Company Introduction

Since **1963, Biuged Instruments** develops professional, precise and cost-effective testing instruments for the textile, paint, coatings, plastic and inks etc. industry.

Biuged's business provides a full series of testing instruments for paint, coating and ink. Covering an area of 10,000 square meters for R&D center and factory, Biuged is the earliest and largest manufacturer of weathering test chambers（Xenon test and UV test） in China.

At present, we have more than 150 employees, including more than 40 with bachelor degrees or above and more than 30 technical engineers. Biuged has more than 68 sales agents all over the world. We also are the only manufacturer of weathering test chambers in China whose products all have been certified conform the European CE standards.

Product quality is Biuged's core value. Our products are in accordance with international standards, such as ISO, ASTM, EN, BS and our manufacturing process is subject to the strictest quality control procedures. At present, our calibration laboratory is the first and only third-party institution approved by CNAS/ILAC in China that specializes in calibration and measurement services for testing instruments.

We make continuous efforts to enhance our instruments' functions, and to ensure clients obtain a high reproducibility and comparability of test results.

As a main member of the Technical Committee for Standardization of Textiles (TC5), Biuged is involved in draft and revision work of Chinese governmental standards and our staff attends several important academic meetings every year. We have drafted over 50 national standards related with testing methods.

With almost 60 years' experience as leading manufacturer of weathering test chambers, our professional and dedicated team, and our high management standards, Biuged sincerely looks forward to working with you by offering the best products and services for the textile, plastic, paint, coating and ink industry.

BIUGED HEDQUARTERS

GUANGZHOU OFFICE

SHANGHAI OFFICE

RICO CALIBRATION LTD.,

Xenon Arc Fading Lamp Test And Color Fastness to Light Tester

Color Fastness

Color fastness, also known as dye fastness or colorfastness, is the resistance of the color of textiles to various effects during processing and use. It is an important performance of textiles. Common color fastness include washing fastness, dry cleaning fastness, light fastness, rubbing fastness, perspiration fastness, chlorine bleach fastness, non-chlorine bleach fastness, ironing fastness, and saliva fastness. Currently, most color fastness testing methods involve simulating or comprehensive testing based on the environmental and conditions of these effects, and assessing the fastness grade based on color changes in the tested samples and staining of adjacent fabrics.

Color Fastness to Light

Color fastness to light is the ability of dyed or printed fabrics to maintain their original color under light exposure, that is, the ability to resist fading or discoloration under light conditions.

Textiles are usually exposed to light during use, and light can damage dyes, leading to the well-known phenomenon of "fading" where colored textiles change in color, usually becoming lighter or darker. Some fabrics may also exhibit a change in hue.

Aging of dyes or polymer textile materials includes surface fading, yellowing, cracking, embrittlement, and a decrease in tensile strength. Many researchs show that the aging of dyes or polymer textile materials is mainly caused by three factors: light, high temperature, and humidity. Any one of these factors can cause material aging, and their combined effects are greater than the damage caused by any individual factor.

◆ **Light**

Although the proportion of ultraviolet （UV）radiation in sunlight is not high, its energy is substantial. The energy of UV radiation ranges from 314 to 419 kJ/mol, whereas the dissociation energy of typical chemical bonds is between 167kJ/mol and 418 kJ/mol. Only a few chemical bonds have higher energies than UV light. Additionally, sunlight exhibits wave-particle duality, and as photons, it carries significant impact on the molecular structure of dyes. When the fundamental structure of the color-producing part in a dye molecule is disrupted by photons, the emitted light color of the dye may change, typically becoming lighter until it becomes colorless. The more pronounced the color change of a dye under sunlight exposure, the poorer its lightfastness.

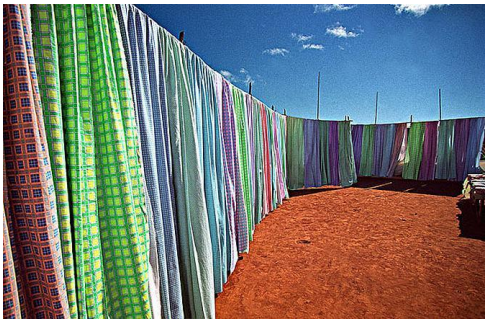
On the other hand, UV radiation is capable of breaking the high molecular bonds in many textile materials themselves, leading to the aging and degradation of the fabric. Different materials have varying sensitivities to light. For materials with excellent durability, the short wavelength of UV radiation is the primary reason of their aging. However, for materials with average durability, both the long wavelengths of UV radiation and even visible light can cause severe damage.

◆ **Heat（Temperature）**

The higher temperature is, the faster chemical reactions rate would be. Aging reactions are a type of photochemical reaction, where temperature does not affect the rate of the photochemical reaction itself but influences subsequent chemical reactions. Therefore, the impact of temperature on textile aging is often nonlinear.

◆ **Water（Rain, dew, humidity）**

Water directly participates in material aging reactions, and relative humidity, dew, and rainwater are some of the main forms of water in the natural environment. Researchs show that textile materials often remain in a damp state for extended periods, especially during soaking and washing processes.



Assessment for Color Fastness to Light

The test for the color fastness to light of textiles includes: exposing the textile sample and a mutually agreed-upon reference standard sample （blue standard wool） to artificial light sources under specified conditions. The degree of color change between the two samples is compared, and the light fastness rating of the sample is determined by comparing it to the blue wool lightfastness standard sample exposed simultaneously. In European standards, the colorfastness is divided into 8 levels, and 8 leve is the best，1 level is the worst. In American standards, it is divided into 5 levels.

All tests for colorfastness to light use a relative comparative method, and the exposure equipment does not directly provide the test results. To obtain consistent test results in the laboratory, it is necessary to know completely all the main factors that would affect the color fastness to light of textiles. In the actual testings, the factors influencing the color fastness to light of textiles include internal and external factors. Internal factors are mainly caused by differences in the properties of textile dyes. Textiles of the same color may have significant differences in light fastness due to the use of different dyes. External factors include various aspects such as the selection of light sources, spectral energy, temperature settings, and relative humidity. Since the internal factors of colorfastness to light are precisely what the test aims to investigate, they are not closely related to the testing method. The stability and reproducibility of the test results are primarily influenced by external factors. The impact of external factors constitutes the three main factors causing material aging: light exposure, temperature, and water. Therefore, the accelerated aging equipment used in the laboratory should be capable of simulating and accurately controlling these three parameters.

Regarding the light source parameter, the commonly methods in the textile field is to use xenon lamps to simulate sunlight, while also controlling temperature and humidity （or rain）to simulate the natural conditions that materials are exposure outdoors.

Xenon lamp is full of xenon, and would send out light because of xenon discharge. The energy distribution of spectrum through this way is very close to sunshine . Furthermore, xenon lamp has a stable character, its spectrum energy distribution wouldn’t change at all within the limited lifetime, this is because its spectrum distribution among continuous spectrum part don’t have any relation to input power of lamp. As a special light source, xenon lamp has a good consistency for electric parameters , and it is easy to light, once light on, it can output a steady light energy at once. Furthermore, during working, the electric parameter won’t be influenced by any external conditions. Therefore, xenon lamps can perfectly simulate the entire spectrum distribution of sunlight during the whole testing（including ultraviolet UV, visible light and infrared IR）, and their spectra closely match the spectrum distribution of sunlight within the range of 295nm to 800nm.

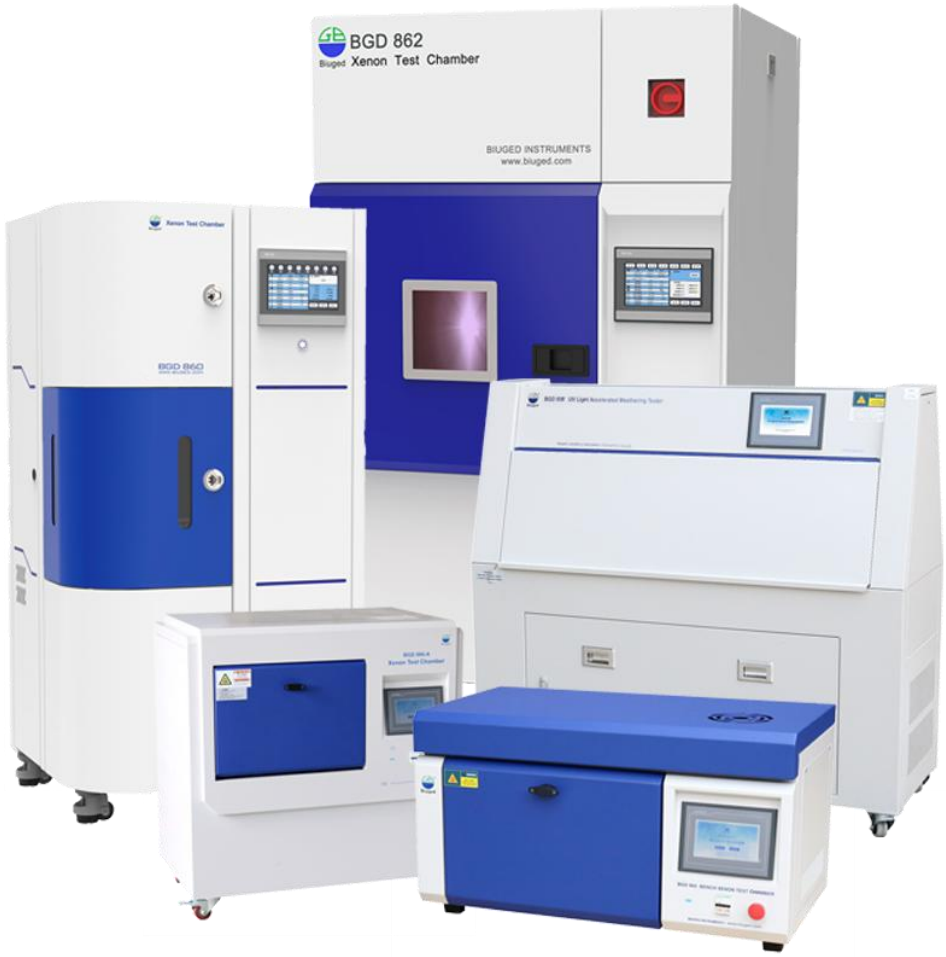
BIUGED Xenon Test Chambers for Color Fastness to Light

For Xenon Weathering Test Chambers , two well-known American companies have been occupied most coutries textile markets. However, many customers couldn’t afford the high equipment costs and daily maintenance cost, especially when the equipments are out of warranty. The high maintenance costs and long repair cycles are the two biggest issues faced by textile customers.

For these reasons, BIUGED started to develop our ownxenon weathering test chambers in 2006. As one of the earliest companies in China to focus on aging equipment research and development, we have accumulated extensive experience in the development and manufacturing of xenon aging weathering test chambers. Most of our weathering test chambers use light sources consistent with similar Amercian brands, ensuring the comparability and reproducibility of test results. At the same time, we have developed a control system with independent intellectual property rights based on the usage habits of textile field. Additionally, we have a team of experienced technical support engineers who can resolve any after-sales issues on-site within 24 hours.

Based on the needs of different industries and laboratories, Biuged has developed some different types of weathering test chambers, including desktop-type, cabinet-type, console-type, flat-panel, and drum-type, among others. Users can always find a xenon aging weathering test chamber suitable for their testing requirements. Currently, thousands of Biuged's weathering test chambers of various types are working all over the world. The efficient and stable working performance, precise and comparable test results, and professional and fast technical support make our weathering test chambers become the first choice for the textile customers.

Water-cooled Xenon Lamp



Light Source and Filters System

The normal sunlight contains the visible light that can be seen by the human eyes, as well as the invisible ultraviolet（UV）and infrared（IR）portions. Light in various wavelengths can change the chemical properties of textiles. Research has shown that ultraviolet light, with it shorter wavelength and higher energy, has the most significant influence on the color fastness to sunlight of textile.

Currently, the light sources used mainly for testing the color fastness of textiles under sunlight exposure include xenon lamps and ultraviolet fluorescent lamps. Ultraviolet fluorescent lamps are mainly used for aging tests of outdoor textiles, while xenon lamps have been used as artificial light sources for color fastness tests since 1954. This is because the spectral power distribution curve of xenon arc lamps closely resembles that of sunlight, making it the closest artificial light source to natural sunlight in terms of its production of ultraviolet , visible, and infrared radiation.

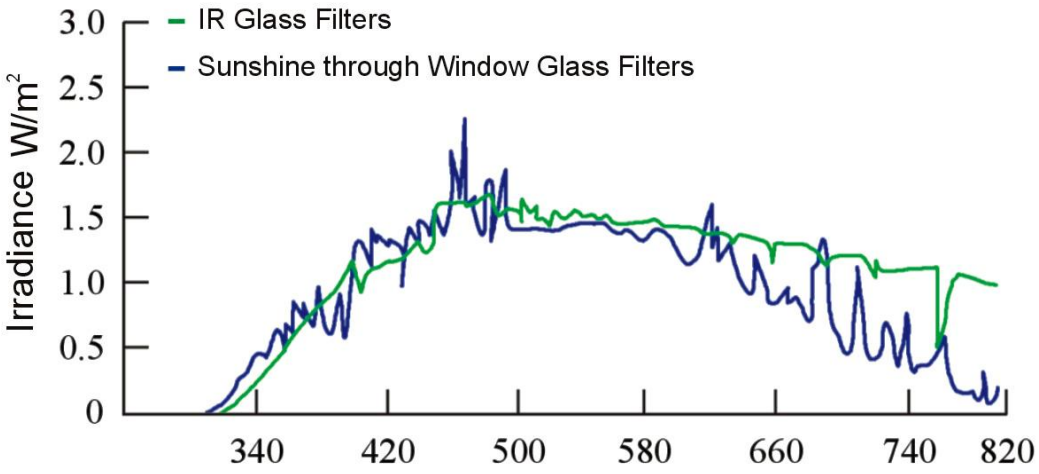
Furthermore, to simulate the spectral energy distribution of textiles under different usage conditions, appropriate filters need to be selected based on specific circumstances.

The B-SUN series xenon lamp aging and colorfastness testing chambers all use xenon lamp tubes imported from the United States, which can accurately simulate full-spectrum sunlight to provide uniform

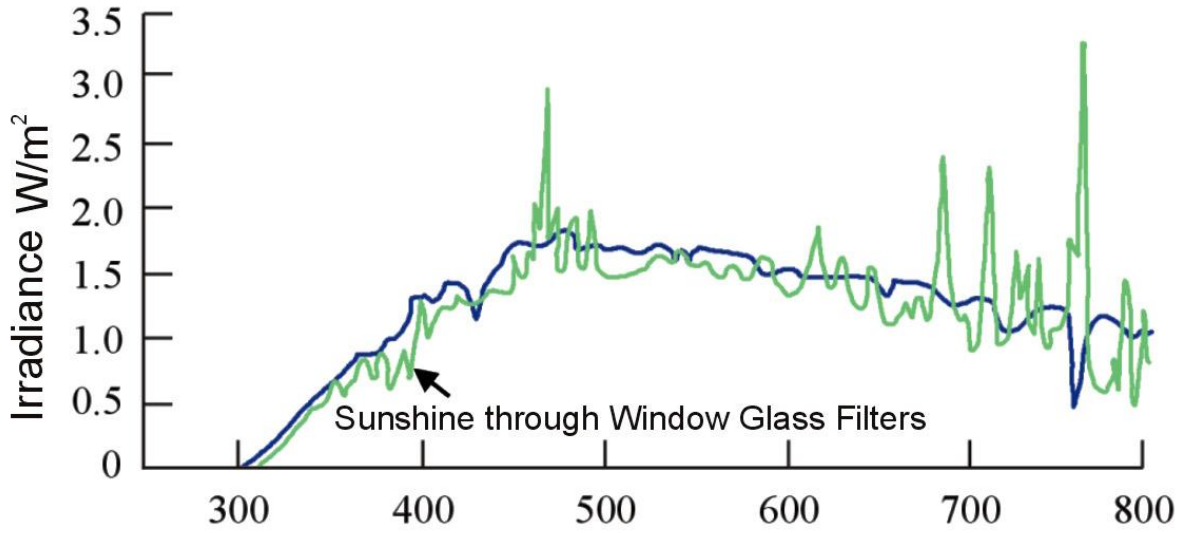
and consistent irradiance and stable spectral output. They effectively reproduce the effects of visible light and infrared heating on different types of textiles in daily environmental conditions.

The B-SUN series xenon lamp aging and color fastness testing chambers can be equipped with four different filter systems（IR window glass filter, B/SL window glass filter, daylight filter, and UV extened filter）to obtain different energy distribution spectra. Details can be found in the optional accessories. In practical use, the daylight filter is commonly used for testing outdoor products, the UV extension filter is often used in the automotive industry, while the window glass filter is the most commonly used in textile testing.

According to current standards for color fastness of textiles under sunlight exposure, the most common type of window glass filters are the IR window filter（also known as Window-IR）and the B/SL window glass filter（also known as Window-B/SL）. A comparison between these two filters and the sunlight spectrum is shown in the diagram below：



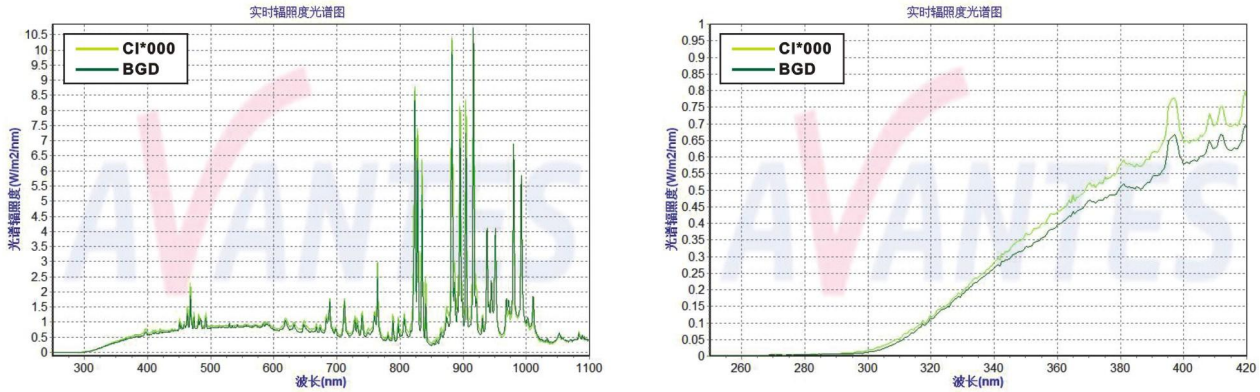
The Spectrum Distribution of Sunshine through Window Glass filters compared IR Glass Filters



The Spectrum Distribution of Sunshine through B/SL Glass filters compared sunlight

According to the spectral graph, both the window glass IR filter and the window glass B/SL filter can effectively control the cut-off point of ultraviolet light around 310nm. This is an important requirement for the light- filtering film in textile color fastness test samples exposed to sunlight.

At the same time, it is evident that the window glass IR filter can effectively filter out the infrared portion of sunlight, while the window glass B/SL filter does not have this effect. Depending on the requirements of different testing standards, the window glass IR filter is commonly used in textile colorfastness tests based on ISO standards and Marks Spencer standards, while the window glass B/SL filter is commonly used in textile colorfastness tests based on AATCC standards.



The Spectrum Distribtion of B-SUN compared Amercian brand Xenon tester chambers

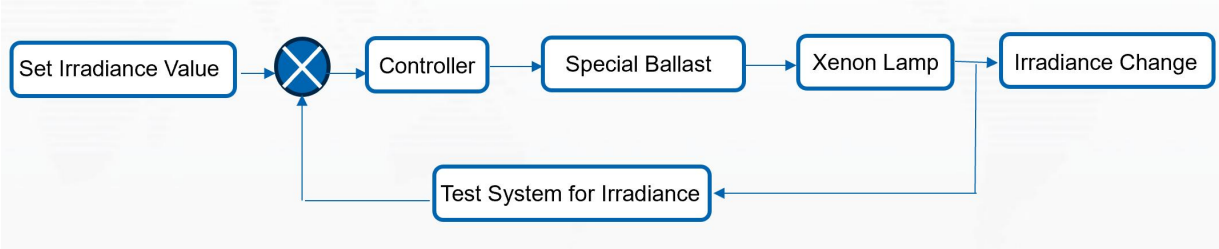
Control Irradiance

The irradiance directly affects the decomposition rate of textile and dyes, thereby influencing the color fastness of textiles to sunlight. Therefore, controlling the irradiance is the most important. In current standards, the control of light intensity and total radiant flux is mainly achieved by controlling a specific

point or spectral range in the spectrum. There are currently two common methods, one with an illuminance of 42W/m² in the wavelength range of 300nm to 400nm, and the other with an irradiance of 1.1W/m² at 420nm point.

In textile color fastness tests, when selecting suitable xenon lamps and filters, the output power of the xenon lamp and the aging of the filter must also be considered. These two factors directly affect the variation of the light source spectrum. This ultimately always causes a certain spectral drift when the spectrum emitted by the xenon lamp reaches the surface of the sample. Therefore, all manufacturers of color fastness testing chambers must strictly specify the lifetime for the use of xenon lamps and filters they supply. Even if the irridiance of the control band or control point is accurately controlled, if the xenon lamps and filters exceed the lifetime, it cannot ensure that the spectral drift of the xenon lamp occurs within the control band or control point, resulting in significant errors in the aging speed and aging mode.

In order to ensure the reproducibility and comparability of test results, BIUGED uses a closed-loop control technology for irradiance , which automatically monitors the energy value of the whole testing period. When the preset irradiance cannot be achieved due to lamp aging, the system can automatically detect and compensate for it. In terms of B-SUN irradiance control, BIUGED has developed its own advanced and reliable technology, which allows the normal lifetime of the lamps to exceed 1,500 hours.



Closed-loop Control System for Irradiance

New Generation Ballast with Invention Patent

Temperature Control

Temperature is an important parameter for the color fastness to light test, and its influences on the color fastness to light of textiles couldn't be underestimated. Variations in temperature are bound to cause changes in the chemical properties of the samples. The combined effect of color and high temperature will result in accelerated degradation of textiles. Therefore, the color fastness to light test for

textiles should not only consider the spectral distribution and irradiance received by the sample's surface but also take into account the surface temperature of the specimen and the ambient temperature.

In the color fastness to light test for textiles, the surface temperature of the test sample is typically obtained by measuring the temperature of a standard metal plate. Currently, there are two types of standard metal plates used for ISO, and AATCC standards. The first type is an uninsulated black plate known as the Black Panel Thermometer（BPT）, and the other type is a black plate mounted on an insulated plastic plate known as the Black Standard Thermometer （BST）.

The Black Panel Thermometer（BPT）consists of a stainless steel flat plate with dimensions of approximately 150mm in length, 70mm in width, and 1mm in thickness. One side of the plate facing the light source is coated with a black matte paint that can absorb at least 90% of the total incident energy at 2500nm. The temperature measurement on the flat plate is performed using a rod-shaped bimetallic disc sensor or a thermistor sensor firmly connected and coated black at the center of the plate. The temperature indicated by the Black Panel Thermometer（BPT）is the sum of the temperature rise due to the heat transfer from the black panel to the surrounding air and the temperature increase caused by the irradiation from the light source. Since the Black Panel Thermometer（BPT）uses a metal plate with properties approximating a blackbody as the temperature sensing element and is placed parallel to the test sample on a sample rack, and blackbodies have the maximum heat absorption capacity, the temperature indicated by the Black Panel Thermometer （BPT）generally indicates the highest temperature that the test sample may reach.

The development of the Black Standard Thermometer（BST） followed the Black Panel Thermometer（BPT）. In long application, it was found that due to the fast heat dissipation of the BPT and the sample rack, both made of metal, it was inconvenient to measure the temperature rise of dark-colored samples with poor thermal conductivity. Therefore, a Black Standard Thermometer with an insulated base was developed, named BST. The BST is made of a stainless steel plate measuring 70mm in length, 40mm in width, and 1mm in thickness. One side of the plate facing the light source is coated with an aging-resistant black matte paint to form a "black panel." This black panel should be able to absorb 95% of the total incident light flux within wavelengths up to 2,500nm. The temperature of the black panel is measured using a platinum resistance thermometer sensor installed on the side opposite to the light source, ensuring good thermal contact with the plate's center. The back of the thermometer is supported by a 5mm thick polyvinylidene fluoride（PVDF）base with grooves for fixation. The dimensions of the grooves should correspond precisely to the sensor, but the sensor does not directly touch the PVDF groove surface, leaving a gap of about 1mm. The length and width of the entire PVDF base are large enough to ensure that there is no metal contact heat transfer between the metal plate of the thermometer and the sample rack when the BST is installed on the sample rack. There should be a minimum distance of 4mm between the metal frame or bracket on the sample rack and the edge of the thermometer's metal plate.

The BST is more suitable for displaying the temperature of exposed surfaces of dark-colored samples with poor thermal conductivity. The temperature indicated by the BST will be higher than that indicated by the BPT, making it more suitable for monitoring the upper limit of the allowable test temperature. Therefore, the BST is a new type of thermometer that has gradually developed in recent years to replace the BPT.

Control of the air temperature inside the testing chambers is also very important because the temperature of the chambers directly affects the temperature of the test surface and the air humidity inside the chambers, ultimately affecting the color fastness to light of textiles.

The Black Panel Temperature（BPT）

The front of BST

The back of BST

Humidity Control

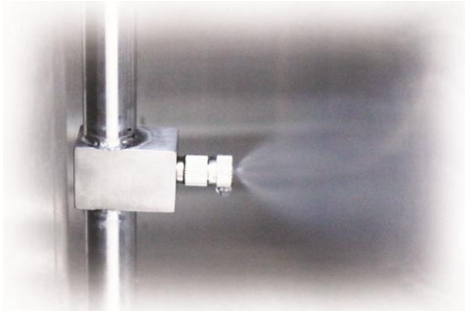
The relative humidity plays a very important role in the color fastness to light test of textiles. When the humidity increase, the water solubility of most dyes would be fast,and their decomposition rate also acceletrates. Therefore, it is necessary to control the relative humitiy of the chambers appropriately.

The current standards define the effective humidity based on the air temperature, the surface temperature of the sample, and the relative humidity of the air that determines the moisture content on the sample surface during the exposure period. The measurement of effective humidity requires the use of a humidity control standard sample. The humidity control standard sample is made of cotton fabric dyed with a red azo dye and is commonly referred to as the humidity control red cloth. As the effective humidity increase, the color fastness ability to light decrease significantly.

The B-SUN series use the technology of ultrasonic humidification to adjust the humidity in the working room. The humidification is efficient and uniform, and it’s equipped with high-precision imported humidity sensors. The humidity control is carried through closed-loop automatic control and can be calibraged.

Spray System

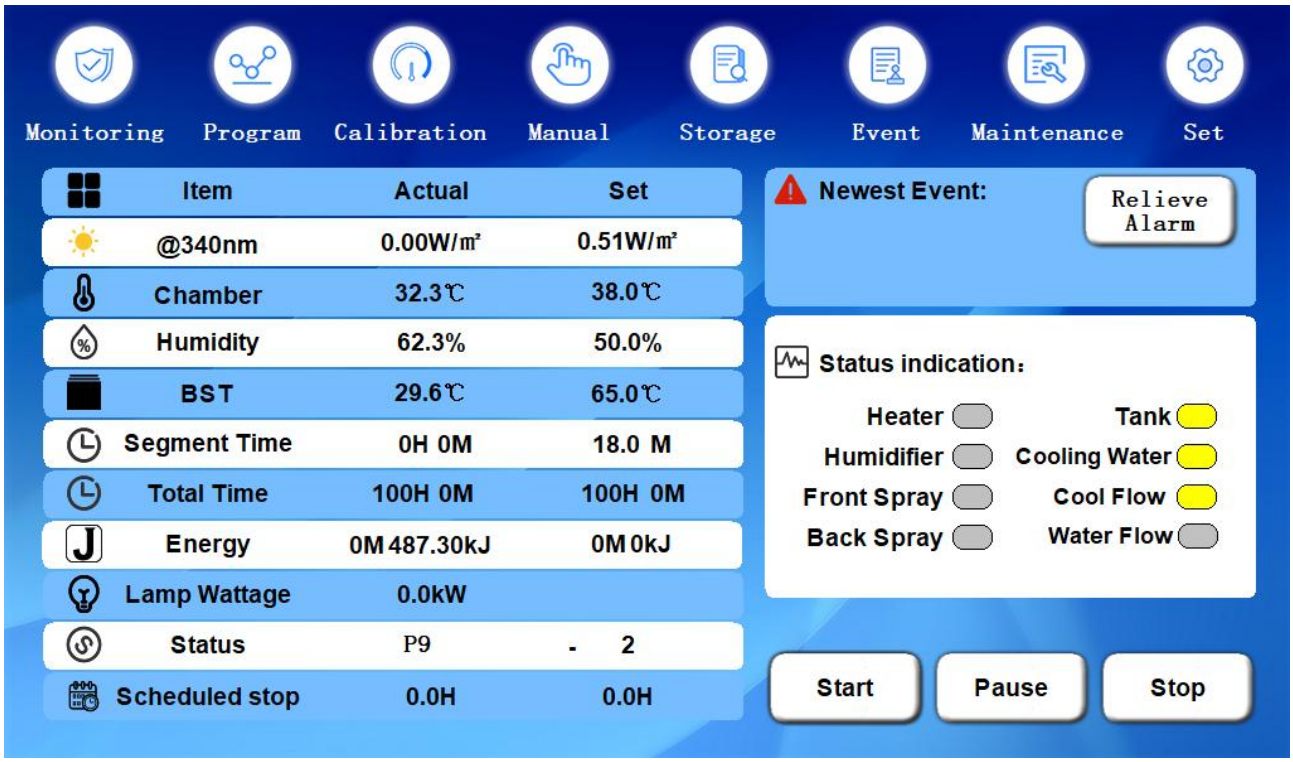
In natural, it is usually rain suddenly when mateials are exposed sun light. The spray system of B-SUN is used to simulate the thermal shock or relevant mechanical erosion caused by big temperature change and rain wash



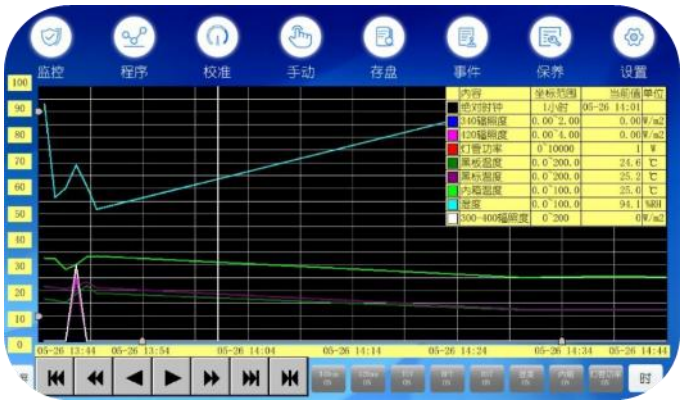
Professional High Atomization Nozzle

Simple and Easy to use Operation Window

- All operations and displays of B-SUN are carried out with a high definition colorful touch-screen, menu operation window is easy to use and maintenance.
- Easy to set test program and monitor real-tiem working status of all parameters
- Can check history curve of parameters, the variation trend is shown more visual.
- Fast and accurately calibrate irradiance and temperature.
- Dual-language operation window of Chinese and English
- Ethernet interface offers internet function, operator can monitor and control chamber remotely on line.



High-definition Colorful Touch-screen window, can set many parameters freely



Check the variation of parameters visually.

Unattended Operation

Fast and easy to calibrate

● Operator can calibrate irradiance by themselves through a radiometer, only need to input the reading value from radiometer to B-SUN calibration window, then finish the whole calibration automatically.

● With USB interface, operator can download all running parameters of B-SUN and creat EXCEL format automatically, convenient to chek the running status of B-SUN at any time.

Fast and easy to calibrate periodically

Standards

ISO 105-B02 (EN) (DIN) 《Textiles-Tests for colour fastness- Part B02: Colour fastness to artificial light: Xenon arc fading lamp test》

ISO 105-B04 (EN) (DIN) 《Textiles - Tests for Colour Fastness - Part B04. Colour Fastness to Artificial Weathering: Xenon Arc Fading Lamp Test》

ISO 105-B06 (EN) (DIN) 《Textiles - Tests for Colour Fastness - Part B06: Colour Fastness and Ageing to Artificial Light at High Temperatures: Xenon Arc Fading Lamp Test》

ISO 105-B07 (EN) (DIN) 《Textiles - Tests for Colour Fastness - Part B07: Colour Fastness to Light of Textiles Wetted with Artificial Perspiration》

ISO 105-B10 (EN) (DIN) 《Textiles - Tests for Colour Fastness - Part B10: Artificial Weathering - Exposure to Filtered Xenon-Arc Radiation》

ISO 4892-1 《Plastics – Methods of Exposure to Laboratory Light Sources – Part 1: General guidance》

ISO 4892-2《Plastics - Methods of Exposure to Laboratory Light Sources - Part 2: Xenon-arc lamps》

ASTM G151《Standard Practice for Exposing Nonmetallic Materials in Accelerated Test Devices that Use Laboratory Light Sources》

ASTM G155《Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials》

AATCC TM16 《Colorfastness to Light》

AATCC TM169 《Weather Resistance of Textiles: Xenon Lamp Exposure》

ALL BIUGED Xenon Chambers for Color Fastness to Light

Ordering Information → Parameters ↓	**BGD 865/A Bench Color Fastness to Light Chamber**	**BGD 866/A Small Color Fastness to Light Chamber**	**BGD 861 New Color Fastness to Light Chamber**	**BGD 862 Big Color Fastness to Light Chamber**
Xenon Lamps	1 piece 1.8KW air-cooled American xenon lamp		1 pc 1.8KW air-cooled American xenon lamp	1 piece 6.5 KW water-cooled American xenon lamp
Filters	IR Window Filters			
Sample holder	Flatbed	Flatbed	Rotating drum	Rotating drum
Samples Capacity（150×70mm）	9 pieces	9 pieces	22 pieces	65 pieces
Edit Program	No	Yes（6 programs）	Yes（10 programs）	Yes（6 programs）
Spray Function	No	Yes（front）	Yes（front & back）	Yes（front & back）
Dark Function	No	Yes	Yes	Yes
Control BPT.	Yes	Yes	Yes	Yes
BPT. Range	RT+30℃～90℃	RT+20℃～90℃	RT+30℃～100℃	RT+20℃～110℃
Working room Tem. Range	---	---	RT～65℃	RT～70℃
Control Irradiance	Yes	Yes	Yes	Yes
Irradiance Range（300～400nm）	30～100W/m^2		30～90W/m^2	29～141W/m^2
Monitoring Method to Irradiance	1	3	4	4
Monitor cumulative Energy	No	Yes	Yes	Yes
Control work room	No	Only show	Yes	Yes

relative humidity				
Export test data	Yes	Yes	Yes	Yes
Alarm Function	Yes	Yes	Yes	Yes
Calibration Function	Yes	Yes	Yes	Yes
Pure water machine	No	Optional	Optional	Optional

B-SUN Filter

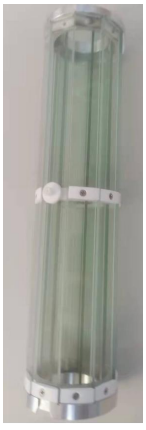
Biuged also offers other four different filters to meet with different testing requirments.

① **B/SL Window Glass Filte**r：It's common in AATCC, using 3mm thickness window glass to produce spectra equivalent to sunlight coming through normal window glass（no filtering IR）. This spectrum can also simulate some indoor lighting such as the harsh lighting found in a typical commercial or office environment. They are used for indoor materials such as printing materials or textiles. This test is called as" **Exposure to artificial radiation Test**"

② **IR Window Filter**：Compared with B/SL window glass filter, it filterings all IR of sunlight coming through normal window glass

③ **Daylight Filters**：Used to simulate noon summer direct sunlight, they can offer the best correlation to the natural exposures for most fact applications. Materials which are typically used outdoors like exterior coatings or outdoor rubbers should be tested using Daylight Filters. This test is called as "**Artificial Weathering Test**"

④ **Extended UV filters**：These filters allow excess UV, below the normal cut-on of natural sunlight, used to simulate sunlight which doesn't come through atmosphere .They are used to produce faster or more severe test results. This test is called as "**Artificial Accelerated Weathering Test**"



Monitoring Method to Irradiance

In the system of xenon test , measuring and controlling irradiance is very important. The spectrum range of xenon lamp is from 295nm to 3,000nm. In the newest standards （such as ISO 11341-2004, ASTM G 155-05, ISO 4892-2：2003 etc）, irradiance is recommended to be measured and controlled by point（narrow band）or broad band.

Narrow band：340 nm or 420 nm； Broad band：300-400 nm

Choosing narrow band or broad band depends on different simulated environment or different material.

340 nm narrow band：for outdoor and evaluate physical performance of material

420nm narrow band： for indoor and evaluate fading of material

300nm-400nm （TUV）：for small special standards.

① Bench Color Fastness to Light Chamber

BGD 865/F is a small, simple and economic xenon test chamber. It uses a low power air-cooling xenon lamp to produce enough big irradiance energy in a small space. Moreover, through a special catoptrical system to ensure every exposure sample get the homogeneous irradiance distribution.

BGD 865/F is equipped with window glass IR filters to produce spectra equivalent to sunlight coming through normal window glass. This spectrum can also simulate some indoor lighting such as the harsh lighting found in a typical commercial or office environment. They are used for indoor materials such as printing materials or textiles. This test is called as“ Exposure to artificial radiation Test”

Operator can set all required test parameters （Irradiance, test time, BPT etc）through the touch screen, and can check its running status at any time. All running parameters can be exported to computer through the USB interface.

Characters

◆ Small Size, easy to install, use and practically maintenance-free.

◆ The xenon light source correspond with international standards; ensure reproducibility and comparability of testing results.

◆ Irradiance energy can be accurately controlled. The "**Closed-Loop**" control system can automatically compensate the change of light intensity caused by ageing or other factors.

◆ Users can easily calibrate and adjust the irradiance or the blackboard temperature by themselves.

◆ With High precision Pt100 Temperature sensor. Blackboard temperature is auto-controlled during the whole process

◆ Alarm function for protection：Over temperature of BPT, big error for irradiance, auto shut-down protection when opening door，protection for too low air pressure

◆ Touch screen and user-friendly operation interface allow operator to set the test parameters and monitor all the test process easily.

◆ Specimen mounting and evaluation is fast and easy With unique slide-out specimen tray

◆ Real-time data can be collected and recorded. The incidental USB connector allow users to copy the

test data into a USB drive, achieving unattended operation.

Main Technical Parameters

■ Xenon Lamp：One 1.8KW xenon lamp imported from America

■ Fliter：IR window filters（Also can choose B/SL window glass filter or daylight filter or extended UV filter）

■ Irradiance monitor methods：340nm or 420nm（Narrow band）or 300nm～400nm（Broad band）（Choose anyone before ordering）

■ Lamp Lifetime：Near 1,500 hours

■ Exposure Area：1,000 cm^2 (can put 9 standard samples 150×70mm)

■ Adjustable Irradiance Range：30W/m^2～100W/m^2（300nm～400nm）or 0.3 W/m^2～0.8 W/m^2（@ 340nm）or 0.5 W/m^2～1.5 W/m^2（@ 420nm）

■ Adjustable Black Panel Temperature Range：RT+20℃～90℃（Depends on environment temperature and setting irradiance value）

■ Interior Material of Chamber：Stainless steel -SUS 304 material

■ Exterior Material of Chamber：Powder coating

■ Overall Size：950×570×540mm（L×W×H）

■ Net Weight：93KG（130KG for gross weight）

■ Power Supply：220V 50/60HZ（Alternative）

■ Max. Current：12A

■ Max.Power：2.5 kW

■ **Ordering Information:**

BGD 865/F---Bench Color Fastness to Light Chamber

BGD 8156--- American Xenon Lamps（1.8 KW）

（See next pages for Xenon Calibration Radiometer）

② Small Color Fastness to Light Chamber

Compared with BGD 865/F, BGD 866/F adds spray function. Spray function is used to simulate rain and humidity when the material is used at outdoor. Furthermore, operator can set the cumulative energy （Total irradiance energy）obtained by sample to stop a test procedure.

Operator can set all required test parameters （Irradiance, test time, BPT etc）through the touch screen, and can check its running status at any time. All running parameters can be exported to computer through the USB interface.

Characters

◆The test procedures can be programmed freely; and up to 16 predetermined procedures can be saved in one time. Every procedure includes up to 10 segments setting data.

◆ Can set the cumulative energy （total irradiance energy） obtained by sample to finish a test procedure.

◆ With spray function, can set spray time and spray interval time.

◆ The xenon light source correspond with international standards; ensure reproducibility and comparability of testing results.

◆ Irradiance energy can be accurately controlled. The"**Closed-Loop**" control system can automatically compensate the change of light intensity caused by ageing or other factors.

◆ Users can easily calibrate and adjust the irradiance or the blackboard temperature by themselves.

◆ With High precision Pt100 Temperature sensor. Blackboard temperature is auto-controlled during the whole process

◆ Show the relative humidity of working room

◆ Alarm function for protection：Over temperature of BPT, big error for irradiance, auto shut-down protection when opening door，protection for too low air pressure

◆ Touch screen and user-friendly operation interface allow operator to set the test parameters and monitor all the test process easily.

◆ Specimen mounting and evaluation is fast and easy With unique slide-out specimen tray

◆ Real-time data can be collected and recorded. The incidental USB connector allow users to copy the test data into a USB drive, achieving unattended operation.

Main Technical Parameters

■ Xenon Lamp：One 1.8KW xenon lamp imported from America

■ Fliter：IR window filters（Also can choose B/SL window glass filter or daylight filter or extended UV filter）

■ Lamp Lifetime：Near 1,500 hours

■ Exposure Area：1,000 cm^2 (can put 9 standard samples 150×70mm)

■ Adjustable Irradiance Range：30W/m^2～100W/m^2（300nm～400nm）or 0.3 W/m^2～0.8 W/m^2（@ 340nm）or 0.5 W/m^2～1.5 W/m^2（@ 420nm）

■ Adjustable Black Panel Temperature Range：RT+20℃～90℃（Depends on environment temperature and setting irradiance value）

■ Controlling irradiance point：340nm or 420nm or 300nm～400nm（show at the same time）

■ Interior Material of Chamber：Stainless steel -SUS 304 material

■ Exterior Material of Chamber：Powder coating

■ Overall Size：1000×650×1020mm（L×W×H）

■ Net Weight：135 KG（176KG Gross weight）

■ Power Supply：220V 50/60HZ（Alternative）

■ Max. Current：12A

■ Max.Power：2.5 kW

■ **Ordering Information:**

BGD 866/A---Small Color Fastness to Light Chamber

BGD 8156--- American Xenon Lamps （1.8 KW）

BGD 8170---Pure Water Machine（50L/h）

（See next pages for Xenon Calibration Radiometer）

③ New Color Fastness to Light Chamber

BGD 861 New Color Fastness to Light Chamber is a powerful, highly cost-effective, easy to use and convenient to maintain color fastness to light chamber. It uses a air-cooled xenon lamp imported from America and IR window filter（both are imported from America）, to simulate more real and much better the full spectrum sun light of outdoor through window, ensure the test results obtained from laboratory have a perfect correlation with indoor application. Furthermore, the samples holder is designed with a special rotating drum to ensure each sample can obtain the same and uniform irradiance during the whole test.

BGD 861 can meet with all standards requirements from different fields, it can hold 22 pieces samples, not only has spray function, but also can control the relative humidity of working room.

Operator can set all required test parameters （Irradiance, test time, BPT, BST etc）through the touch screen, and can check its running status at any time. All running parameters can be exported to computer directly through the USB interface.

Characters

◆ Xenon lamps imported from America can ensure the test results have a good repeatability and comparability.

◆ Special rotating-drum design for samples holder ensure each sample can obtain the same and uniform irradiance during the whole test.

◆ Irradiance energy can be accurately controlled. The "**Closed-Loop**" control system can automatically compensate the change of light intensity caused by ageing or other factors.

◆ Can choose narrow band （at 340nm or at 420nm）or broad band（from 300nm～400nm or from 300 nm～800nm）to control irradiance.

◆ Affordable air-cooled xenon lamp, the lifetime can reach 1,500 hours.

◆ Can choose three different filters（Daylight, Window glass, Extended UV） to meet different test requirements.

◆ The test procedures can be programmed freely; can set 10 programs and save 6 predetermined programs in one time. Every program includes up to 10 segments for setting parameters.

◆ Can set and control precisely and automatically the relative humidity of working room.

◆ Can set the cumulative energy （total irradiance energy）obtained by sample to finish a test procedure.

◆ With spray function, can set spray time and spray interval time.

◆ Users can easily calibrate and adjust the irradiance or the blackboard temperature by themselves.

◆ With High precision Pt100 Temperature sensor. BPT（black panel temperature）, BST（black standard temperature）and working room temperature can be set and controlled precisely and automatically during the whole process

◆ Alarm and protection function：Over temperature（BPT，BST，Working room）, big deviation of irradiance，shortage of spraying water, abnormal lamp power，big error of humidity.

◆ Touch screen and user-friendly operation interface allow operator to set the test parameters and monitor all the test process easily.

◆ Real-time data can be collected and recorded. The incidental USB connector allow users to download the test data（EXCEL format）directly, achieving unattended operation.

Main Technical Parameters

■ Xenon Lamp：One 1.8KW xenon lamp （imported from America）

■ Filter：IR window filters（Also can choose B/SL window glass filter or daylight filter or extended UV filter）

■ Lamp Lifetime: Near 1,500 hours

■ Exposure Area：2,200 cm^2 (can put 22 pcs samples of 150×70mm size)

■ Adjustable Irradiance Range：

0.3～0.75 W/m^2 (Single point of control：340nm)

0.5～1.35 W/m^2 (Single point of control：420nm)

30 W/m^2～90 W/m^2 (Full spectrum ：from 300～400nm)

■ Controlling irradiance point：340nm or 420nm or 300nm～400nm（show at the same time）
■ Adjustable Black Panel Temperature Range：RT～100℃
■ Adjustable Working room Temperature Range：RT+8℃～62℃
■ Adjustable relative humidity of working room：10%～75%（Light）；10%～95%（Dark）；
■ Overall Size：860×800×1770mm
■ Net Weight：200KG
■ Power Supply：AC 380V（Three-phase four-wire system）/ 50HZ；Max. Current 16 A
■ Max. Total Machine Power：5.5 kW
■ Requirements of Compressed air：Clean，oilless compressed air with 0.5MPa pressure，Max. air supply is near 60L/min. Average air consumption is 10L/min～30L/min（Depends on testing standard）
■ **Ordering Information:**

BGD 861---New Color Fastness to Light Chamber
BGD 8150---American Xenon Lamps （1.8 KW）
BGD 8170---Pure Water Machine（50L/h）
BGD 8179---Air Compression System（Includes air compressor、air reservoir、freezing dryer、precise filter etc）
BGD 8189/D---Daylight Filter
BGD 8189/W---B/SL Window Glass Filter
BGD 8189/WIR---IR Window Filter
BGD 8189/E---Extended UV Filter
（See next pages for Xenon Calibration Radiometer）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Big Color Fastness to Light Chamber

BGD 862 is a multi-function big color fastness to light chamber（xenon test chamber）which is equipped with one piece high power（6.5KW）water-cooling xenon lamp, its exposure area arrive 6,500cm^2

Powerful functions and reliable test results

◆ Meet with all international standards of xenon test.

◆ Equipped with ATLAS xenon arc lamp , filter and components, ensure to get high and same running parameters. Test results have a good reliability and repeatability comparing with import machines.

◆ Automatic rotating drum-type sample rack with three floors structure maximizes exposure uniformity over all specimens

◆ 6,500cm exposure area , can hold different shapes and sizes samples.

◆ Can set the cumulative energy （total irradiance energy）obtained by sample to finish a test procedure.

◆ Advanced cooling system for xenon lamp and intelligent air system.

◆ Chinese or English operation window

Can set and control automatically many test parameters

◆ Irradiance energy can be set and accurately controlled（340nm，420nm，300nm～400nm，300nm～800nm）. The **"Solar Eye"** control system can monitor and automatically compensate the change of light intensity caused by ageing or other factors.

◆ Working room temperature, BPT（black panel temperature）and BST（black standard temperature）can be set and controlled automatically. With high precision Pt 100 temperature sensor, all these temperatures could be moitored accurately.

◆ Working room relative humidity can be set and controlled automatically. With ultrasonic wave humidifying system, the working room can obtain more stable and uniform humidity distribution.

◆ Can set spray way to sample（front spray or back spray）, spray time and spray interval time.

Simple, easy to use

◆ Colorful touch screen and user-friendly operation interface allow operator to set the test parameters and monitor it easily.

◆ The test procedures can be programmed freely; and up to 16 predetermined procedures can be saved in one time. Every procedure includes up to 10 segments setting data.

◆ With USB interface, operator can export any test parameters with Excel format at any time, convenient to check B-SUN's running status at any time.

◆ Pure（deionized）water machine is optional. With high purity water, operator can get a more reliable testing result，Chamber has alarm function for monitoring water.

Safe and reliable

◆ Many alarm protections：Big irradiance difference, pure water conductivity is over limits, too high temperature of cooling water, too low flow rate of cooling water, over-temperature, heating problem，abnormal lamp power，B-SUN will stop running automatically and show the alarm information in the operation window.

◆ Can select TCP/IP Ethernet interface, the user can tele-control the machine through TCP/IP internet. Convenient to help customers to slove all problems and do some necessary after service

Main Technical Parameters

Ordering Information → Technical Item ↓	**BGD 862 Color Fastness to Light Chamber （Xenon Test Chamber）**
Xenon Lamp	6.5 KW water cooling long arc xenon lamp
Light Filter	IR window filters
Exposure Area	6,500 cm^2（63-65 pcs standard samples of 15cm×7cm size）
Monitoring Method to Irradiance	Four types：340nm，420nm，300nm～400nm，300nm～800nm Showing at the same time
Adjustable Irradiance	See Table B.
Lifetime of lamps	2,000 hours
Adjustable Range of BPT	RT~110℃
Adjustable Range of BST	RT~120℃
Adjustable Range of Working room	RT~70℃（Dark）
Temperature Stability	± 1℃
Temperature Uniformity	≤ 2℃
Temperature Deviation	≤ 1℃
Adjustable Humidity	**Light**：10%-75%　　**Dark**：10%-95%
Rotate speed of sample	1 r/min（circle as lamp centre）
Spray Function	Can set spray continuous time and spray period
Water Demands	High purity deionized water（Conductivity<2us/cm）
Compressed Air	Clean，oilless compressed air with 0.5MPa pressure，Max. air supply is near 60L/min. Average air consumption is 10L/min～30L/min（Depends on testing standard）
Deionized Water Consumption（24h）	300L～400L（When running ISO 16474-2 Cycle No.1）
Power Supply	AC380V±10%，Three-phase four-wire 50Hz；Max. Current 50A，Max. Power 9.5KW
Overall Size	1,220mm×1,200mm×2,050mm（L×W×H）
Net Weight	500 KG
Structure	
Cabinet Material	Working room is made up of high quality stainless steel （SUS316）
Chamber Door	Simple door to left with filter window；silicon rubber seal the door edge
Sample Holder	Stainless steel material, its position in the chamber can be adjusted（up, middle or down）, Sample crack rotate around the centre of lamp
Controller	Siemens programmable controller. LCD touch-screen
Way of adding humidity	Add humidity by high pressure aerosol
Thermometer	Heat insulate type black standard thermometer and black panel thermometer
Cooling System	Cooled by compressor and forced-air blast system
Security Protections And Error Protections	
Xenon Lamp Protection	Over temperature of cooling water，low flow of cooling water，abnormal of lamp power
Alarm Function	Big irradiance difference, over-temperature of BPT or BST or Working room, big error of humidity, spraying water shortage, pure water conductivity is over limits. Operator can set these values and downtime
Cooling-water System Protect	Monitor the conductivity of cooling-water at real-time
Protection to Radiation	Xenon lamp will turn off automatically when opening the chamber door, in case xenon lamp radiate operator

Installing Environment Requirement	
Site Requirement	Net area of installation site ≥12m²; Net height≥2.8m. Equipped with separate air condition which can ensure a 22℃～30℃ & 30%～80% environment permanently. No strong electromagnetic fields, no high concentration dust，no corrosive gas or flammable materials.
Power Source	380V ± 10% 3-phases；50Hz；50A power source；Equipped with circuit，ground wire and air circuit breaker.
Air Outlet	There should be air outlet（Distance to chamber ≤1.0m，height to ground is 2.5m～2.7m, diameter should be 153mm）
Water Supply	Equipped with water supply pipes and valves，Supply water pressure≥2.0kg/c㎡；conductivity≤120us/cm
Drainage	Draining pipes diameter≥ 50mm，height to ground≤10cm，distance to chamber≤0.5m

Table A：Main Configuration

Products	Numbers	Manufacture	Notes
Xenon Lamp	1 pc	Atlas	6.5KW（Also select other USA brand）
Filter	1 set	Atlas	Includes five inner filters and one 4.5K/6.5K outer filter（S BORO/S BORO）
Control System	1 set	SIEMENS	S7-300 PLC+ Siemens analog imput
Interface	1 pc	MCGS	10″ human-computer touch screen

Table B：Adjustable Range of Irridiance

Combinating Filters			Adjustable Range of Irridiance（W/㎡）			
Filters	**Inner Filter**	**Outer Filter**	**Lamp Power（KW）**	**340nm**	**420nm**	**300-400nm**
Daylight	Type S Boro	Type S Boro	2.5～7.5	0.25～1.26	0.59～2.76	29～141
Window Glass	Type S Boro	Soda Lime	2.5～7.5	0.23～1.10	0.61～2.76	28～129
Extended UV	Quartz	Type S Boro	2.5～7.5	0.29～1.50	0.59～2.79	32～161

Optional Accessories

BGD 8158---ATLAS 6.5 kW Xenon Lamp （Water-cooled）

BGD 8159---USA brand 6.5 kW Xenon Lamp （Water-cooled）

BGD 8160--- ATLAS 2000 HRS Supply PKG（Includes one BGD 8158 ATLAS 6.5 kW water-cooled lamp，5pcs S65 inner filters，one pc 4.5K/6.5K outer filter）

BGD 8161---6.5KW BGD 2000 HRS Supply PKG（Includes one BGD 8159 USA brand 6.5 kW water-cooled lamp，5pcs W-143 inner filters，one pc W-144 outer filter）

BGD 8171--Purity Water System （100L/h, pure water can less than 0.1μS/cm （input water＜200μS/cm））

BGD 8176—Cooling Water Machine（For cooling and cycling pure water, can greatly reduce water consumption）

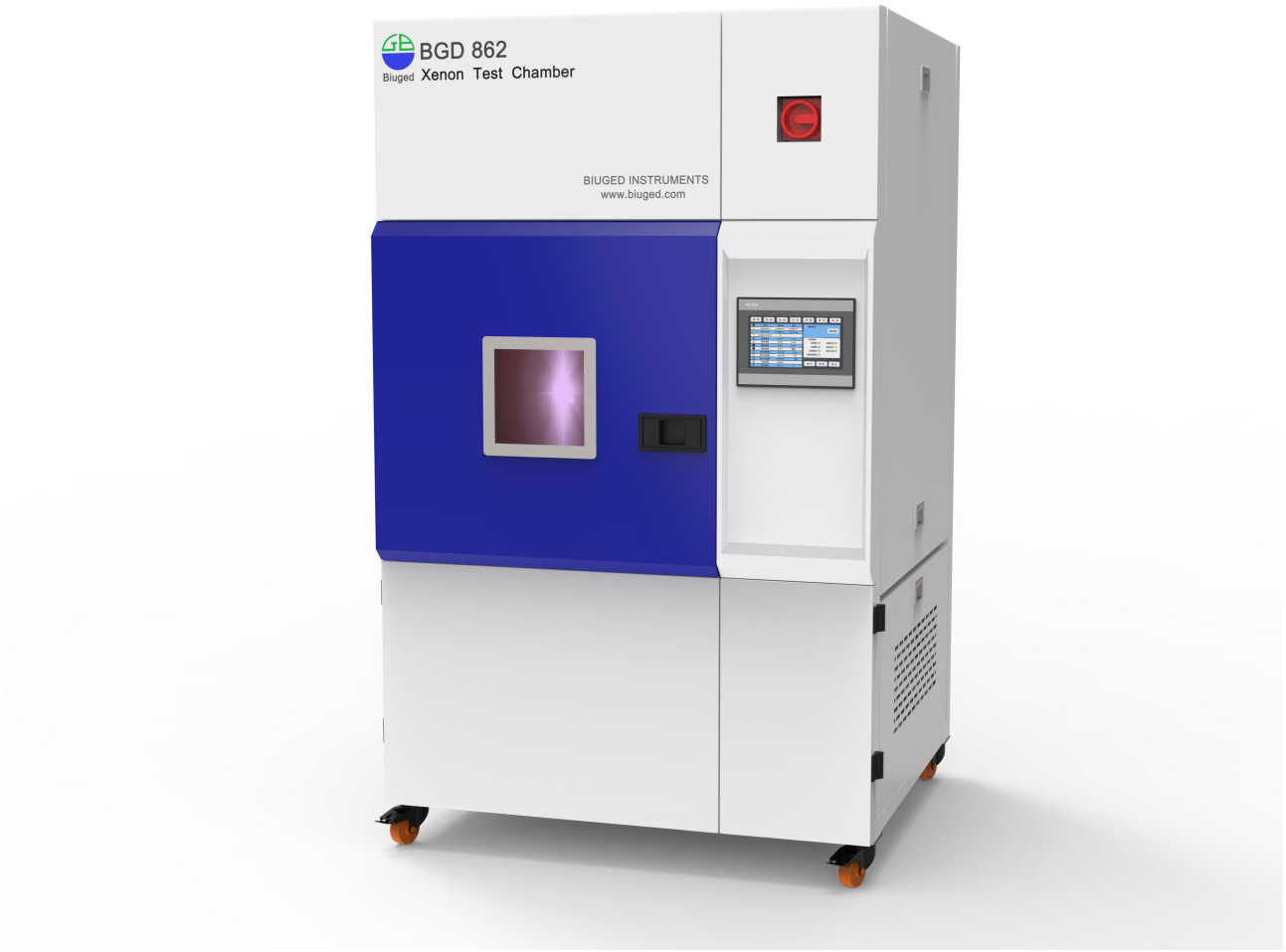
BGD 8179---Air Compression System（Includes air compressor、air reservoir、freezing dryer、precise filter etc）

BGD 8186---Daylight Filter

BGD 8187---Window Glass Filter

BGD 8192---Metal Frame Air Filters

BGD 8197---Sample shelf



Multifunctional Irradiance Radiometer

For all artificial light accelerated aging test chambers, the irradiance（irradiation energy） is one of the most important parameters affecting the test results. On the other hand, with the extension of the service time of the aging test chamber, some components（including filters, irradiation probes, sensors, etc.） will age, resulting in deviation of irradiance displayed on the instrument. Therefore, regular calibration of the irradiation energy of aging instrument is a necessary operation in the process of artificial accelerated aging test.

The multifunctional irradiance radiometer is a brand-new hand-held instrument produced by Biuged. It includes a hand-held irradiance radiometer（main body） and one or more special probes. When using, select the corresponding probe and insert the irradiance radiometer according to the required calibration object, and select the lamp or filter type in the radiometer display screen. Then place the probe in the calibrated instrument and start the aging test chamber, and calibrate the irradiance in the aging test chamber by reading the value displayed on the irradiance radiometer. On the other hand, when the probe is inserted into the irradiance radiometer, its display screen will automatically read and display the factory number and calibration date of the probe, so that the user can calibrate the probe in time.

The multifunctional irradiance radiometer can be used to calibrate the irradiance of all aging test chambers（including xenon lamps and fluorescent ultraviolet）produced by Biuged. Compared with other irradiance radiometer on the market, the multifunctional irradiance radiometer has the following characteristics:

◆ After inserting the calibration probe, the main body automatically recognizes the type of the probe

and its relevant parameters.

◆ Xenon lamp calibration probe, which can simultaneously calibrate the irradiance of air-cooled and water-cooled xenon lamps and different filters.

◆ UV calibration probe can simultaneously calibrate the irradiance of different types of fluorescent ultraviolet lamps（UVA / UVB）.

◆ 5-inch capacitive LCD touch screen with HD resolution of 1080*720.

◆ The modular irradiance probe is adopted, which is lower in cost than the traditional instrument with integrated probe and host.

◆ After the validity period of the self-identification probe expires, the user can choose to recalibrate or replace it.

◆ Built in Chinese and English languages for users to switch.

Main Technical Parameters:

■ Measuring Range：0.00~2.00W/m²（340nm）；0.00~4.00W/m²（420nm）；0~300W/m²（300nm~400nm/TUV）；0.00~2.00W/m²（UVA&UVB）

■ Irradiance Error： ±10%

■ Recommended Calibration Period：One year

■ Probe Temperature Drift of probe： ±0.02% / ℃

■ Operating Environment：0 ~ 50℃；10%RH～90%RH

■ Maximum Working Temperature：70℃

■ Main Body Size: 143mm×75mm×20mm

■ Net Weight （main body and probe）：380g

■ **Ordering Information**

BGD 8118/S---Multifunctional Irradiance Radiometer for UV lamps（UVA&UVB）

BGD 8140/S---Multifunctional Irradiance Radiometer for Xenon lamps（340nm）

BGD 8141/S---Multifunctional Irradiance Radiometer for Xenon lamps（420nm）

BGD 8142/S---Multifunctional Irradiance Radiometer for Xenon lamps（300nm~400nm）

BGD 145---Multifunctional Irradiance Radiometer Body

BGD 8134---Calibration Probe for 300nm～800nm

BGD 8136--- Calibration Probe for 340nm

BGD 8137--- Calibration Probe for 420nm

BGD 8138---Calibration Probe for 300nm~400nm

BGD 8139--- Calibration Probe for UVA&UVB lamps

Other Optional Accessories

Sample Charts

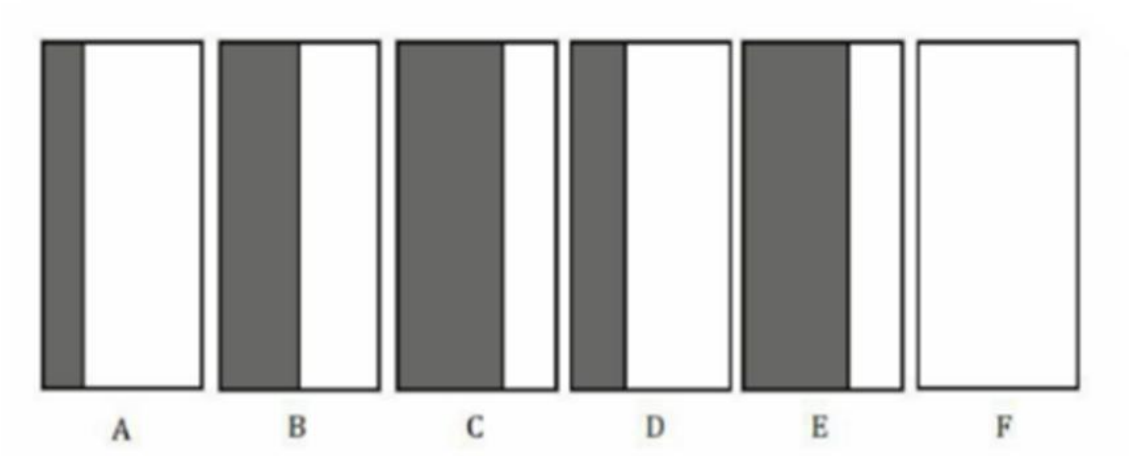
They are white hard paper charts as sample base, used to put samples for color fastness to light test.

Smaple Holder

Biuged can customize all special sample holders according to different sample size and shape.

Shading Panel

Used to cover some part of sample, suitable for different degree exposure to sample



A----1/4 Shading Panel
B----1/2 Shading Panel
C----3/4 Shading Panel
D----1/3 Shading Panel
E----2/3 Shading Panel
F----0 Shading Panel

Pure Water Machine

Most color fastness to light chambers need clean water to carry out spray or add humidity to working room. Unclean water would pollute sample or cause big problem when judging color fastness. Biuged offers two types pure water machines according to their yield.

BGD 8171 Pure Water Machine is a economical option for BGD 866/F

Water Yield：100L/hour

Required Water Supply：Municipal tap water（Conductivity ≤ 400us/cm ）

Output Water Quality：Online conductivity < 0.1us/cm

Rated Power Supply：220V/AC

Rated Power：600W

Filter Resin：Bayer N60 from Germany

RO Film：Dow from USA

External Accessories：100L bucket, automatic softener

Overall Size：650mm×630mm×1700mm

Weight：160 KG

Ordering Information: BGD 8171--- Pure Water Machine

Consumables	Replace Period
Filter Materials (PP cotton、Charcoal)	Replace every 3～6 months，material expenses is near USD 15 each time
Front Soft Resin (Reproducible)	Replace every 3 years，material expenses is near USD 150 each time
Ion Exchange Resin	Relace every 100 ton water，material expense is near USD 260 each time; Normal water consumption for machine is 50L ~ 100L everyday, it should be replaced near 1 ~ 3 years
Reverse Osmosis (RO) Membrane	Replace every 5 years，material expenses is near USD 450 each time

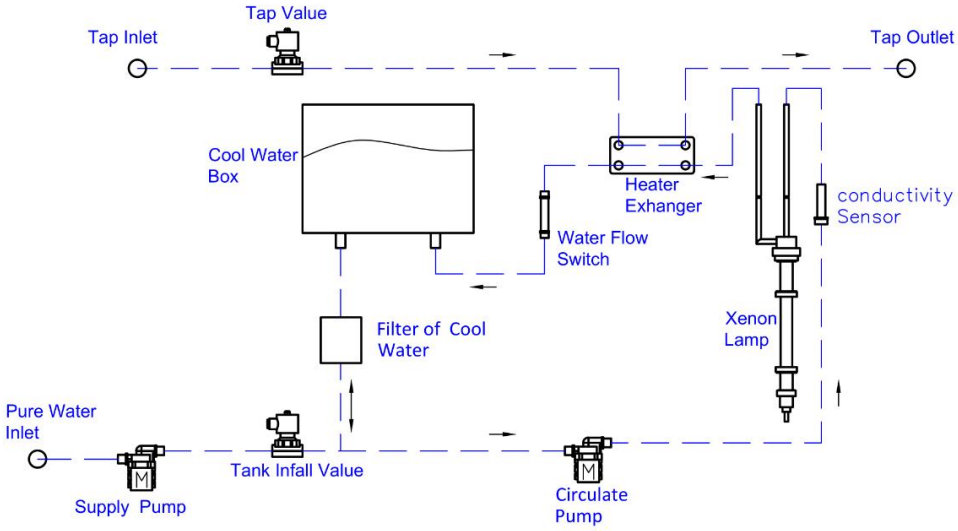
BGD 8172 Industry Ultrapure Water Machine adopts RO+EDI technology, its output water online resistivity＞10MΩ·cm. This product has energy conservation, environmental protection, one-button operation, low running cost and high performance-price ratio etc.

- ◆ Integrated design, silent, dust resistance and durable
- ◆ Online water quality detection, the machine will alarm and power off if water quality isn’t up to the standards.
- ◆ PLC＋touch screen design, high- performance controlling technology, large flow self-flushing function, more durable.
- ◆ One-button operation: Can add controlling function through mobile Internet of Things which is available for remote operation and indicator monitoring.
- ◆ Install easily, only need to connect input water, output water and drain outlet.
- ◆ Shut off water source automatically when leaking；
- ◆ Explosion-proof function for optional（if required）
- ◆ Output Water Conductivity：＜ 0.10 μs/cm（when input water conductivity＜300 μs/cm ）
- ◆ Rated Yield Water：100L/h
- ◆ Water Tank Capacity：120L～200L
- ◆ Overall Size：140cm×80cm×180cm（L×W×H）

Cooling Water Machine

Xenon will produce a lot of heat when it works. Using cold water to cool it is a fast and efficient way. The lower temperature the cold water is, the higher efficiency can achieve

- ◆ The cooling medium is pure water, but the consumption is little.
- ◆ The minimum temperature which cooling water can reach depends on its environment.
- ◆ The temperature is too high would decrease the lamp lifetime, which shows apparently the lamp surface is white, coarse and then broke.
- ◆ By setting a reasonable cooling water temperature, condensation on the filter surface could be avoided.



Air Compression System

The humidity control is achieved through the use of a secondary fluid（compressed air and pure water）in the form of spray mist. Therefore, it's necessary to have compressed air available on-site.

An air compression system can provide clean compressed air to the site, but it requires regular maintenance. The main maintenance include lubricating the air compressor and draining the air tank and filters. It is recommended to do maintenance on the same schedule as lamp replacement. The user may not choose dryer if the requirements of test isn't strict or the chamber has a regular maintenance.

Note：Although the chamber come with an oil-water separator, it doesn't serve as the primary filtering function. The compressed air supplied to the chamber must be free of oil and water.