

ENVIRONMENTAL MONITORING FOR MUSEUM CURATION

DATA LOGGERS MONITOR TEMP, HUMIDITY, LIGHT & MORE

In museum environments, accurate and reliable data is essential for preservation purposes. In fact, many art and curative organizations will not loan their collections unless the recipient institution can prove that they have an environmental monitoring system in place to ensure that the articles are always maintained in safe conditions.

Some lenders require one or more years of climate-control data before agreeing to loan their exhibitions. They ask for evidence of the environmental data to be submitted in the Facility Report, a document adopted by the [American Alliance of Museums](#) when applying for and receiving exhibits and loans.

A Data Logger is an ideal device to record environmental data and transfer the readings to your PC for later analysis. In this brief overview, [CAS DataLoggers](#) covers the basics of environmental monitoring and how it helps curators to protect and preserve their collections.

CLIMATE CONTROL VERIFICATION

Manual data collection is very time-consuming, and retrieving the data can be difficult due to the number of data logger recording locations.



In particular, Temperature and Relative Humidity (RH) must be closely controlled and kept at suitable levels (generally a temperature of 68° to 72°F, and RH of 50% with +/- 5% fluctuation). Warmer temperatures can cause heat damage to certain objects, and high humidity levels can lead to mold formation and cause objects to corrode, warp, or crack.

Fragile paintings, documents and other artwork also need to be protected against excessive light exposure and ultraviolet light. Through automated monitoring, facilities can ensure that their protective measures (such as UV light filters and tinted panels) are fully effective.

Another key challenge is balancing the optimal conditions for preservation and those for exhibition and occupant comfort. Data loggers are also useful to verify performance of a climate-control system.

TRANSPORTING ARTWORK

Temperature and humidity alarm systems are commonly used in libraries, archives and document storage rooms and for transporting these valuable assets between facilities. Pieces in transport require a compact, lightweight solution to record all the necessary environmental parameters. All data is timestamped to show users the effectiveness of their climate control systems and other preventative measures.

WHAT SHOULD YOU MONITOR?

Common parameters of interest in museum applications include:

- Temperature
- Humidity
- Visible (Illuminance) and Ultraviolet light (UV levels)

Environmental dataloggers track and alarm temperature, humidity, and illuminance/UV light to protect artwork and installations in galleries and historical sites. These values can all be monitored with high accuracy. Wireless solutions are also available to save users from the hassle and cost of installing a wired system.

Whether you need a simple single-channel unit to log temperature or a multi-channel system to log temperature and other environmental parameters from several locations at the same time, you can find a data logger to meet your exact needs.

The ambient environment in an enclosed space with a properly performing HVAC system does not change radically. Therefore, the sample rate required for an environmental monitoring system is relatively slow. Typical sample rates are in the once per hour to once per 15 minute range.

HOW TO MONITOR TEMPERATURE

Temperature is the most widely measured parameter; therefore there are more choices for temperature loggers than any other parameter. There are many different types of temperature sensors as well as sensor probe types. For most museum and storage applications environmental applications, a temperature logger with an internal sensor is a good solution. In normal circumstances, the air temperature in an interior room does not change rapidly. Having the sensor internal to the data logger provides a time constant; the time it takes the air temperature to be sensed internal to the logger. A data logger with an internal temperature sensor can be less obtrusive and exist without negative impact to the aesthetics of the exhibit.

Temperature loggers with external sensors are useful when the logger must remain outside of an enclosure or storage device. Many simple environmental data loggers use proprietary temperature sensors in order to reduce costs.



HOW TO MONITOR HUMIDITY

Humidity is an important parameter to track when you're storing materials such as metals and paper products. Rot and rust are common results in facilities that fail to correct for high humidity levels. As with temperature sensor placement, be sure you have enough sensors to give good coverage of the goods or room you're monitoring.

Specific models of data loggers measure relative humidity (RH) in the surrounding area up to a certain range. For example one model might measure from 10% to 95% RH while another can record 5% to 95% RH. For many applications the standard range and accuracy may be enough, but when storing certain materials you'll want to be sure.

Many of these models record data using their own sensors, while others allow you to attach third party sensors. High-accuracy models are also available.

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HOW TO MONITOR LIGHT LEVELS

Many dataloggers use sensors that simultaneously measure and record illuminance/UV intensity. Some devices also calculate the cumulative illuminance and cumulative amount of UV light during recording sessions, which can be viewed without stopping recording.

Wide-ranged illuminance measurements can range from 0 to 130,000 lx, while UV range can be from 0 - 30 mw/cm². For more unique light or exposure needs, specialized sensors may be required.

GOING WIRELESS

Because of the sheer size of some exhibit areas, it can be extremely difficult to install a wired system. [Wireless monitoring systems](#) are ideal for museum interiors to verify that exhibits are in a controlled and non-damaging environment. Popular communication options include WiFi, Bluetooth, Cellular, and more. Additionally, many of today's networked WiFi versions can automatically send all data online to a cloud server for real-time monitoring and archiving.

Typically wireless systems consist of Remote Wireless Units which automatically monitor storage conditions and transmit all their temperature data and alarms online. They in turn send their data to a Wireless Gateway, which send it to an office PC or mobile device.

The choice of whether to go wireless or wired depends on several factors including your facility's network, the physical layout, wireless range, and where the dataloggers will be installed. A wireless setup saves personnel the cost of installing wiring and the hassle of running lengths of cables through the building.



Wireless systems are ideal when:

- You need to monitor a number of distributed points or floors;
- It's difficult or expensive to run wires from these points back to a central location;
- Closed displays were designed without penetrations for sensors or wiring;
- Data and/or alarms need to be collected from a site that is difficult to access or doesn't have regular internet connectivity.

WIRELESS RANGE

Wireless devices can be deployed in hard-to-access locations if necessary, including storage areas and inside display cases, giving personnel easy access to the data using mobile devices or hand held wireless readers.

For example, [Bluetooth Smart technology](#) enables curators to download the readings wirelessly from up to 100 feet away with just a smart phone or tablet. Historical data and real-time data are equally accessible.

LOGGING UNATTENDED WITH STANDALONE DEVICES

If your exhibit areas or storage areas have multiple walls or obstructions, then you may want a wired or standalone solution instead. Standalone dataloggers perform unattended temperature monitoring completely independent of a PC. These are most commonly [USB data loggers](#) which can be set to record on their own. Simple, direct USB connection enables users to quickly and easily download each datalogger's data directly to a PC via the USB cable.

These devices commonly feature alarming capability notifying you the moment that your values go out of specification in a variety of ways including text warnings, emails, LED status lights and more.

AUTOMATING THE DATA COLLECTION

Many environmental monitoring systems are available which can retrieve the data and push it over a network via FTP or send it via e-mail without the need for human interaction. This can result in dramatic reduction in man-hours freeing them up for tasks that benefit from being performed by a human. Avoiding transcription errors or missed data is also a great benefit of electronic data loggers and automated archival.

WHO GETS ALARMS AND HOW?

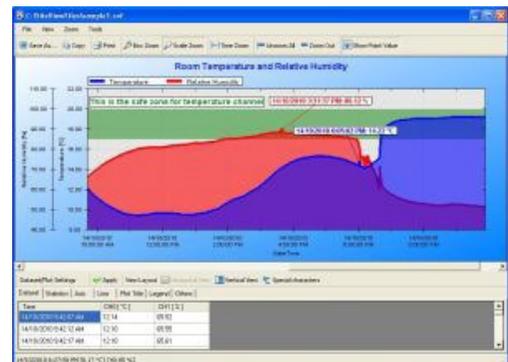
Alarm generation is one of the most important factors to consider: do you want a datalogger that indicates an alarm by LED, or do you need the system to send out email warnings? Many data logger models support several alarm capabilities so you can choose how you want to receive alerts.

All considered, the most effective alarm type is the one you're sure will go to the right people and be immediately acted upon.

ANALYSIS SOFTWARE

Typical software capabilities include:

- Configuring and naming sensors
- Automatically updating site data to a datafile or database
- Generating reports presenting the data



Users can track readings by room to get a highly accurate environmental profile to aid long-term preservation. For example, today's software allows users to color-code areas such as room and walls, so you can focus on a length of wall in green or the ambient temperature of a room in blue. This way all data collected is made as meaningful as possible to the museum.

For further information on [Environmental Monitoring Systems](#), for Museums and Archives, or to find the ideal solution for your application-specific needs, contact a CAS Data Logger Application Specialist at **(800) 956-4437** or www.DataLoggerInc.com.