement accuracy offered by today's most advanced data loggers rivals the performance of many higher priced, computer-based data acquisition systems.

However, not all temperature data loggers are created equal, and with so many choices available today, it can be challenging to know which one is right for your application. Do you need to measure a range of conditions, or just a single parameter? Does your application require alarm notification when conditions go beyond a certain threshold? Will the data logger withstand harsh environments? How often will you need to offload data?

Whether you are an experienced data logger user, or just getting started, this article can help you during the temperature logger selection process. It points out some of the most important considerations to keep in mind, and offers tips on specific features.

1. Know your accuracy requirements

No matter what you need to measure, understanding your measurement accuracy requirements is essential. For example, if you're monitoring air-conditioning temperature in an office space, you may only require a temperature measurement accuracy of +/- 1C, while monitoring conditions in a research lab may require far greater accuracy.

Accuracy specifications vary widely among different types of data loggers, and a good understanding of specific accuracy requirements will help you avoid paying for accuracy you might not need. When looking at the accuracy specifications for a given data logger, be sure to look for charts that indicate accuracy over an entire measurement range, not just a single value. The accuracy a data logger can achieve at the high or low end of a given range may be far different from the accuracy at the middle of the range.

Another important factor is data logger resolution; that is, the number of increments of a value a data logger is capable of reporting. For example, a data logger with 16-bit resolution can report 4,096 values over a given temperature range. While a 16-bit data logger may offer more resolution than an 12-bit model, it's important to keep in mind that higher resolution does not necessarily mean better measurements.

If you're unsure about the data logger accuracy and resolution requirements of your application, an experienced data logger supplier should be able to help you determine which product will best meet your needs.
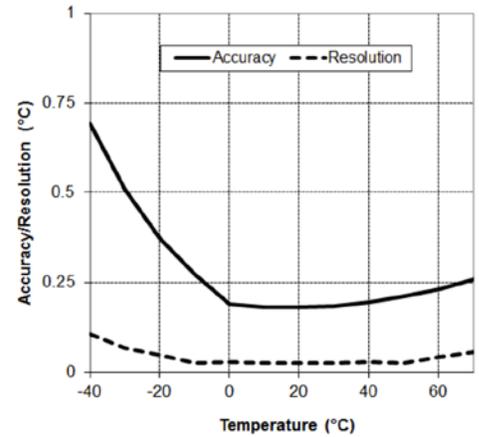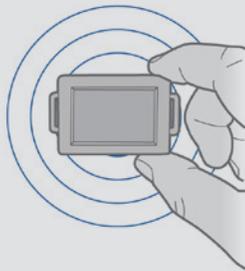

Plot A: Temperature Accuracy and Resolution

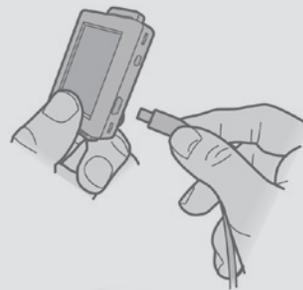## Using a Temperature Data Logger
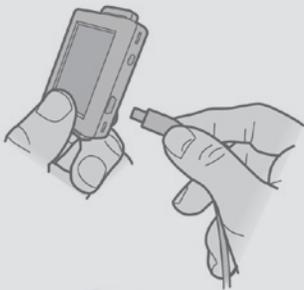
1. Configure and launch

Install and start HOBOware CD in your computer.

Connect your data logger to your computer via USB and set parameters.

2. Secure in place

Deploy the data logger in the desired location. Securing it in place can be as simple as using a magnet, screw, or lanyard to fasten it to a wall.

3. Download or access data

After the desired monitoring period, reconnect the data logger to the computer, and launch the software to read out the data.
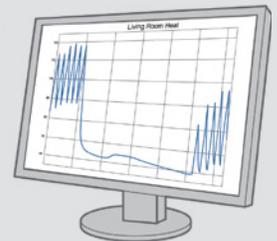
4. Process/analyze data

The data logger's software allows you to combine and compare data, and display the measurements in graphs that show profiles over time.

Wireless temperature data loggers transmit highly accurate temperature/RH data from dozens of points to a central location.

2. Anticipate your data access needs

With the simplest stand-alone data loggers, temperature data is directly offloaded to a computer via a USB interface. In many instances, however, it's not practical to bring a computer out to a site, nor is it always convenient to bring a data logger back to an office computer. In such cases, data retrieval from stand-alone loggers can instead be easily and quickly accomplished using a pocket-sized device called a data shuttle. With a shuttle, you can download and store the collected data without having to interrupt or move the logger, and later link the shuttle to a computer for downloading and analyzing the data.

Wireless temperature data loggers transmit highly accurate real-time temperature/RH data from dozens of points to a central location. With a networked arrangement, the chore of manual retrieval and offloading of data from individual loggers is eliminated.

Web-based data logging systems enable real-time remote access to temperature and other types of data via GSM cellular, Wi-Fi, or Ethernet communications, and can be configured with a wide range of plug-and-play sensors. Data can be accessed easily through a secure web site or integrated into custom systems with a relatively simple-to-implement set of web services.
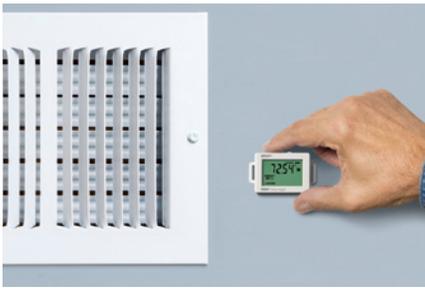
Stand-alone Temperature Loggers

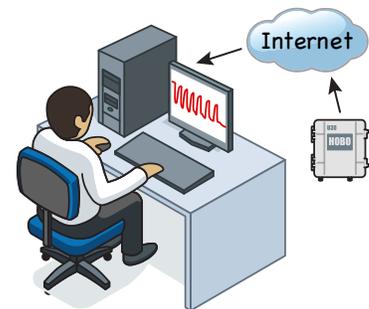Short-term trend logging with manual offload

Wireless Temperature Loggers

Short-range centralized data collection

Web-Based Systems

Wireless Internet access

3. Look for time-saving features

Time is money, so you'll want to make sure the temperature data logger you select has a feature set that will make the process of field deployment a snap. Here are a number of features to look for:

- LCD display – temperature loggers with LCD displays enable you to visually confirm logger operation and battery status in the field, eliminating the need to connect the logger to a computer to view the information.
- Large memory capacity – make sure the logger has enough memory to allow for longer deployments with fewer site visits. Some of the most advanced loggers can store more than 84,000 measurements.
- Start & Stop pushbuttons – having a temperature logger you can start, stop, or resume with the simple push of a button can make life easier when at the job site.
- Mounting flexibility – since temperature loggers are typically deployed in a wide range of environments and spaces, they often need to be mounted in different ways. Look for mounting options like rare earth magnets, straps, and command-strips to streamline the mounting process and help ensure reliable deployments.

It's also a good idea to look for features that can save time when offloading and analyzing data. Some temperature loggers, for example, can operate in a statistics logging mode where they continuously calculate and display the minimum, maximum, average, and standard deviation for measurements as they are being recorded. This eliminates the need to post-process data to generate these statistics.

Finally, selecting a temperature logger with firmware that you can upgrade from the field offers much greater convenience than having to send the unit back to the manufacturer for upgrades.
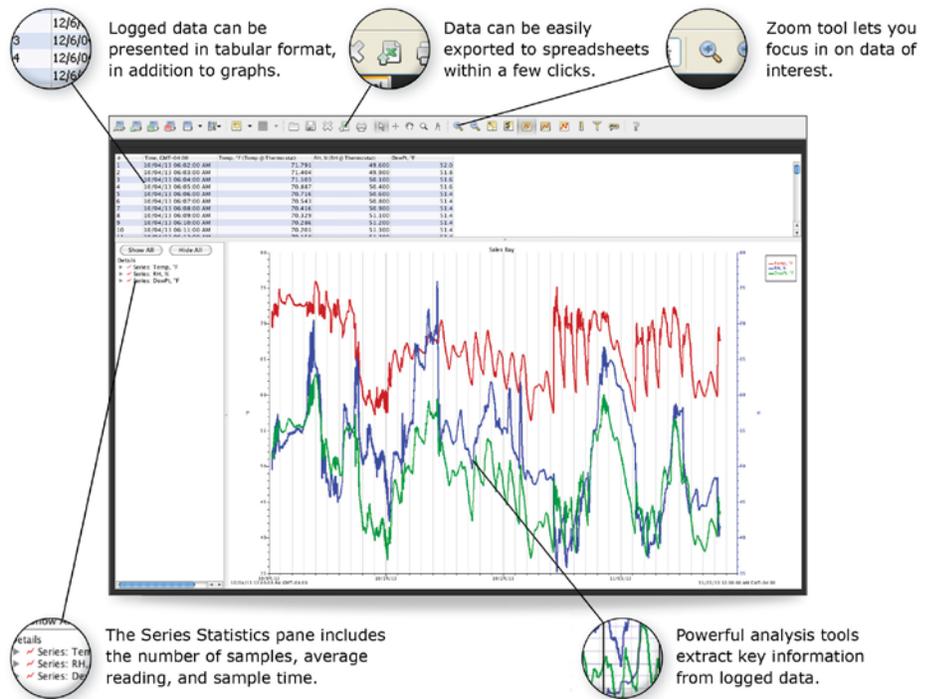
Data logger securing methods

3M® adhesive

Rare earth magnets

Velcro strap
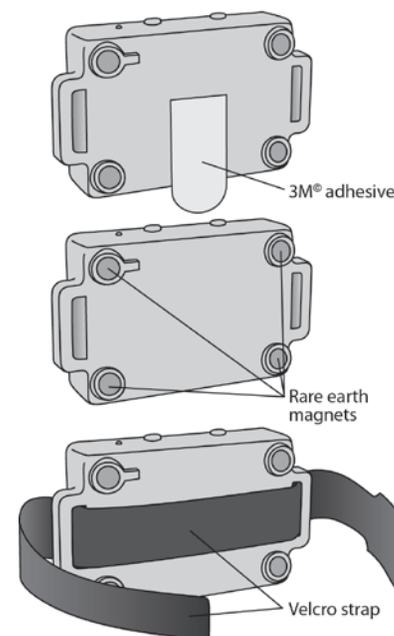
4. Don't overlook the software

Just as there are many different types of temperature loggers available, there are also many different types of data graphing and analysis software packages. In general, look for software that is Windows or Macintosh-based, depending on your requirements, and highly intuitive so the learning curve is minimal. The software should enable you to quickly and easily perform tasks such as configuring parameters, starting the data logger, and offloading data, with point-and-click simplicity. Certain packages allow you to batch-configure and read out hundreds of loggers very quickly.

The data logging software package should also offer powerful data plotting capabilities, with an ability to easily merge, append, and crop data, and enable you to easily export data to other programs, such as Microsoft Excel, for analysis.

Logged data can be presented in tabular format, in addition to graphs.

Data can be easily exported to spreadsheets within a few clicks.

Zoom tool lets you focus in on data of interest.

The Series Statistics pane includes the number of samples, average reading, and sample time.

Powerful analysis tools extract key information from logged data.

5. Consider power requirements

Overall, data loggers are extremely low-power devices. However, because they are used in a variety of environmental conditions and sample at different rates, battery life can vary widely. As a general rule of thumb, make sure the data logger you select has a battery life of at least one year. For some remote situations, you may want to investigate whether a solar-powered option is available.

You may also ask a supplier about whether or not the temperature logger battery is user-replaceable, as this can eliminate the time and expense of having to ship the logger back to the manufacturer for battery replacement. Finally, data loggers that run off standard household batteries offer greater convenience than those requiring specialized batteries.

Battery

Battery door
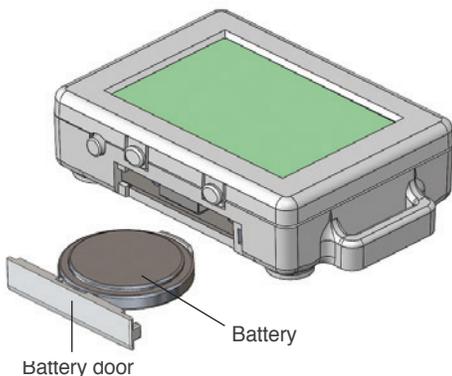
Case Study – The Rockefeller University

"I'm surrounded by scientists all day long, and they like data. Data loggers allow me to show actual numbers to people."

Alexander Kogan is responsible for plant operations and housing at The Rockefeller University in New York, NY, an institution for research and graduate education in laboratory biosciences, chemistry, and physics. The 21 buildings on campus include offices, student housing, laboratories, and a hospital, and serve 1,800 people ranging from staff to professors and graduate students.

When it comes to addressing temperature-related complaints or requests, Kogan and his HVAC team of 16 turn to battery-powered data loggers. "We use them all over the place. We have building management systems, but the loggers are great for checking that what the system says is happening is really happening. There are instances where a professor says, 'You've got this great automated system, but something just isn't right.' After deploying a logger, we can see that there is in fact a glitch in the system software, and the logger told us exactly when and where the glitch occurred."

Kogan sees plenty of situations where individuals report being too cold or too hot in their workspaces. In one lab, occupants often complained that they were too cold, "so we put in a logger to check out the situation. We confirmed that, yes, the room was too cold, and that led us to discover that someone had moved a refrigerator near the thermostat. As you know, fridges pump out heat, and it prevented the heat from going on in the room." In this case, the logger was able to confirm the temperature discrepancy and prompt an investigation into the source of the problem.

In another example, three people in a shared office space complained that they were too hot or too cold at different times of the day. A temperature data logger confirmed that while the temperature did fluctuate throughout the day, the room temperature was in fact tracking with the thermostat setting. Here, the problem was not with the equipment, but with the fact that the individuals in the room kept adjusting the thermostat. The equipment was operating correctly, but, according to Kogan, "It was that the people in the room couldn't agree."

Being able to retrieve data quickly and easily is a big plus for Kogan; it's as simple as bringing the loggers to a computer and plugging them in. That ease of use also makes it simple to deploy loggers at the drop of a hat. Kogan also appreciates that it's easy to format the presentation of the data. "The software is great, and you get a nice chart out of it." This is especially useful at an institution such as The Rockefeller University, where data rule supreme.
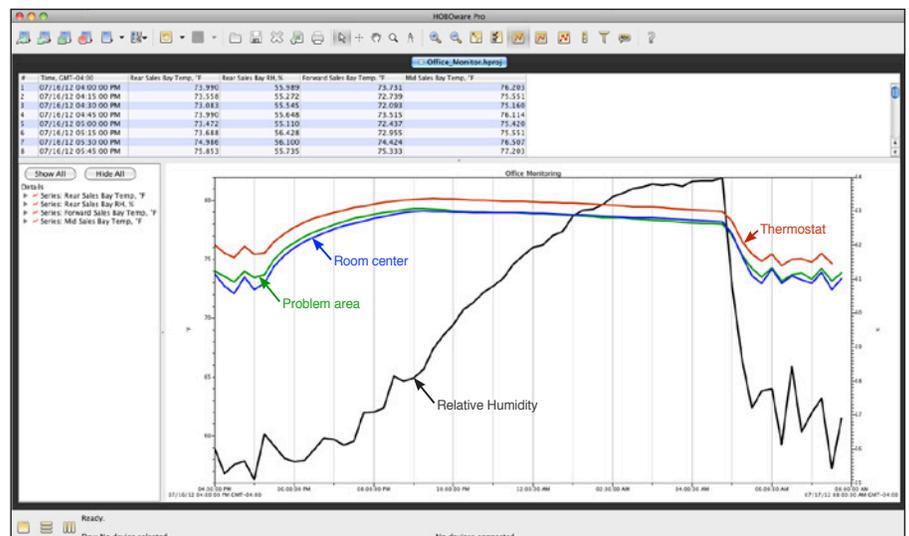
Temperature data from an occupant comfort complaint investigation can be offloaded easily to a computer by connecting the logger via USB cable. The data can then be plotted and analyzed using accompanying software, and exported to a spreadsheet for further analysis if necessary.

Temperature Logging Application Examples

Museum Preservation

Challenge:

- Prevent deterioration of natural history museum collection
- Comply with restrictions associated with historical landmarks
- Monitor and maintain stable temperature/RH levels throughout 420,000 square feet of museum space

Solution:

- 50 wireless data loggers with integrated temperature and RH sensors
- Discreet deployment of data nodes via non-marking 3M adhesive strips
- Real-time data, instant notification potential, and onboard buffer memory to ensure no data are lost

Results:

- Convenient data offload from multiple locations
- Prompt identification, diagnosis, and resolution of HVAC equipment dysfunction

Fumigation Temperature Monitoring

Challenge:

- Monitor temperature for optimal pesticide fumigation conditions
- Collect measurements during exposure times without risking worker safety
- Introduce ideal amount of fumigant for effective and economical operation

Solution:

- Wireless temperature/RH data loggers
- Data collection during fumigation operations
- Temp/RH data transmitted wirelessly every 20 minutes

Results:

- Low-cost, convenient method for monitoring Temperature/RH remotely
- Improved pesticide application accuracy
- Successful fumigations with minimal facility shutdown time
- Significant fumigant cost savings

Cold Storage Temperature Monitoring

Challenge:

- Maintain high quality/safety standards at food production company
- Implement reliable backup temperature monitoring system in cold storage areas

Solution:

- Several temperature data loggers
- Temperature recorded at five-minute intervals, around the clock
- Data analyzed on an as-needed basis, with verification at least once a month

Results:

- Correlation of building automation system alarms with time-stamped readings from data loggers
- Second level of assurance that proper temperatures are being maintained
- Real-time temperature data on an easy-to-read LCD screen

Airline Fire Safety Monitoring

Challenge:

- Ensure that the corrugated packaging that houses oxygen generators on passenger aircraft will not catch fire even if an oxygen generator ignites and begins its exothermic chemical reaction to produce oxygen

Solution:

- Fire-safety testing of the corrugated packaging
- Seven temperature data loggers to monitor internal and external temperatures of the container throughout 15-minute tests, the time it takes for an oxygen generator to burn

Results:

- Despite charring of exterior data logger covers, and extensive fire damage to the data logger that was placed inside the container, the boards within the loggers remained intact and all data were retrieved
- Data analyses resulted in determination that fire-retardant coatings should be sprayed on the corrugated box and higher-quality poly bags should be used to wrap the generators to contain any possible fires

Other informational resources available from Onset:

Choosing an Occupancy and Light On/Off Data Logger – 5 Important Considerations

This paper provides guidance on features to consider when choosing an occupancy and light on/off data logger, including calibration, LCD display, logger accuracy and range, speed of deployment, and time-saving software. Learn how to select the right logger for identifying ideal locations in your building where changes in lighting could result in cost savings up to 80%.

Utility Incentive Programs: How to Get More Money Quickly and Easily

"Utility Incentive Programs: How to Get More Money Quickly and Easily," is aimed at making the process of applying for and receiving energy efficiency incentives and rebates faster, easier, and more rewarding. Authored by Carbon Lighthouse, an energy firm that makes it profitable for commercial and industrial buildings to eliminate their carbon footprint, the paper discusses the two main types of incentive and rebate programs, how utility efficiency program managers think, and how to use data to get more incentive dollars for your projects.

Using Data Loggers to Improve Chilled Water Plant Efficiency

Chilled water plant efficiency refers to the total electrical energy it takes to produce and distribute a ton (12,000 BTU) of cooling. System design, water quality, maintenance routines, cooling tower design, and cooling coil load all affect chiller water plant efficiency and the expense of operating the system.

Data Logger Basics

In today's data-driven world of satellite uplinks, wireless networks, and the Internet, it is common to hear the terms "data logging" and "data loggers" and not really have a firm grasp of what they are.

Most people have a vague idea that data logging involves electronically collecting information about the status of something in the environment, such as temperature, relative humidity, or energy use. They're right, but that's just a small view of what data logging is.

Addressing Comfort Complaints With Data Loggers

This paper offers facility managers, HVAC contractors, and others with valuable tips on how low-cost data loggers can be used to validate temperature-related comfort complaints.

Monitoring Green Roof Performance with Weather Stations

Data logging weather stations are the ideal tools for documenting green roof performance. A weather station can measure weather parameters such as rainfall, stormwater runoff, temperature, relative humidity, wind speed, solar radiation, and a host of non-weather parameters such as soil moisture on a continuous basis (say every five minutes, hourly, or an interval appropriate to the situation).

Using Data Loggers Beyond Equipment Scheduling

While data loggers are a great tool for identifying equipment-scheduling opportunities in buildings, their usefulness far exceeds just that one function. This paper discusses how the use of inexpensive data loggers and some spreadsheet analysis can provide all the evidence needed to make powerful building-specific cases for saving money by replacing failed air-handler economizers. It also describes how information from data loggers can be used to accurately calculate the energy savings that can be realized from variable frequency drives (VFDs) on pumps and fans, supply air resets, and boiler lockouts

Analyzing Air Handling Unit Efficiency with Data Loggers

Operating a heating, ventilation and air conditioning (HVAC) system at optimum efficiency in a commercial setting is complicated, to say the least. There is a very real chance that any number of setpoints, levels, and feedbacks at boilers, chillers, pumps, fans, air delivery components and more can cause costly inefficiencies.

Finding Hidden Energy Waste with Data Loggers: 8 Cost-Saving Opportunities

The first step to reducing building energy costs is identifying energy waste. Statistics on utility bills or name plates on equipment, while useful, are not enough to identify what practices and equipment are contributing to high energy use. Portable data loggers can be used to obtain critical energy use information in a wide range of commercial building types – from manufacturing plants to office buildings.

Monitoring HVAC Performance with Data Loggers

This paper is for building operators and managers who have the difficult job of providing comfortable working conditions and coaxing aging mechanical equipment to operate at peak performance while minimizing energy costs.

Access our full resources library at: www.onsetcomp.com/learning

About Onset

Onset is a leading supplier of data loggers. Our HOBO data logger products are used around the world in a broad range of monitoring applications, from verifying the performance of green buildings and renewable energy systems to agricultural and coastal research.

Based on Cape Cod, Massachusetts, Onset has sold more than two and a half million data loggers since the company's founding in 1981.

Contact Us

Our goal is to make your data logging project a success. Our product application specialists are available to discuss your needs and recommend the right solution for your project.

Sales (8am to 5pm ET, Monday through Friday)
▶ Email sales@onsetcomp.com
▶ Call 1-800-564-4377
▶ Fax 508-759-9100

Technical Support
▶ (8am to 8pm ET, Monday through Friday)
▶ Contact Product Support
▶ Call 877-564-4377

Onset Computer Corporation
470 MacArthur Blvd.
Bourne, MA 02532