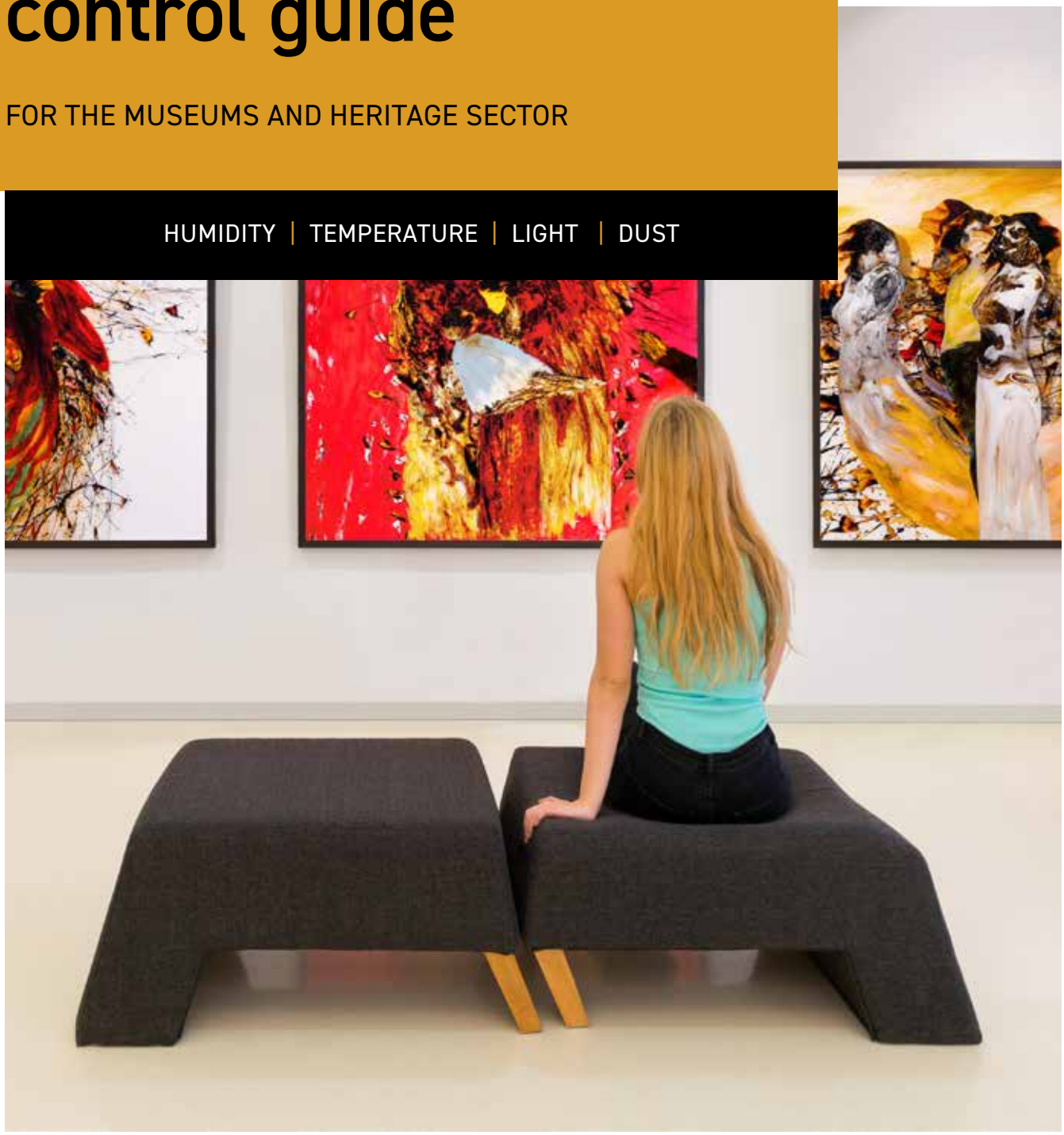
Environmental control guide

FOR THE MUSEUMS AND HERITAGE SECTOR

HUMIDITY | TEMPERATURE | LIGHT | DUST



NOVATRON SCIENTIFIC

A division of Rhopoint Metrology

Specialists in precision humidity equipment and calibration services

www.novatron.co.uk sales@novatron.co.uk +44 (0)1403 754 416

Image: © Ashmolean Museum, University of Oxford

Why use Novatron?

Industry experts

Novatron have been supplying humidity monitoring equipment to the museums and heritage sector for over 20 years.

Reliable products

Our Swiss-manufactured range of Defensor humidifiers are trusted by museums, galleries, restorers and private collectors.

Service

Reliable, efficient service with a full selection of spare parts carried for effective and hassle-free maintenance.

Find out more or book an appointment

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Image: © Ashmolean Museum, University of Oxford

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What is humidity?

Relative humidity (% RH) is an expression that tells us how far the air around us is towards becoming water-vapour saturated (100% RH).

For example, at 50% RH, the air is halfway to saturation. The higher the air temperature, the greater the capacity for air to hold water-vapour.

Therefore, relative humidity falls with rises in air temperature and increases as air is cooled.

Optimal humidity

Consider how a biscuit, being crisp-baked, will go soft if left open in your kitchen environment. That is because it will equilibrate or balance with the higher room relative humidity of your kitchen.

The same too will happen with absorbent materials like wood, leather, canvas & textiles in collections.

Humidity instability may give rise to fatigue damage, caused by constant absorption/desorption resulting in repetitive expansion/contraction.

Relative humidity (% RH)

An expression that tells us how far the air around us is towards becoming water-vapour saturated (100% RH).

Absolute humidity (or mixing ratio)

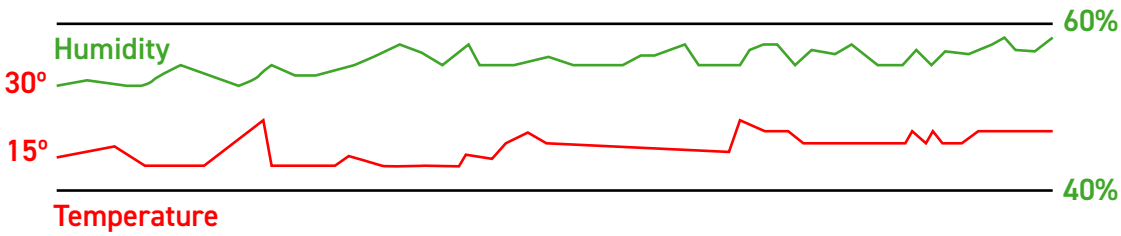
The amount of water in the air by weight g/kg. Typically 1kg air = 1.3 cubic metres.

There are around 8g of water in 1kg of dry air at ambient room conditions of 50% at 20°C. That is about a tablespoon of water per cubic metre.

Dew point temperature

The temperature at which the air reaches 100% RH as it cools °C (td).

Often cold surfaces attract condensation because they are below the dew point temperature of the air. ■



Why is it important to control humidity in the museums and fine art industry?

The stability of the surrounding environment is a vital and basic factor in the conservation of art, requiring temperature and humidity to be strictly controlled.

Fluctuations in temperature and humidity caused by external factors, such as the weather or the number of visitors, are a major problem for museums.

Fluctuations that occur repeatedly over a short period of time will have the most damaging effect as the materials do not have enough time to acclimatise.

For example, an influx of people at one time will increase the humidity considerably, especially on a rainy day. ■

Effects of humidity on art

Poor humidity control can cause irreversible damage to art and antiques made from a wide variety of materials. Maintaining specific humidity levels is often a condition of benefactors in deciding whether or not to loan works of art to galleries.

Most organic materials react with their surrounding environment and will absorb or desorb water accordingly from the air to become acclimatised or at 'equilibrium'.

Consequently, many works of art within museums and heritage could potentially be damaged if relative humidity is too high or too low.

For example, very low humidity may cause shrinkage and cracking of panel paintings, or very high humidity could lead to distortion of paintings or corrosion of metals.

These effects may be very visible such as materials warping, splitting or cracking or they can be microscopic but over time will become more obvious.

As works of art grow older they become brittle and fragile, and less able to readjust their internal moisture level without damage.

For most general collections, the acceptable band of humidity is between 40 - 60% RH at normal room temperature (17-25°C), with no more than 10% fluctuation over 24 hours.

Most heritage collection

environments are now monitored for relative humidity and temperature surroundings with the plotting of analytical graphs, using electronic sensors coupled with software-based data logging systems.

To correct high humidity, dehumidifiers are used and for low humidity problems, humidifiers are used. ■

Works of art can be damaged if relative humidity is too high or too low and fluctuates by more than 10% RH over 24 hours

The type of low humidity damage depends on the exhibit but materials that are particularly at risk include:

Wood

The amount of damage that will be sustained will be dependent on how the wood was primarily seasoned.

However, damage can include warping, cracking and movement of joints, and discolouration of veneers or external veneered layers detaching and separating.

Textiles

A drop in humidity will cause textiles to become brittle. When stretched across wooden boards or frames there is the risk of tearing.

Silk is particularly at risk as are any exhibits that contain human or animal hair, which is a particularly hygroscopic material.

Paintings

Individual layers of paint can react to moisture loss in a different way leading to blistering and flaking.

Ivory

Internal moisture changes can quickly cause thin ivory structures to crack.

Paper and papyrus

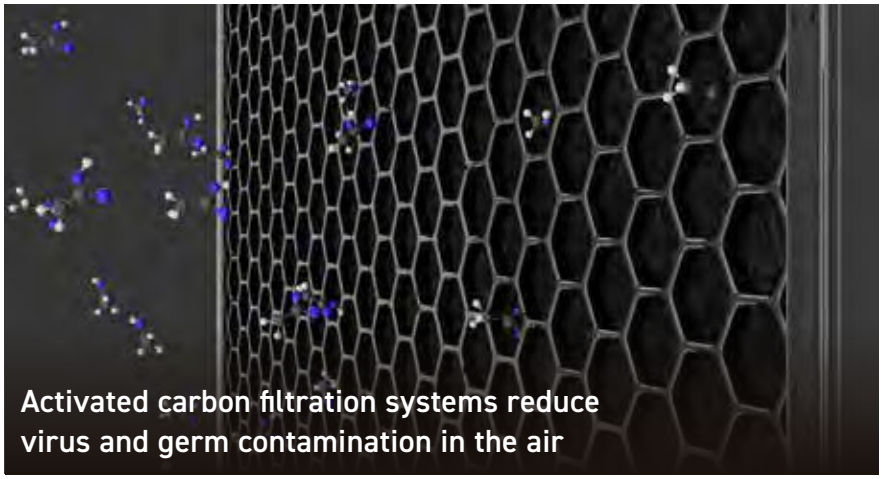
Although moisture can be put back into these materials once they have dried out, regular hydration and dehydration is detrimental to the structure and can cause damage.

Pottery, terracotta and stone

Alterations in the internal moisture content will cause minerals to rise to the surface when wet and then crystallize when dry. This can lead to stains on the surface, powdering and flaking.

Effects of humidity on humans

People can tell whether an atmosphere is hot or cold the moment we experience it but air that has a low or high humidity is not obvious to us.



Activated carbon filtration systems reduce virus and germ contamination in the air

Our senses are not so refined as to "feel" the moisture content of the air we breathe into our lungs or which touches our skin and bodies.

However, the effects of air's humidity on us are significant and can be damaging when extremes are experienced over a long period.

Dry air will draw moisture from any available source it comes into contact with, including our bodies. Water can evaporate from our eyes, skin, hair, nails and any other exposed surface.

This dehydration can cause initial discomfort, such as sore eyes or contact lens irritation, but can also lead to more serious symptoms, such as dry, itchy skin and dermatitis.

Effects on the respiratory system

Even more serious is the effect it has on our respiratory and immune system. When we breathe air below 40% RH, the mucous membranes in our nose, throat and bronchi dry. These elements play a vital role in our body's defence against airborne pollutants, such as viruses and bacteria. ■

Benefits of the correct air humidity

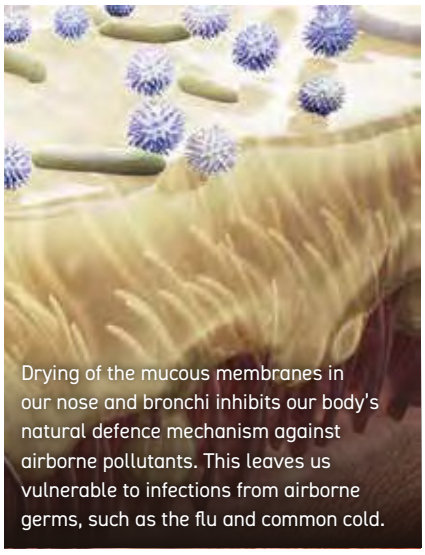
Humidifiers add moisture to the air, which can benefit people with dry skin and respiratory problems.

This can be particularly beneficial for staff and employees in museums that are in a controlled environment for a long period of time.

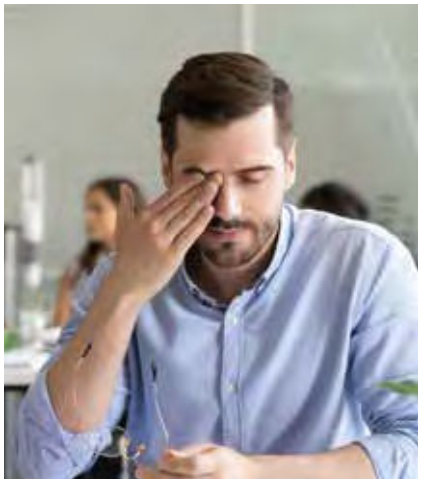
Benefits to people include reduced:

- **Nasal congestion**
- **Nose bleeds**
- **Dry, itchy skin and dry eye**

Drying of the skin's upper epidermal layer through exposure to dry air can lead to itchiness, cracking and dermatological problems.



Drying of the mucous membranes in our nose and bronchi inhibits our body's natural defence mechanism against airborne pollutants. This leaves us vulnerable to infections from airborne germs, such as the flu and common cold.



Sore eyes is a symptom of long term exposure to a dry atmosphere.

Scientific studies

There have been many studies and reviews carried out over the years demonstrating how humidity affects the human body. Here is a concise summary from some of these studies' abstracts illustrating the compelling case for maintaining an optimum humidity for physical health and well-being.

Study: Physiological and subjective responses to low relative humidity

Author: Sunwoo Y et al, 2006

Citation: J Physiol Anthropol. 2006 Jan;25(1):7-14

Method: 16 healthy subjects were monitored in controlled conditions of 25°C and 10% RH, 30% RH and 50% RH. The subjects' physical conditions were monitored, including mucociliary clearance time, frequency of blinking, hydration of skin and transepidermal water loss. Subjects were also asked to subjectively judge temperature, dryness and comfort sensations

Summary result: Low relative humidity detrimentally affects mucous membranes, the dryness of the eye's mucosa and the stratum corneum (outer layer) of the skin and causes a decrease in mean skin temperature. Interestingly, subjects immediately felt cold after a drop in humidity but had only a slight perception of dryness.

Review: The dichotomy of relative humidity on indoor air quality

Author: Wolkoff P, Kjargaard SK, 2007

Citation: Environ Int. 2007 Aug;33(6):850-7. Epub 2007 May 17

Method: Reviewed various epidemiological, clinical and human exposure studies relating to relative humidity.

Summary result: Studies indicate that low relative humidity plays a role in the increase of reporting eye irritation symptoms and alteration of the precorneal tear film. These effects may be exacerbated during visual display unit work. Relative humidity of about 40% is better for the eyes and upper airways than levels below 30%.

Study: Low ambient humidity impairs barrier function and innate resistance against influenza infection

Authors: Eriko Kudo, Eric Song, Laura Yockey, Tasfia Rakib, Patrick Wong, Robert Homer, Akiko Iwasaki

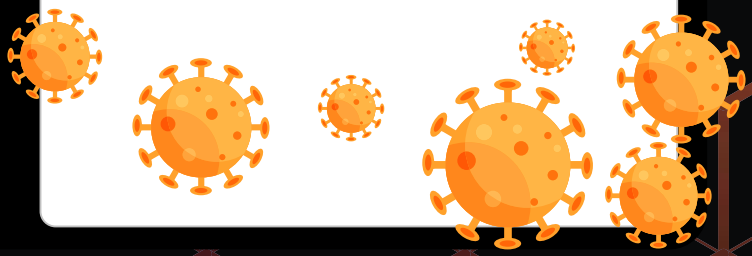
Citation: May 2019, DOI: 10.1073/pnas. 1902840116

Method: This study set out to understand the impact of low humidity on the immune system's defences against the Influenza virus. Genetically modified mice, which resist flu infection in a similar way to humans, were used to test the effects of humidity, at either 10 or 20% RH compared to 50% RH, on flu infection.

The mice were pre-conditioned in an environmental chamber at 20°C and either the low or normal humidity. They were then infected with the flu virus and returned to the environmental chamber for a set period of time.

The mice were studied for their physical reactions to the virus, including temperature, weight, viral load in the respiratory system and ultimately their mortality to the virus.

Summary result: The study found that mice housed at 20% RH suffered a worse disease course compared to those kept at 50% RH, with more rapid and greater weight loss, drop in body temperature and shortened survival. In fact, whereas all mice at the lower humidity died within 11 days of infection, of those that experienced 50% RH, just under half survived until the end of the experiment.



Controlling humidity to protect against COVID-19

The effects of low humidity on the air we share

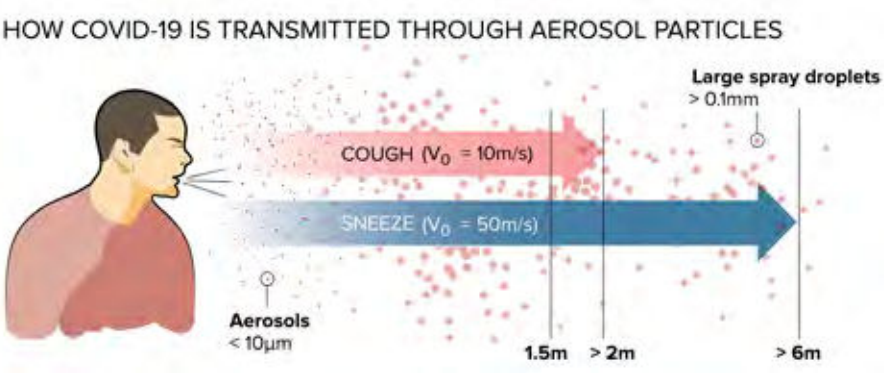
Low air humidity below 40% RH acts as a conduit for viruses and airborne bacteria to disperse and travel around a building.

This occurs due to a combination of an increased virus survival time at lower humidity and the enhanced suspension of the infectious particle in dry air.

Whenever an infected person breathes, talks, coughs or sneezes they release aerosolised droplets that contain elements including saliva, mucus, salts, germs and viruses into the air. Large droplets fall to the ground or settle on surfaces but droplets less than 4 microns in size have been shown to remain airborne for hours.

In room air, expelled droplets lose more than 90% of their moisture content rapidly by evaporation after they are released. At a humidity level of above 40% RH, elements like salts and proteins are still dissolved in the droplet but become highly concentrated. They attack viruses and bacteria, rendering them inactive, reducing the risk of secondary infection.

However, below the critical level of 40% RH, further evaporative moisture losses result in these elements crystallising out of solution. The internal environment of the airborne droplets changes from aggressive to protective towards the transported



germs inside. This enables airborne viruses and bacteria to remain infectious for longer.

The lower humidity also causes more droplets to evaporate down to a size capable of remaining airborne. So dry air has the double effect of creating a greater quantity of airborne droplets and prolonging the infectivity of the germs they carry, significantly increasing the potential risk of secondary infection.

Protecting staff and visitors

The optimal humidity to minimise risks to human health from biological contaminants, pathogens and chemical interactions occur in the narrow range between 40 - 60% RH at normal room temperatures.

Cooler temperatures and reduced airborne pollution has a positive impact on productivity, as staff are healthier and happier. ■

Top image: Above 40% RH, droplets remain larger and more fall to the ground, reducing airborne infection. For those particles small enough to remain airborne, their internal salts stay in solution and attack the germs, reducing their infectious capability.

Bottom image: Below 40% RH, more droplets become smaller through evaporation and remain airborne, increasing the risk of infection. Internal salts crystallize out of solution and are no longer a threat to the transported germs, prolonging their infectivity.

Scientific studies

There have been many studies and reviews carried out over the years demonstrating how humidity affects the transmission and survival rates of airborne germs, such as cold and flu viruses.

Here is a concise summary from some of these studies' abstracts illustrating the compelling case for maintaining an optimum humidity to improve indoor air quality and human health.

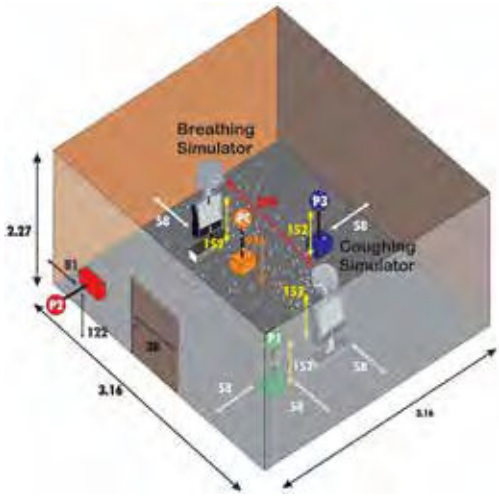
Study: High humidity leads to loss of infectious influenza virus from simulated coughs

Author: Noti JD et al, 2013

Citation: PLoS One. 2013; 8 (2):e57485

Method: Influenza was "coughed" using manikins fitted with nebulizers in a room at different humidity levels between 7-73% RH. Air samplers collected suspended aerosol particles to assess their continued infectious nature at the different room conditions.

Summary result: At low relative humidity, influenza retains maximal infectivity. Inactivation of the virus at relative humidity above 40% RH occurs rapidly after coughing. Maintaining indoor relative humidity >40% RH will significantly reduce the infectivity of an aerosolized virus.



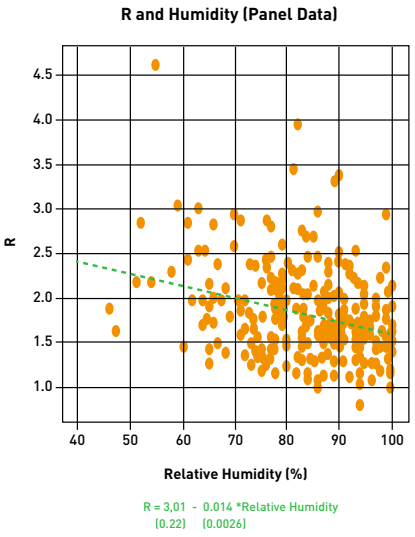
Study: Dynamics of airborne influenza A viruses indoors and dependence on humidity

Author: Yang W, Marr LC

Citation: PLoS ONE, 1 June 2011 | Volume 6 | Issue 6 | e21481

Method: Modelled the size, distribution and transformation of aerosol droplets carrying influenza A virus (IAV) emitted from a cough, over humidity levels ranging from 10-90% RH.

Summary result: Humidity is an important variable in aerosol transmission of IAV because it both induces droplet size transformation and affects IAV inactivation rates. The virus inactivation rate increases linearly with relative humidity. At the highest % RH inactivation can remove up to 28% of IAV in 10 minutes.



Study: Quantifying Environmental Mitigation of Aerosol Viral Load in a Controlled Chamber With Participants Diagnosed With Coronavirus Disease 2019

Authors: Hooman Parhizkar, Leslie Dietz, Andreas Olsen-Martinez, Patrick F Horve, Liliana Barnatan, Dale Northcutt, Kevin G Van Den Wymelenberg

Citation: Jan 2022, doi.org/10.1093/cid/ciac006

Objective: This study set out to examine the effects different environmental control strategies had on the viral load suspended in the air, with a view to recommending which strategies should be prioritised to minimise viral transmission.

Method: An airtight, modular chamber was equipped with air samplers, humidifiers, dehumidifiers, HEPA filters, settling plates, particle counters, a stand-up desk and a treadmill.

Over a period of two months, 11 University of Oregon students who had been diagnosed with COVID-19, entered the unit one at a time and were invited to sit, stand, talk, talk loudly, cough on purpose and walk on the treadmill during a three-day set of experiments.

Throughout the course of each study day, the researchers conducting the study would measure viral RNA in the air and on surfaces, as well as directly from the research participants' nose and mouth. The idea was to measure how virus particles move through the air, controlling for three variables: ventilation, filtration and humidity.

Results: Increased viral load in nasal samples is associated with higher viral loads in environmental aerosols and on surfaces captured in both the near field (1.2 m) and far field (3.5 m).

Viral loads were monitored in the air and on surfaces, across the different activities and environmental conditions. Photo credit: University of Oregon.

Aerosol viral load in far field is correlated with the number of particles within the range of 1–2.5 μm. Increased ventilation and filtration significantly reduced aerosol and surface viral loads.

Higher relative humidity resulted in lower aerosol and higher surface viral load, consistent with an increased rate of particle deposition at higher relative humidity. Data from near field aerosol trials with high expiratory activities suggest that respiratory particles of smaller sizes (0.3–1 μm) best characterize the variance of near field aerosol viral load.

Conclusion: The findings indicate that building operation practices such as ventilation, filtration, and humidification substantially reduce the environmental aerosol viral load and therefore inhalation dose, and should be prioritized to improve building health and safety.

11 students diagnosed with COVID-19 spent 3 days each in the controlled chamber. Participants carried out a variety of activities at different levels of ventilation, air filtration and humidity.

How to manage humidity in museums

© Ashmolean Museum, University of Oxford

Each gallery has its own unique requirements so general specifications, designs and poor selection of critical plant items is often the cause of problems.

In many galleries the exhibits are displayed on the walls, therefore it is the conditions at the wall surface rather than in the centre of the gallery that is more important.

However in other galleries the exhibits are stored in sealed display cases and it is these that need to be controlled, yet in both instances the environment has to be maintained to ensure visitor comfort.

When designing a humidification system, the stability of the humidity control is far more important than

the precise level. The most frequent design condition is a relative humidity of between 45-55% RH with daily fluctuations held to ± 5% RH.

Ventilation and humidity

Ventilation is essential for libraries, since it ensures the health of staff and visitors as well as minimizing the potential for mould growth.

However, increased ventilation will increase the demand for humidification, particularly in winter and with paper being a highly hygroscopic material the stability of the humidity is critical. This can only be achieved by selecting the right humidifier for the application.

Increased ventilation will increase the demand for humidification particularly in winter

As mentioned previously, the main problem for museums is stability. The internal environment of a museum or gallery is subject to almost constant change in temperature and humidity during all the hours that visitors are going through its doors. Therefore any humidification system installed must be able to react quickly to a drop in humidity, shut down rapidly when the humidity level is increased and modulate from 0-100% operation to cope with the close control required.

Controlling the environment

Museums need to control the environment around the exhibits 24 hours a day, 7 days a week. Constant operation of the humidification system ensures good environmental control and eliminates sharp spikes and excess fluctuations of temperature and relative humidity.

For this reason humidifiers need to be reliable and also not too expensive to run.

Maintenance is also an issue as the units will need to be maintained frequently due to the long operating hours. Anything that is costly to maintain will quickly become very expensive.

Museums and galleries are often housed in old buildings that don't have built-in duct-work networks for pumping round conditioned air. In modern office buildings humidity is introduced into the atmosphere through these ducts but without them humidity has to be introduced directly into the room that requires the humidity control.

Humidity solutions

Humidity can be introduced into an atmosphere in three basic ways: spraying a fine mist, releasing steam or evaporation from a wetted media.

The most popular solution for museums and art galleries is direct room humidification with portable evaporative humidifiers.

These give the flexibility to move the humidifiers into more sensitive areas, as required. These typically incorporate a humidity controller (also called a humidistat or hygrostat) to give the required level of control. ■

Main advantages:

- Low noise
- Easy to fill
- Low energy cost
- Low maintenance cost

HUMIDIFIER

Increases water levels

A humidifier puts water into the air to raise the humidity level

VS

DEHUMIDIFIER

Decreases water levels

A dehumidifier removes water from the air to reduce the humidity level

Challenges of winter environments

Both images: © Ashmolean Museum, University of Oxford

For conservation of fine art it is essential to maintain air relative humidity to stable conditions of within 40 – 60% RH, with a maximum variation of ±10% over a 24 hour period.

These are the standards set by the industry and most accredited museums & art galleries need to demonstrate that they are working to achieve this.

Normally the indoor relative humidity falls to below 40% during the colder months of October through to May when the heating comes on.

To compensate for this, Novatron supply precision portable humidifiers for local control and for back–up of air conditioning systems in museums, art galleries, heritage buildings and archives.

However, humidity levels in museums and art galleries are notoriously difficult to maintain consistently.

The constant influx of people through a room will cause the temperature and humidity to fluctuate. One minute a room may be full of visitors and the next it is empty.

Temperature and humidity are inextricably linked. If the temperature increases in a room, the humidity level will drop if water is not artificially added. This is due to the fact that cold air holds less water than warm air.

Heat an atmosphere that has 55% humidity and the humidity level will decrease until the atmosphere can draw enough water from other sources to achieve its natural level at its warmer temperature.

This means that dry air is largely a seasonal problem. As heating systems are turned on, indoor humidity levels drop.

However, in a museum environment even minor fluctuations in humidity, such as when lights are turned on or off in a display cabinet, can cause damage over time. ■

Affect of light on works of art

Preserving over 3 centuries of artefacts at the Freemasons Museum, London

MUSEUM OF FREEMASONRY

One of the primary causes of deterioration of textiles is due to prolonged exposure to light which can cause permanent damage to the artefact.

The damage is often gradual, caused over a long period of time. This process is known as photochemical deterioration and is invisible to the human eye.

Both ultraviolet (UV) and infared (IR) energy are not visible to human vision, but the effects can be very damaging to works of art, some of which are several centuries old. UV rays have short wavelengths and lead to photochemical destruction which is often manifested as fading.

Typical damage occurs from radiant heat causing a rise in temperature. This forms a reaction on the surface of an object such as cracking, lifting and colour changing in the paint used to create the works of art we enjoy on museum walls.

The most common way to lessen the severity of light damage is to prevent it from reaching the object. UV-blocking blinds are used in the museum which offer a 99.9% reduction in the UV light transmission. Accurate measurements of light transmitted onto the artefacts are measured using the ELSEC 765C instrument from Novatron.

This can determine how much illuminance (visible light) and potential damage a work of art will receive. Once the current intensity and make-up of the visible light is known, the lighting may be reduced or altered to slow the rate of photochemical deterioration.

Other methods to help preserve and slow UV and IR damage is through the use of filters. Reducing the intensity of the light on the object by moving it further away will also help, as will the duration of exposure.

Aggressive lighting choices can often cause heat and light damage, often resulting in permanent color distortion and brittleness.

An ELSEC 765C instrument measures the levels of lux, UV, humidity and temperature that the artefacts are exposed to. It keeps track of UV radion levels which can be used to measure the levels of UV radiation that works of art are exposed to. A datalogging radiometer can keep track of UV radiation levels, as well as the time and duration of varying levels of intensity.

This kind of technology is essential to protecting works of art for future generations. ■

Follow these rules to ensure the longevity of your collection:

- Avoid displaying artwork in direct sunlight. Ultraviolet light and infrared radiation can cause fading.
- Don't allow light to directly face artwork. This will protect your artwork against heat damage.
- Avoid fluorescent lighting. It emits a high level of ultraviolet energy, which accelerates colour fading and distorts the colour of the artwork.

Case study - Picture restorer

In order to protect priceless pieces of art to be enjoyed by future generations; temperature and humidity stability is not just important, they are crucial factors. Our customer, a second-generation family business established in 1989 and based in the heart of Chelsea explains further.

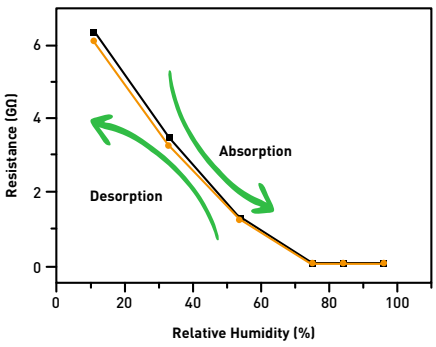
In order to protect priceless pieces of art to be enjoyed by future generations; temperature and humidity stability is not just important, they are crucial factors. Our customer, a business established in 1972 and now based near Chelsea explains further.

What sets our customer apart from other picture restorers is their reputation. They have established themselves as the provider of choice with the most enviable client listing.

One third are institutional clients, one third private clients and the final third being the commercial art market. Their area of speciality is the conservation of paintings from the 15th century through to the early 1900s, both panel and canvas paintings.

Effects of humidity on timber

Prior to 1550, most paintings were painted on wood. Timber is a hygroscopic material that has the ability to adsorb or desorb water in response to temperature and relative humidity of the atmosphere surrounding it. The front of the painting (when painted on one side only) is semi-permeable and therefore slower to exchange moisture. The back of the panel is relatively free to interact with the environment. Fast absorption and desorption cause the greatest damage and compression to these often-priceless works of art. Due to the hysteresis of the material, the change with absorption is not the same as the contraction with desorption; the moisture gradient is different across the thickness of the panel painting.



The effect of changes in humidity on a panel painting can be very damaging, with reported problems including: warping, splitting, blistering of paint, lines of flaking paint (often relating to the restraining of the panel in low humidity).

The effects of humidity on canvas

In the 16th Century, Europe moved towards paintings on canvas; typically on flax. When flax is formed into a thread, it is twisted. When these threads absorb moisture, the twist tightens increasing the overall tension. Extremes of high and low

Timber explained

Merry Company, by Isack Elyas, 1629, Dutch painting, oil on panel

The back of the painting is free to interact with the environment

The front of the painting being painted on one side only is semi permeable and therefore slow to moisture exchange

humidity can cause increased tension.

Our customer sees the largest effect of moisture on unlined canvases. The edges are subject to failure from the stress and also the increased tension can lead to tearing.

Given that accurate humidity control of a painting in their care is a fundamental part of our customer's business, they needed humidification units that they could rely on to control their humidity at 50 – 55%. Whilst industry guidelines suggest that 40 - 60% RH is an acceptable banding, our customer can see changes in some sensitive panels with movement of timber taking place with a 2% change.

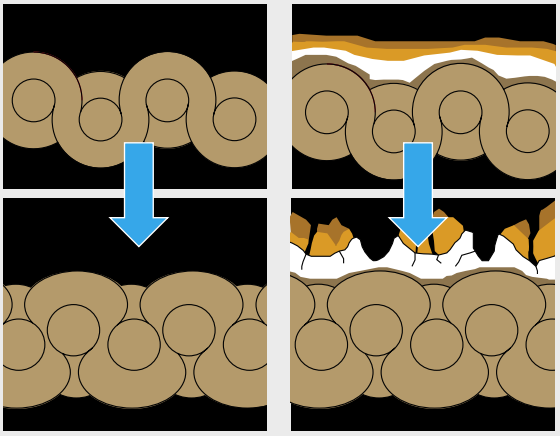
Most notably, if the painting which has been painstakingly restored by our customer, is returned to an environment which is not humidity controlled, it could happen that they see it again within a few years with further damage!

Novatron have been supplying the Defensor range of humidifiers to the fine arts sector for over 20 years.

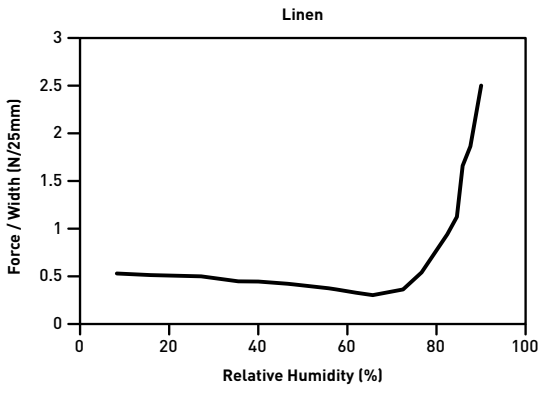
The reputation of our products is what convinced them to trust Defensor; only the most reliable product coupled with excellent customer service would be acceptable along with sound advice on how to care for the humidifier to ensure longevity of life.

Our customer has had 2 x PH26 humidifiers for over 20 years (now succeeded by the PH28) and a PH14A (now succeeded by the PH15A) which was purchased 3 years ago, all serviced and maintained by Novatron Scientific. ■

Canvas explained



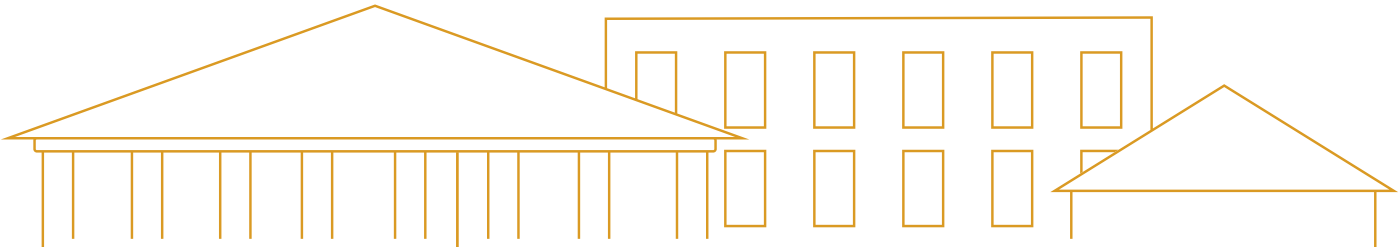
The effect of humidity on a canvas painting can often include sagging, fraying and tearing of the material



The response of a linen canvas to changing relative humidity

Product guide

Buying Guide



Low noise

Easy to fill

£ Low energy

£ Low maintenance

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PH15 Humidifier

Suitable for room sizes
up to 900m³

p23

PH28 Humidifier

Suitable for room sizes
up to 1300m³

p25

Harry Humidifier

Suitable for room sizes
up to 300m³

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Robert Humidifier

Suitable for room sizes
up to 200m³

p28

Novatron also supply complete wireless environmental monitoring systems (NEMS).

Please ask for more information.

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Edward Humidifier

Perfect for
display cases

p27

Albert Dehumidifier

Suitable for room sizes
up to 200m³

PH15 Humidifier

Humidifiers for large spaces
For room sizes up to 900m³

The PH range efficiently humidifies while simultaneously purifying the air in dusty and contaminated air for the benefit of Works of Art and also human health.

Defensor.

Low noise | Easy to fill | £ Low energy | £ Low maintenance

The Defensor PH15 is an easy to use humidifier that requires very little maintenance on a day to day basis. This durable air humidifier from Novatron is featured with a 20 litre trolley water tank. It has been designed with convenience in mind and has an auto fill feature.

Suitable for room sizes up to 900m³, including museums, galleries, palaces and private collections.

Easy to fill

Filters viruses and pollen

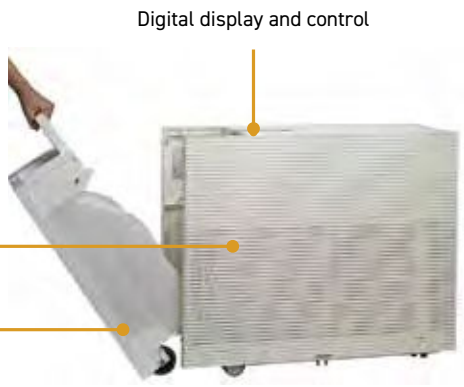
Features

- Electronic water level detector
- Electronic overflow detector
- Direct connection to a water supply, model PH15A
- Optional control via radio hygrostat
- Ultra quiet operation
- Low cost of ownership

Technical data

- 4 Fan speeds
- Humidification capacity [l/h]: 0.6 - 1.7
- Air circulation rate [m³/h]: 155 - 340
- Power consumption: 75W max.
- Weight (empty): 25kg
- Water tank capacity: 20l
- Dimensions: 730mm x 610mm x 370mm (W x H x D)

Intelligent controls for maximum performance

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PH28 Humidifier

Humidifiers for large spaces
For room sizes up to 1300m³

The PH range efficiently humidifies while simultaneously purifying the air in dusty and contaminated air for the benefit of Works of Art and also human health.

Low noise | Easy to fill | £ Low energy | £ Low maintenance

Defensor.

The Defensor PH28 air humidifier from Novatron is a robust product that has the benefit of requiring very little maintenance.

Suitable for room sizes up to 1300m³, each model comes with a 30 litre trolley water tank which is easily replenished and is useful should a water supply not be close by to the application. For direct connection to a water supply, refer to model PH28A.

Easy to fill

Filters viruses and pollen

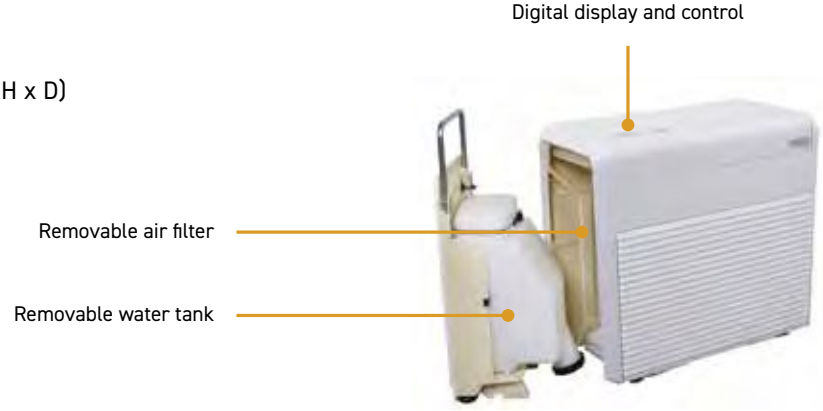
Features

- Easy and convenient handling
- Hygienic and dust-free humidification
- Silver ioniser water sterilisation included
- Direct connection to a water supply, model PH28A
- Low maintenance requirements
- Minimum energy consumption
- Low cost of ownership

Technical data

- 4 Fan speeds
- Humidification capacity [l/h]: 1.7 - 2.7
- Air circulation rate [m³/h]: 320 - 750
- Power consumption: 128W max.
- Weight (empty): 43kg
- Water tank capacity: 30l
- Dimensions: 800mm x 750mm x 440mm (W x H x D)

Intelligent controls for maximum performance



Robert Humidifier

Humidifiers for smaller spaces
For room sizes up to 200m^3

This easy-to-use and slimline small humidifier makes it ideal for art stores, offices, domestic art collectors, conservation studios and libraries.

NOVATRON SCIENTIFIC
A division of Rhopoint Metrology

Low noise | Easy to fill | £ Low energy | £ Low maintenance

The Robert model benefits from a modern design with a digital hygrostat for accurate measuring of humidity and a unique filtration system for improving the quality of the air. Easy to clean and wash the filtration discs.

Easy to fill

Filters viruses and pollen

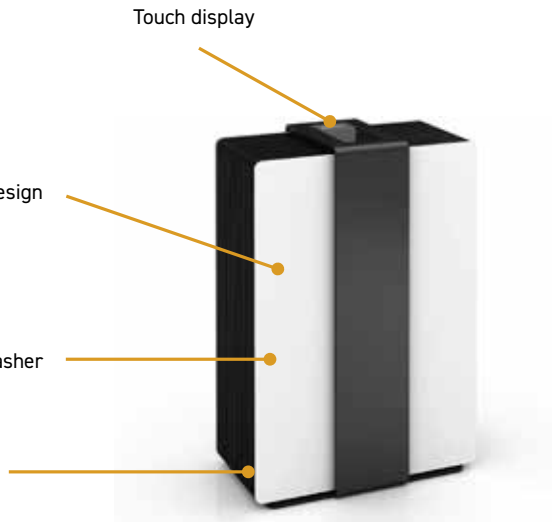
Features

- Touch display
- Slimline design
- Sophisticated air washer
- Environmentally friendly water sterilisation cube included
- Digital humidistat
- Fragrance container

Technical data

- Humidification per day: 13.2l / 550g/h
- Operation noise level [dB]: 27-56dB(A)
- Power consumption: 30W max.
- Weight (empty): 8.2kg
- Water tank capacity: 6.3l
- Dimensions: 321mm x 471mm x 235mm (W x H x D)

Easy access to the water tank



Harry Humidifier

Humidifiers for smaller spaces
For room sizes up to 300m³

Whether it is used as a humidifier, air purifier or a combination of both – it satisfies all your needs.

Low noise | Easy to fill | £ Low energy | £ Low maintenance

NOVATRON SCIENTIFIC
A division of Rhopoint Metrology

This easy-to-use and slimline small humidifier makes it ideal for art stores, offices, domestic art collectors, conservation studios & libraries up to 300m³.

The Harry is supplied pre-commissioned and is set at 50% RH on maximum fan speed which will provide quiet operation and should allow you to maintain control within 40 – 60% RH even with some extra air losses and the occasional emptying of the water tank overnight.

Easy to fill

Filters viruses and pollen

Features

- Fully portable
- Digital hygrostat
- Intelligent control
- Environmentally friendly water sterilisation cube included
- Quiet operation
- Electronic humidity sensor

Technical data

- Humidification per day: 15l / 625g/h
- Operation noise level [dB]: 25dB(A)
- Power consumption: 30 Watt max.
- Weight (empty): 10.4kg
- Water tank capacity: 10l
- Dimensions: 347mm x 435mm x 490mm (W x H x D)

Easy access to the water tank

Digital display and remote control

Active carbon and hepa filter system

Edward Humidifier

The smallest humidifier For display cases

The Edward humidifier is very easy to use and has a neat, slim-line design making it perfect for small areas.

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NOVATRON SCIENTIFIC
A division of Rhopoint Metrology

Low noise | Easy to fill | £ Low energy | £ Low maintenance

Edward is the smallest of our humidifiers making it ideal for those spaces where others won't fit. This model benefits from a slimline design with a digital hygrostat for accurate measuring of humidity, a unique filtration system for improving the quality of the air.

An added benefit is that this model needs no installation. Simply fill the tank with water, plug it in and turn it on. In addition, annual maintenance is recommended with replacement V4 filters required.

Quiet operation

Optimal humidity

Fits in small spaces

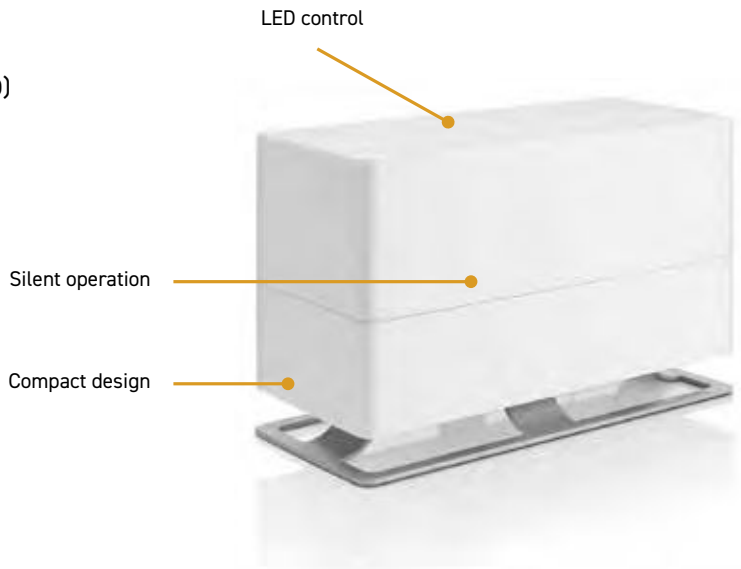
Features

- Fully portable
- Digital hygrostat
- LED control
- Silent operation
- Electronic sensor

Technical data

- Humidification per day: 7l / 250g/h
- Operation noise level [dB]: 35-46dB(A)
- Power consumption: 35W max.
- Weight (empty): 3.9kg
- Water tank capacity: 6l
- Dimensions: 470mm x 290mm x 200mm (W x H x D)

Easy maintenance



Albert Dehumidifier

Swiss made design
For room sizes up to 200m³

Reduces humidity, low energy use, compact design.
Removable water collection tank or plumbed drainage.

Low noise | Easy to fill | £ Low energy | £ Low maintenance

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This mobile dehumidifier is the perfect choice for homes, conservation storage for artefacts and small galleries. The Albert can also be used in the construction industry to aid drying times. Once plugged in and in position, it is safe for 24hr operations.

The Albert dehumidifier will extract up 20 litres of moisture from the atmosphere every 24 hours. It has a 4.6 litre water tank and when full will automatically shut off and a warning light will come on and an audible alarm will sound.

Fully portable

Powerful moisture extractor

Damp and mould protection

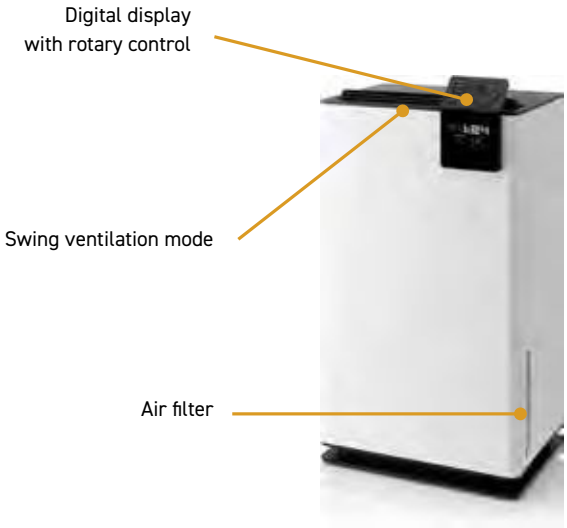
Features

- Digital humidistat
- Digital display and rotary control
- Air purifying
- Quiet operation
- Intelligent controls
- Auto-defrost system

Technical data

- Auto, Night and Clean modes
- Operation noise level [dB]: 33-44dB(A)
- Continuous drainage: optional
- Power consumption: 320W max.
- Weight (empty): 15.36kg
- Water tank capacity: 4.6l
- Dimensions: 655mm x 350mm x 252mm (W x H x D)

Easy maintenance



Other monitoring & measuring equipment

NOVATRON SCIENTIFIC
A division of Rhopoint Metrology

Ultra-precise

£ Low energy

£ Low maintenance

Climate Multi-Function hand-held

Measured parameters

- Humidity
- Temperature (°C or °F)
- Absolute Pressure
- Dew Point
- Water Activity

Lux, UV, Humidity & Temperature Data Logger | ELSEC 765C

Measured parameters

- Ultra Violet (UV) level
- Visible Light (Lux)
- % Relative Humidity
- Dew point
- Temperature (°C or °F)

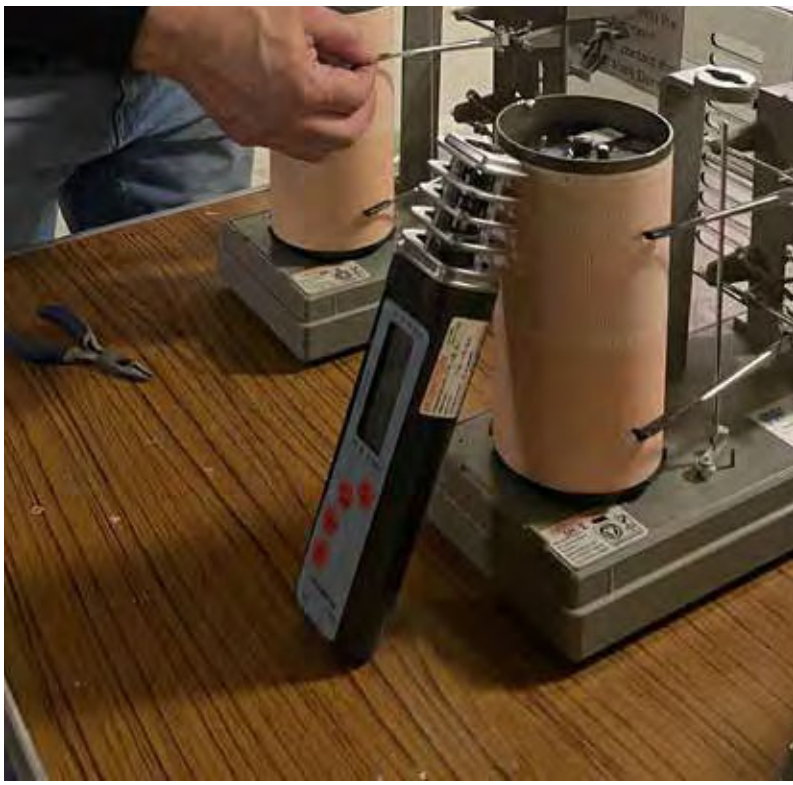
Wireless Environmental Monitoring System (NEMS)

Measured parameters

- Visible Light (Lux)
- Humidity
- Temperature (°C or °F)

Do's and don'ts – measuring humidity with handheld meters

There are many ways to use a handheld meter. Make sure you use yours correctly to ensure accurate results.



Some things to consider before taking measurements:

- Ensure that the environmental settings of your handheld meter are correct
- If your probe includes a chemical purge option, remember to use it regularly to keep the probe free from contamination
- If available, use the preheat function when installing the probe if there's a risk of condensation
- For duct sensors it is good to plan for field checking in advance. During installation make a second sealed hole next to the duct sensor to insert a handheld probe future calibration

DO	AVOID
Keep sensors away from sources of: Heat, light, cold or warm air draughts, moisture and air-borne volatiles (e.g. paint spray).	Do not locate the humidity sensor near: Doors, windows, outside walls, heaters, humidifiers
Air movement around the sensor is needed to give updated & true readings by keeping it 'refreshed'.	Hands give off heat and exhaled human breath is high humidity. Avoid handling sensors for more than a few seconds at a time and keep the instrument at arms length.
Siting of humidity sensors should be in a representative location, for example as central to the room as possible.	Sensors mounted outdoors could attract dew, rain, sun and so falsify the readings. Therefore, avoid siting in direct line of the elements by mounting in proper screens, like a Stevenson weather screen, for example.
Allow sufficient time for the instrument to stabilise in its climate prior to taking readings. Some meters have stability indication on the LCD readout, which can help. It is actually temperature that normally takes longest, so keeping measuring sensors in a similar room temperature always will speed things up (e.g.. hand-held meters taken from your car, indoors on a frosty morning, could take hours to settle).	

Diagnostic equipment

Rhopoint Instruments is a sister company of Novatron Scientific and a manufacturer of measuring instruments; some of which are used within the museums and heritage sector.

RHOPOINT INSTRUMENTS

Easy to use | Long battery life | Ultra-precise | £ Low maintenance

Dust measuring instrument: Novo-Gloss Trio dust monitor

Measure the dust of exhibits to determine when to initiate a cleaning process. Ideal for use in museums, galleries, heritage properties, libraries and private collections.

Features

- Handheld and fully portable
- Rapid data transfer
- Single button push initiates measurement of all parameters
- Pass / Fail for easy identification of non-conformances

Data transfer via USB or Bluetooth

Technical data

- Weight: 390g
- Dimensions: 140mm x 65mm x 50mm (H x W x D)
- Operation time: 17+ hours

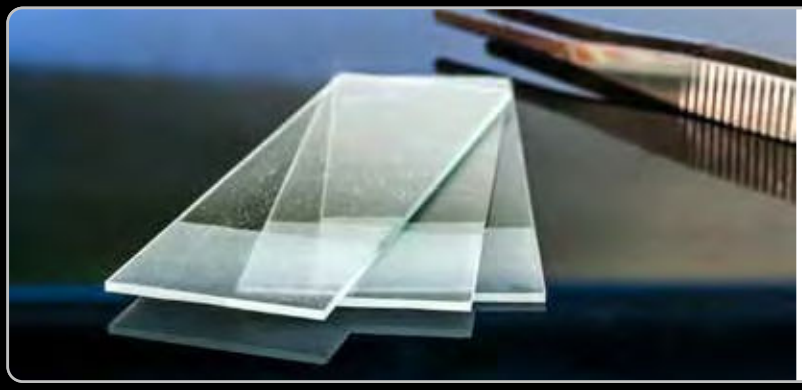
High resolution screen

How to measure dust with a glossmeter

Monitor dust fall effectively and easily using a glossmeter.

Step 1

Position a mounted glass microscope slide in the area to be monitored.



Step 2

After a period of time, the accumulation of dust on the slide will result in the glass losing its glossiness

Step 3

By measuring the reduction of gloss of the glass slide the dust accumulation can be quantified and the cleaning process initiated.

Useful articles for further reading on dust measuring processes:
www.blog.nationalarchives.gov.uk/gathering-dust/
www.blog.nationalarchives.gov.uk/reflections-gloss/

Servicing & Maintenance

Image: © Ashmolean Museum, University of Oxford

Portable Humidifiers Essential Service & Maintenance

6 MONTHS
RECOMMENDED SERVICE INTERVAL

It's important to perform regular maintenance and servicing on your Defensor humidifiers to ensure they are working their best and keeping the environment at the preferred humidity. Novatron Scientific has a team of qualified, experienced engineers who will visit your premises to carry out preventative maintenance and make sure that your portable humidifiers remain safe, efficient and reliable.

Servicing

Regular service, cleaning and replacing consumable parts is essential to get the best from all types of humidifiers as dust and limescale are always a problem.

Our service contract provides you with support to protect your investment to ensure longevity. We have instruments that are still in use by customers after 20+ years. These units have a 6 month service interval.

Preventative Maintenance

Planned maintenance of your humidifier will ensure reliable and safe operation all year round and reduces the risk of it failing.

We recommend at least two planned inspections each year. One should be during the autumn, before the weather turns cold. The other should be early spring to check that the humidifier is still working efficiently following the higher use over the colder weather.

Portable humidifiers are relatively simple and low cost to run but they will accumulate both lime-scale and bacterial/fungal build-up if they are not cleaned and maintained regularly.

Our preventative maintenance contract includes top to bottom inspection and maintenance of your humidifier as well as training for your on-site staff. ■

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6 monthly service

On site service

Experienced engineers

Competitive prices

What to expect with an essential service & maintenance contract

Our efficient process ensures your portable humidifiers are always running reliably.

Process:

Step 1: Confirmation/reminder of scheduled visit

Step 2: Experienced field-service engineers visit your premises

Step 3: Cleaning, disinfection and de-scaling to ensure safety and efficiency

Step 4: Replacement of contaminated filters and evaporator mats

Step 5: Exchange of heavily scaled internal parts

Step 6: Repair and replacement of faulty components; common spares carried

Step 7: Recalibration of internal sensor / controller

Step 8: Full service report issued upon completion

Benefits of a maintenance contract:

- ✓ Maintain energy efficiency
- ✓ Continued reliability
- ✓ Continue to deliver the level of humidity it was designed to provide
- ✓ Safe & efficient operation
- ✓ Prevent failure of the product
- ✓ Prevent lime scale build up, bacteria and mould growth

On site service & full technical support

We are fully Safe Contractor accredited to assure good working practices and great care is taken, essential when working amongst valuable works of art. All spares and consumables are stocked to facilitate the best possible use of all humidifiers during their life-cycle.

Image: © Ashmolean Museum, University of Oxford

*We recommend changing the setting to 45% during frosty weather, unless you have a plumbed in (auto-fill). This is because the tank may need filling too often to keep up with, and humidity shall drop when the tank empties (e.g.. overnight, weekend, bank hols etc.)

> “I would like to take this opportunity to thank you all for the wonderful service that you have provided this year.”

JACK HARPER, ENGINEER
HISTORIC ROYAL PALACE

Experts in the museum and heritage sector

We are proud to be members of the following associations:

- Museums Association
- Irish Museums Association

Specialists in precision humidity equipment and calibration services

NOVATRON
SCIENTIFIC
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