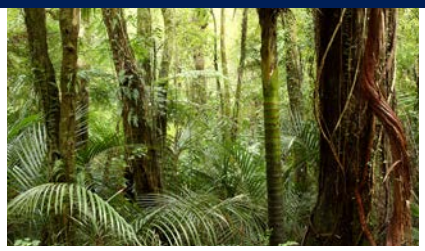



Cincinnati Sub-Zero

PHOTOVOLTAIC MODULE & SOLAR PANEL

ENVIRONMENTAL TESTING GUIDE

www.cszproducts.com

Solar Panel Testing Chamber

We provide a selection of standard & custom solar panel test chambers for testing various size photovoltaic modules and solar panels. These chambers simulate temperature and/or humidity conditions and are designed to meet all three sections of environmental solar panel test specifications for temperature cycling, damp heat and humidity freeze.

Our solar panel testing chambers aid in qualifying that modules can withstand the thermal stress caused by repeated changes in high and low temperatures along with exposure to high humidity. Unique air flow design and distribution ensures precise air flow required for solar panel testing.

All chambers include the EZT-570 Touch Screen Controller with data logging, data file access with USB compatible memory stick, Ethernet control and monitoring, alarm notification via email or phone text message, data file backup system, full system security and more. No need to worry about programming your test profile, our chambers come pre-programmed with the solar test specification you request.

Solar Cell and Module Testing

Model	ZPH-8	ZPH-16	ZPH-32	ZPH-44	ZPH-64
Workspace Dimensions WxDxH (mm)	24" x 24" x 24" (610x 610 x 610)	30" x 30" x 30" (760 x 760 x 760)	38" x 38" x 38" (965 x 965 x 965)	44" x 38" x 46" (1117 x 965 x 1168)	48" x 48" x 48" (1219 x 1219 x 1219)
Temperature Range	Cascade: -70°C to 190°C				
Humidity Range	10% to 98% RH				
Meet Test Methods	Temp Cycling / Humidity Freeze / Damp Heat				

Solar Panel Testing

Models	SP(H)-140	SP(H)-216	SP(H)-345
Workspace Dimensions WxDxH (mm)	48" x 60" x 84" (1219 x 1524 x 2134)	74" x 60" x 84" (1880 x 1524 x 2134)	74" x 96" x 84" (1880 x 2438 x 2134)
Exterior Dimensions WxDxH (mm)	80" x 140" x 106.25" (2032 x 3556 x 2699)	88" x 140" x 108" (2235 x 3556 x 2743)	88" x 176" x 108" (2235 x 4470 x 2743)
Temperature Range	-70°C to 150°C		
Humidity Range	20% to 95% RH		
Meet Test Methods	Temp Cycling / Humidity Freeze / Damp Heat		
Number of Panels*	6 to 14	8 to 20	8 to 20
Door	Left-hand hinged door		

*Number of panels based on weight of 55lbs (25kg) per panel, spaced 4" (102mm) on center
Custom sizes available

Walk-in chambers are ideal for testing larger volumes of solar panels along with a variety of different size panels. These chambers may be designed to fit your specific requirements.

Welded Walk-In Chambers

Welded Walk-In chambers provide wider temperature and humidity ranges. These welded walk-in chambers consist of one solid piece, simplifying installation. Welded Walk-In chambers are constructed using a zinc-coated, exterior polyurethane enamel finish and a type 304 stainless steel interior. Fiberglass insulated walls are 6" thick with seams that are continuously welded to form a hermetically sealed chamber. These chambers are available in temperature ranges from -68°C to 190°C and humidity from 10% to 95% RH.

Environmental rooms and walk-in chambers for testing solar panels.

EZT-570 Touchscreen Controller

Find out more

The Next Generation Controller with Smartphone Technology

All features are built into the controller interface so no additional software or internet is required for access to all the features the controller has to offer.

Communications & Connectivity

- Monitor and/or Control the chamber remotely for anytime, anywhere access from any device using LAN VNC
- Alarm notification sends email and/or text messages
- Email built-in to send data, alarm, audit trail files directly from controller
- Ethernet TCP/IP, and serial communications

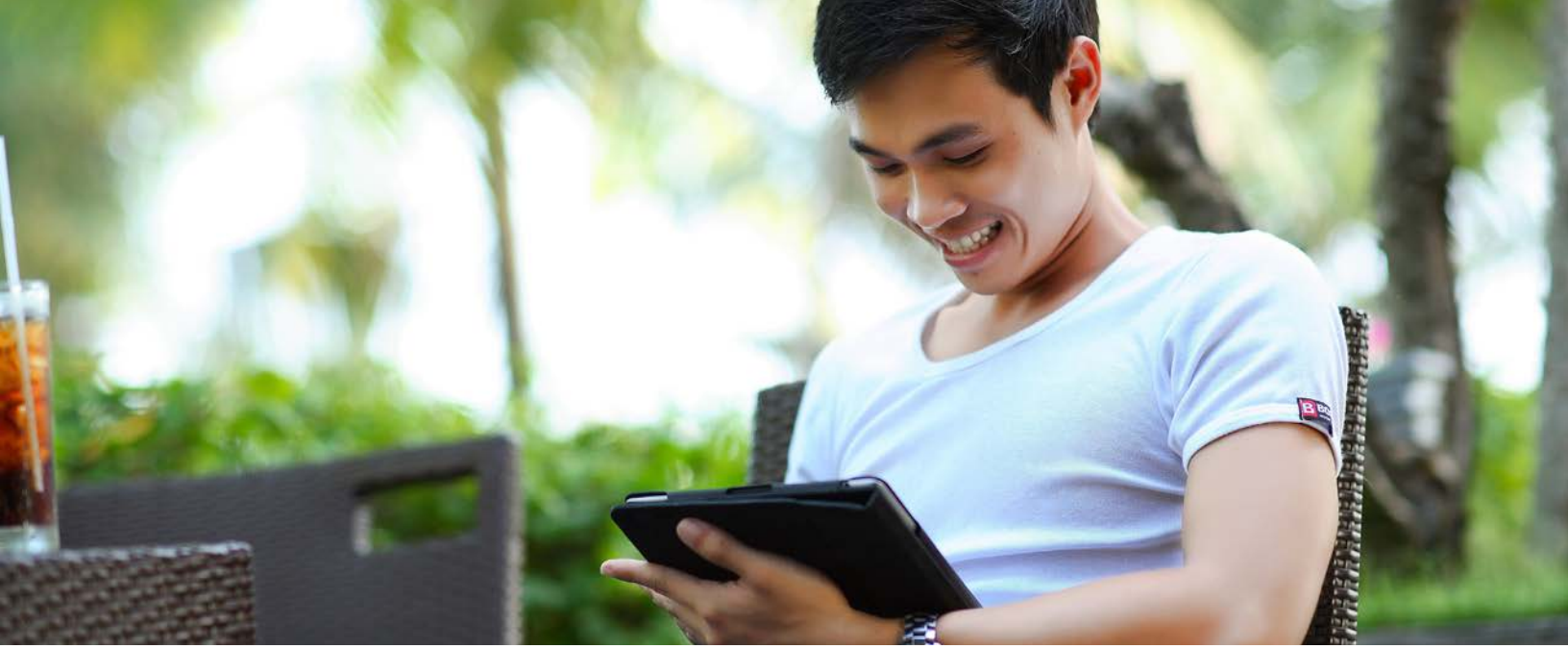
Save valuable time with the ease of use of the EZT-570 featuring fewer steps to accomplish your daily testing needs while incorporating simplified operation and programming to test faster.

Profiling

- Profiling includes up to 99 steps and 1000 cycles
- Program ramp steps entering time or °C/min
- Programs may be written using product control function
- Easily review profile using trend chart or review list of steps before running profile
- Profile status view displays current step, estimated start/stop date and time and more
- Profiles may be transferred to different chambers via USB or optional EZ-View software
- Automated delay profile start

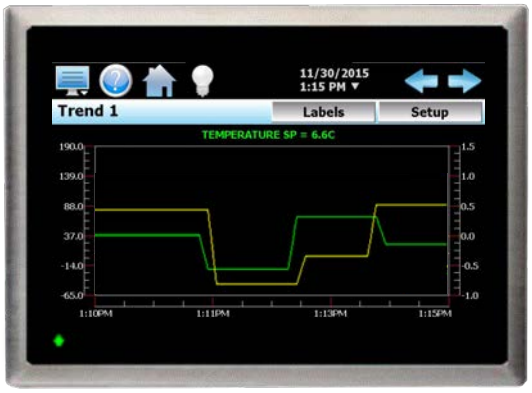
Data Logging

- Configurable log interval, data file length, filename, operator entered batch & lot information as well as an unlimited number of operator notes saved to the data file
- Access data files directly from controller or PC
- Easily download profiles, alarm files, audit trail files and data files using LAN (FTP, email) and/or USB in a compatible .csv file format for ease of use. Files may also be automatically backed up daily for hassle-free file management
- Files may also be automatically backed up daily for hassle-free file management using FTP. FTP/FileWeb/DataWeb (LAN/WAN)



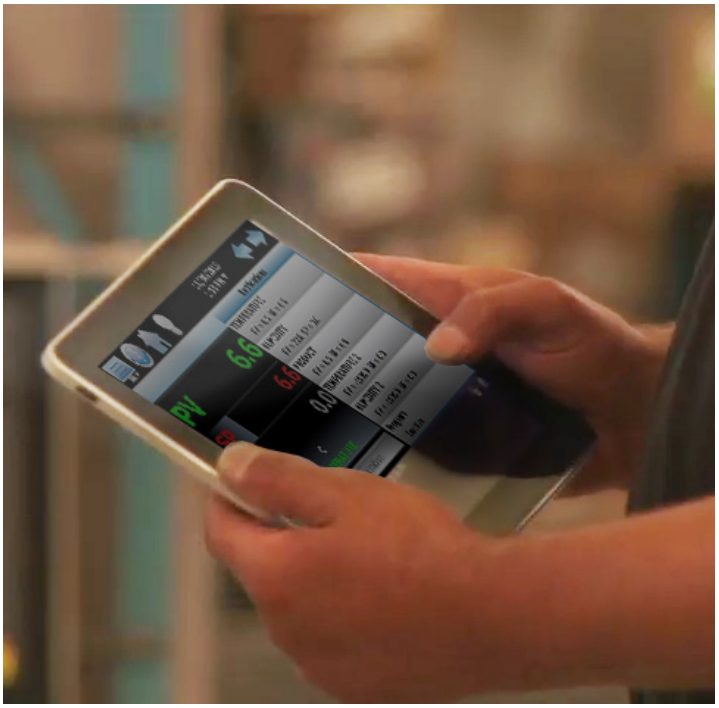
User Convenience & Flexibility

- Controller may be configured in 28 languages
- Selectable power failure/recovery options
- Full system security allows up to 30 different users with four different levels of security
- Audit trail files track changes in settings by each user
- Configure alarm setting and maintenance alerts



Graphing Technology

- Real-time trend display graph with adjustable time and min/max values
- Up to eight configurable trend graphs with left & right axis
- Graph historical data files
- Zoom in/out of graphs for a closer look



Enhanced Communications & Control Options

- Digital input option provides 8 inputs that can be configured for various control functions including starting, stopping and pausing a profile. "Wait for" function allows the user to pause a profile during a particular step of the profile until a specific digital input is turned on or off
- Digital output "customer event" feature provides 15 programmable outputs. Each output can be configured to perform other operations including alarm or profile status indicators for more control over your testing
- Optional refrigeration monitor package displays and data logs temperatures and refrigeration system compressor suction/discharge pressures
- Condensation control option helps prevent condensation from collecting on the part by automatically managing the air dewpoint
- Bar code option allows user to scan barcode to start profile and to add notes to current data file when datalogging

Solar Panel Specifications

Overview of Solar Panel Specifications for Environmental Testing

Solar Energy is one alternative that uses Photovoltaic (PV) modules to generate energy. These modules are exposed to severe environmental temperature and humidity extremes throughout the life of the product.

Listed below is a general overview of common solar panel test specifications that require the use of environmental testing. Outlined are the test conditions related to our test chambers. For more information on IEC, UL or ASTM standards or to purchase a copy of the full specification, visit the following web sites www.iec.ch, www.ul.com, or www.astm.com.

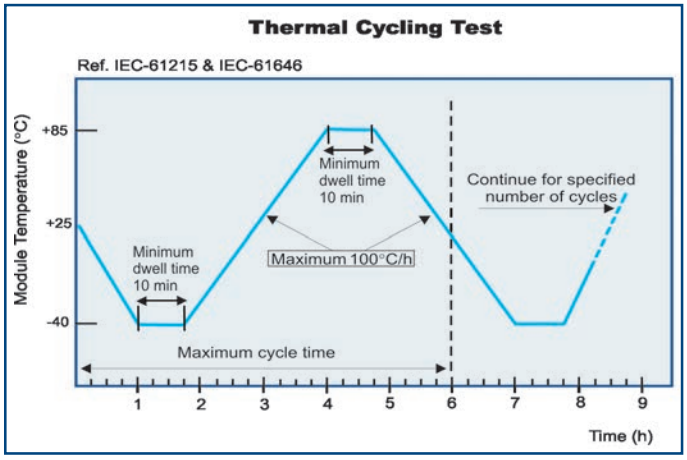
Test Specification	Test Specification Description
IEC 61215	**Crystalline silicon terrestrial photovoltaic (PV) modules - Design qualification** Temperature Cycling: -40°C to +85°C for 50 and/or 200 cycles *Humidity Freeze: -40°C to +85°C & 85% RH for 10 cycles Damp Heat: +85°C & 85% RH for 1,000 hours *Current test chart shows humidity control during the ramp
IEC 61646	**Thin-film terrestrial photovoltaic (PV) modules - Design qualification** Temperature Cycling: -40°C to +85°C for 50 and/or 200 cycles *Humidity Freeze: -40°C to +85°C & 85% RH for 10 cycles Damp Heat: +85°C & 85% RH for 1,000 hours *Current test chart does not show humidity control during the ramp
IEC 61730	**Photovoltaic module safety qualification** Part 2: Requirements for testing
IEC 62108	**Concentrator photovoltaic (CPV) modules and assemblies - Design qualification**
UL 1703	**Flat Plate Photovoltaic Modules and Panels**
ASTM E1171	Test methods for photovoltaic modules in cyclic temperature and humidity environments

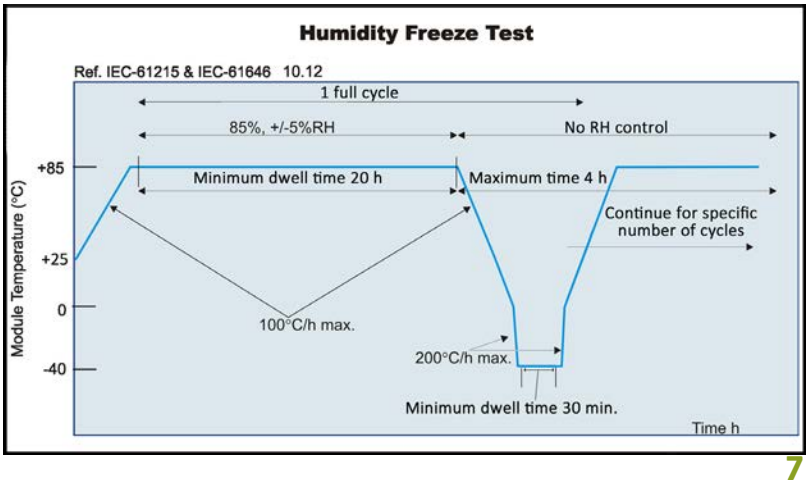
The above list is not intended to be inclusive of all test standards related to solar panel testing. If you have a test requirement for other standards that are not listed above, contact us to see how we can meet your needs.

IEC 61215 & IEC 61646

Crystalline Silicon Terrestrial Photovoltaic (PV) & Thin-Film Terrestrial (PV)

Title	Description
Thermal Cycling	Ramp down from 25°C to -40°C at 100°C/h max., soak for a of 10 minutes. Ramp up to 85°C at 100°C/h or less. Soak a minimum of 10 minutes. Then return to 25°C, 6 hour maximum cycle time. Repeat for specified number of cycles per figure 1 "Qualification Test Sequence" of the IEC-61215 test specification (50 and/or 200 cycles). Current test profile chart is based upon module temperature
Humidity Freeze	Ramp from room temperature with 85%RH to 85°C/ 85%RH at 100°C/h max. Soak for 20 hours minimum. Ramp down to ambient with 85% RH at 100°C/h max. Ramp down to 0°C at 100°C/h max then to -40°C at 200°C/h max. Soak for 30 minute minimum. Ramp from -40°C to 0°C at 200°C/h max and from 0°C to 25°C at 100°C/h max. Humidity must be maintained at 85% ±5% whenever temperature is 25°C or higher. Humidity control is not required during temperature transitions. Current test profile chart is based upon module temperature
Damp Heat	85°C, ±2°C, 85%, ±5% RH No of Cycles/Time: 1,000 hours

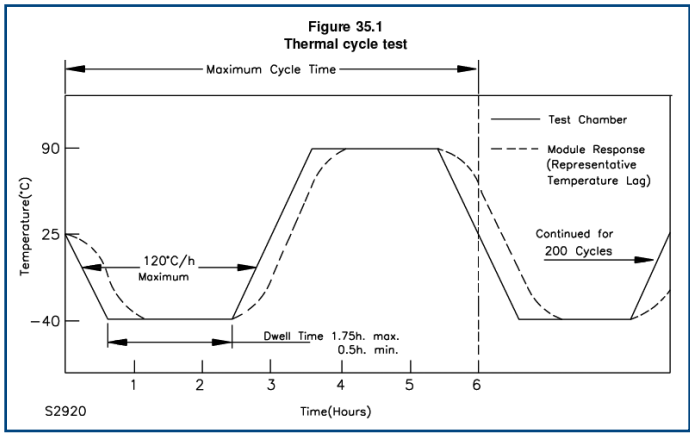


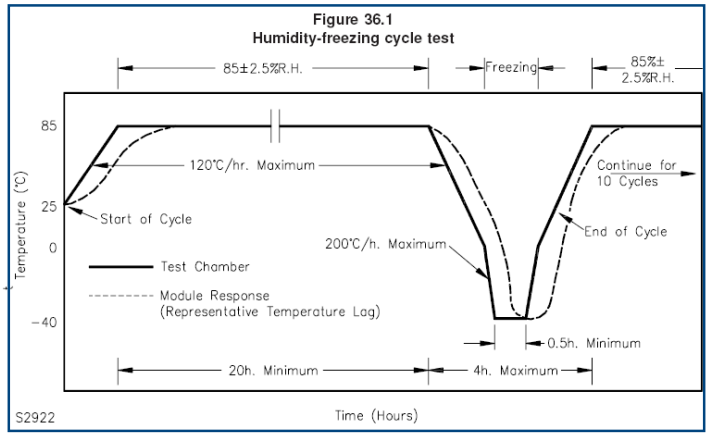


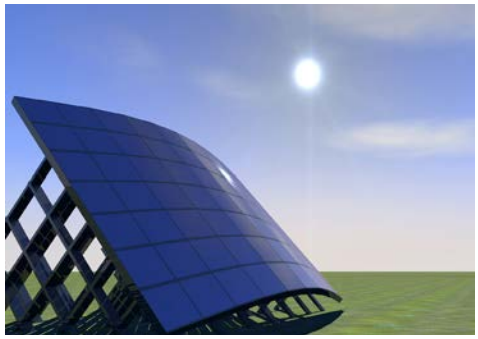
UL 1703

Flat-Plate Photovoltaic Modules and Panels

Section	Title	Description
35	Temperature Cycling Test	Ramp from 25°C to -40°C. Dwell at -40°C for 30 min or until module temperature is within 2°C of chamber temperature. Soak can last no longer than 1 hr 45 min. Ramp from -40°C to 90°C. Dwell for 30 minutes or until temperature is within 2°C of chamber temperature. Soak can last no longer than 1 hr 45 min. Ramp from 90°C to 25°C. Total cycle not to exceed 6 hrs. All transitions not to exceed 120°C/hr.
36	Humidity Test	Ramp from room temperature to 85°C/ 85%RH at 120°C/h max. Soak for 20 hours minimum. Ramp down to 0°C at 100°C/h max then to -40°C at 200°C/h max. Soak for 30 minute minimum. Ramp from -40°C to 0°C at 200°C/h max and from 0°C to 25°C at 120°C/h max. Repeat the entire cycle for 10 cycles. Humidity control is not required during temperature transitions.



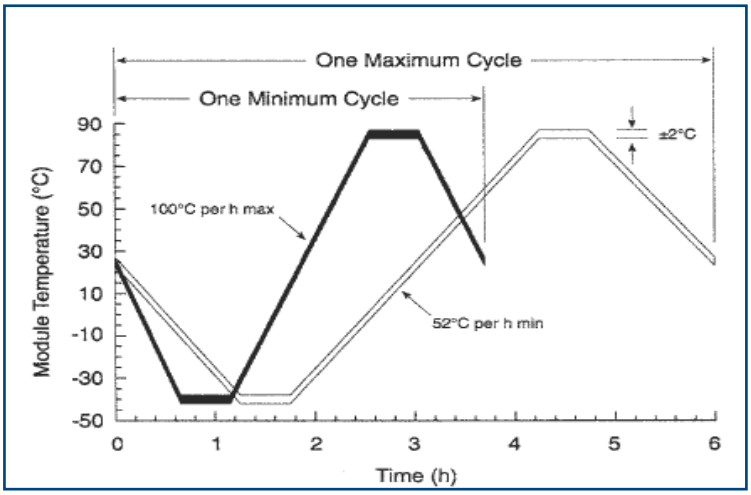


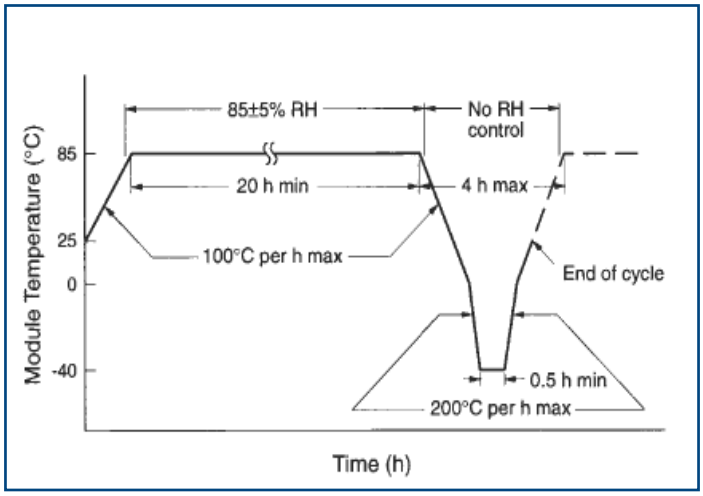


ASTM E1171

Test Methods for Photovoltaic Modules in Cyclic Temperature and Humidity Environments

Section	Title	Description
6.5	Temperature Cycling Procedure	Ramp down from 25°C to -40°C at a change rate of between 100°C/h max and 52°C/h soak for a minimum of 30 minutes. Ramp from -40°C to 85°C at a change rate of between 100°C/h max and 52°C/h minimum. The cycle time is not-to-exceed 6 hours. Repeat cycle for 50 cycles. Perform Visual and Electrical Retest. Re-run cycle for 150 cycles
6.6	Humidity Freeze Cycle Procedure	Ramp from room temperature with 85%RH to 85°C/ 85%RH at 100°C/h max. Soak for 20 hours minimum. Ramp down to 0°C at 100°C/h max then to -40°C at 200°C/h max. Soak for 30 minute minimum. Ramp from -40°C to 0°C at 200°C/h max and from 0°C to 25°C at 100°C/h max. Repeat the entire cycle for 10 cycles.
6.7	Damp Heat Exposure Procedure	85°C, ±2°C 85%, ±5% RH for 1000 hours





Cincinnati Sub-Zero is a product brand of Weiss Technik North America, Inc. Weiss Technik North America is a member of the Weiss Technik group of companies, a division of the Schunk Group with its headquarters in Heuchelheim, Germany. Weiss Technik is the world's largest manufacturer of environmental simulation systems and employs more than 2,900 people in 18 group companies in 15 countries.

Request Information

Cincinnati Sub-Zero

The Testing Standard.

Weiss Technik North America, Inc.
Cincinnati Facility
12011 Mosteller Road
Cincinnati, OH 45241

(p) **513-326-5252**
(f) **513-326-5258**

www.cszproducts.com

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