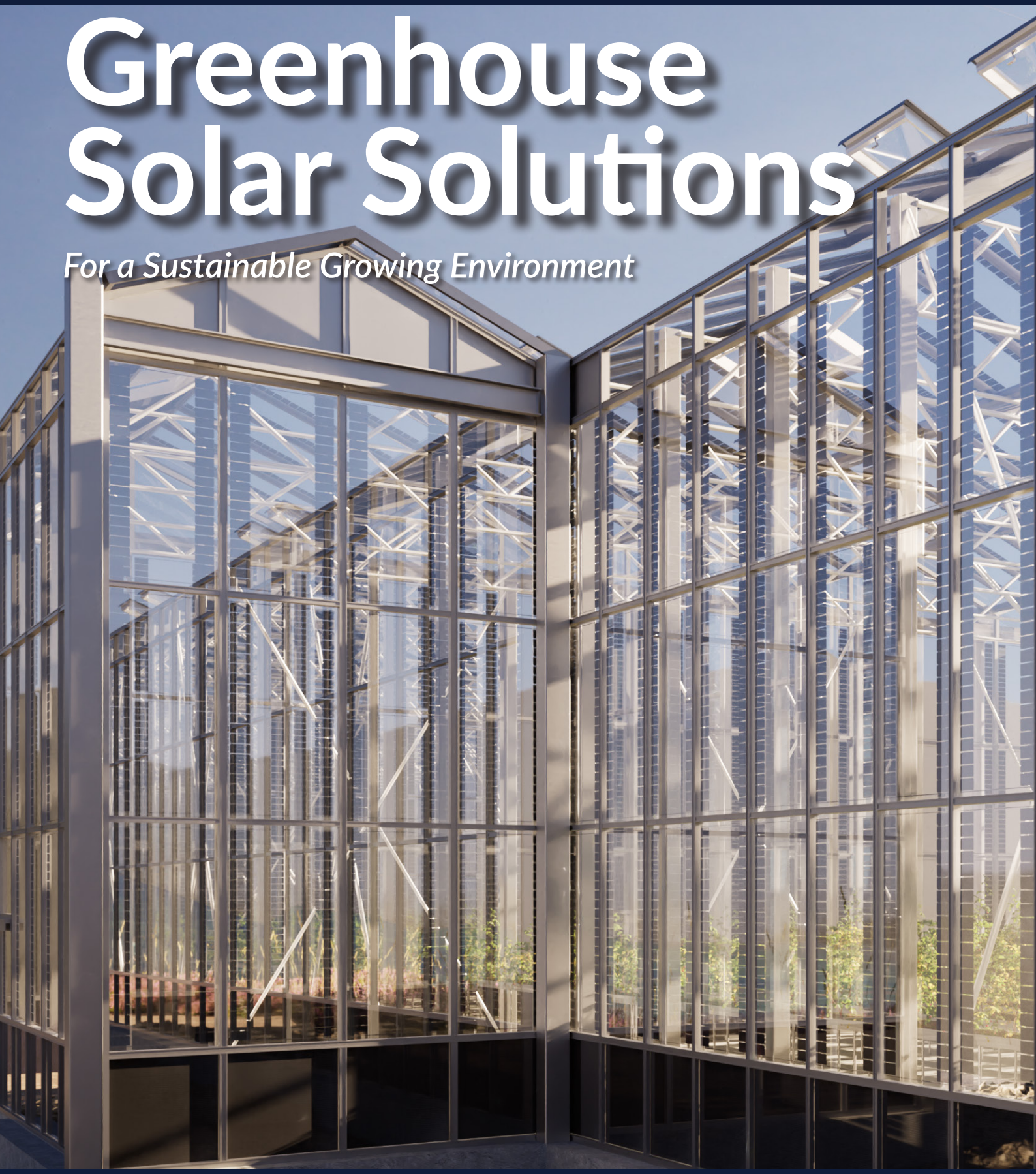
ClearVue[PV] Greenhouse Products

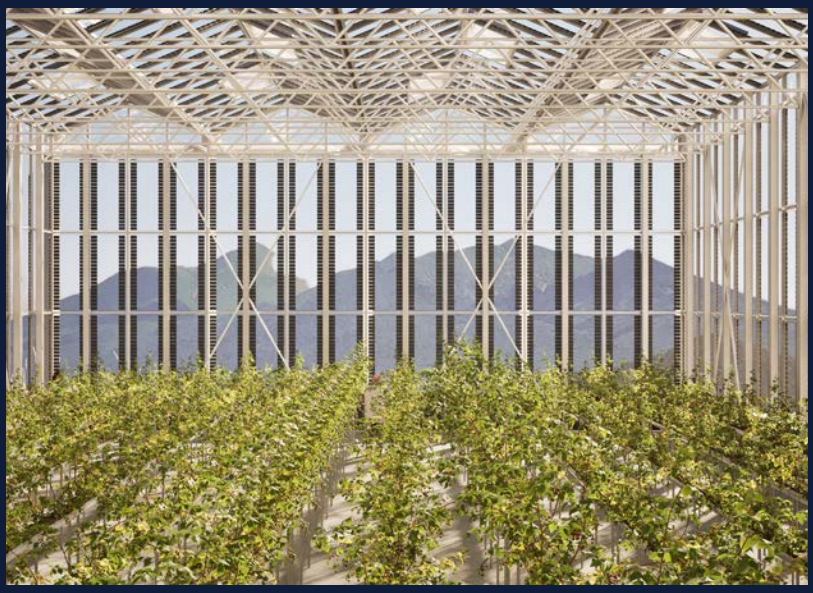
ClearVue[PV]

Greenhouse Solar Solutions

For a Sustainable Growing Environment



Solar Greenhouse Glass



ClearVue^{PV} Greenhouse Glass promotes sustainable agriculture operations by providing energy generation across the rooftop and vertical wall surfaces of greenhouse buildings.

Now it is possible to generate energy via nearly every greenhouse exterior surface.

ClearVue^{PV}

Solar Greenhouse

ClearVue^{PV} Greenhouse Glass generates energy while maintaining the necessary light transparency to support optimal growing conditions.

Reliable
power generation efficiency

Clean Energy
generation offsets building energy requirements

Transmittance
for excellent natural lighting

ClearVue^{PV} Greenhouse Glass is engineered to integrate into industry-standard frames, provides 90% transparency to promote healthy plants, and deliver clean energy generation due to its bifacial component. With ClearVue, greenhouses can be green on the inside and the outside. ClearVue offers two products to maximize energy generation across the building rooftop and vertical surfaces.

Benefits

- Up to 165 watts peak per square meter for black double glass units and 61 watts peak per square meter for bifacial double glass units dependent on installation conditions and desired design
- Compatible with standard greenhouse framing systems
- High-efficiency solar cells maximize energy generation
- 5mm total thickness with custom thicknesses available upon request to enhance structural safety
- Can be utilized in combination with ClearVue^{PV} Full Black Laminate panels for optimized energy generation
- IP68 water resistance for a long lifespan
- Silicon solar cells deliver a proven track record of reliability and longevity
- Project-specific sizes and bespoke options for projects over 1000 meters

ClearVue^{PV} Greenhouse Glass Specifications

Max-Transmittance P-type Bifacial Double-Glass Module

ClearVue's Max-Transmittance Greenhouse Glass is engineered to maximize light transmittance while optimizing energy generation to promote healthy plant development while offsetting greenhouse energy requirements.

Product Features

- Up to 61 watts peak per square meter dependent on installation conditions and desired design
- High-efficiency solar cells along edges with clear central region optimize for the best combination of transparency and energy generation
- IP68-rated water resistance
- Purpose-engineered for agricultural greenhouse environments
- Supports ESG goals and obligations

MECHANICAL SPECIFICATIONS

Cell Type	Mono Crystalline
Solar Cells	400 (2*20)
Module Dimension (mm)	2131*994*5
Weight (Kg)	23
Front Glass (mm)	2.0 Semi tempered coated glass
Interlayer	EVA
Back Glass (mm)	2.0 Semi tempered glass
Panel & Junction Box	IP68 Rated, 1 bypass diodes
Connector	IP68 MC4 (or equiv)
Frame	No Frame
Maximum Load Capacity (Pa)	2400(back side)/2400(front side)

SCOPE OF WORK

Maximum System Voltage	1000 or 1500 DC (IEC)
Operating Temperature	-40~+85˚C
Nominal Operating Cell Temperature	45±3˚C
Maximum Series Fuse Rating	20A
Fire Rating	Class C

TEMPERATURE COEFFICIENTS

Temperature Coefficient of Pmaxx	-0.35%/˚C
Temperature Coefficient of Voc	-0.28%/˚C
Temperature Coefficient of Isc	0.046%/˚C

ELECTRICAL CHARACTERISTICS

	Module Type	CPVAGH-130W (5MM)
STC	Max Power (P_{max})	130W
	Open Circuit Voltage (V_{oc})	14.34V
	Short Circuit Current (I_{sc})	11.70A
	Voltage at Max Power Point (V_{mp})	11.77V
	Current at Max Power Point (I_{mp})	11.05A
	Power Tolerance	0~+5%
	Module Efficiency	5.8%
NMOT	Max Power at NMOT (P_{max})	97W
	Open Circuit Voltage (V_{oc})	13.4V
	Short Circuit Current (I_{sc})	9.43A
	Voltage at Max Power Point (V_{mp})	10.8V
	Current at Max Power Point (I_{mp})	9.00A
	Power Tolerance	0~+5%

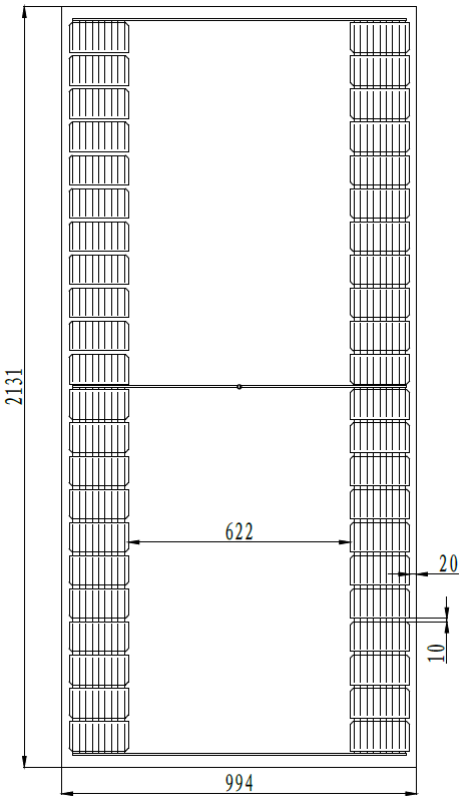
STC: Air Mass AM1.5, Ir-radiance 1000W/m^2, Cell temperature 25°C. NMOT: Air Mass AM1.5, Ir-radiance 800W/m^2, Ambient temperature 20°C, wind speed 1m/s. Bifaciality = 75±5%

ClearVue^{PV} Greenhouse Glass Specifications

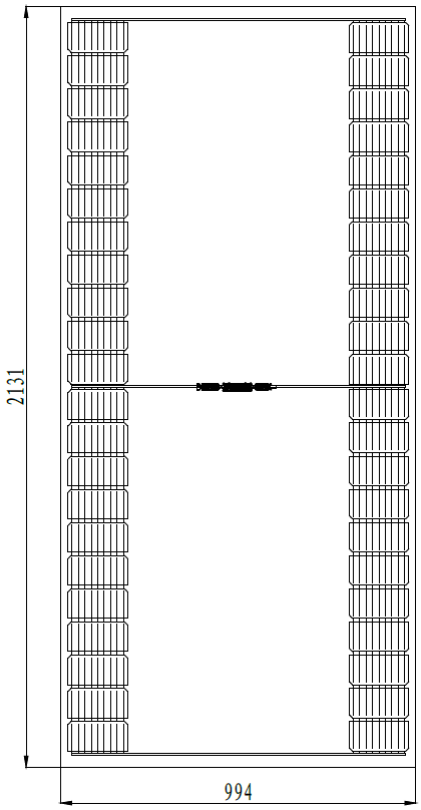
Max-Transmittance P-type Bifacial Double-Glass Module

ENGINEERING DRAWINGS

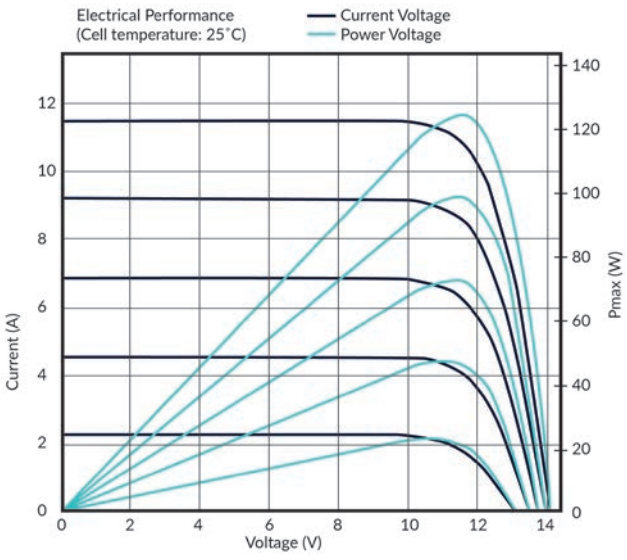
FRONT VIEW



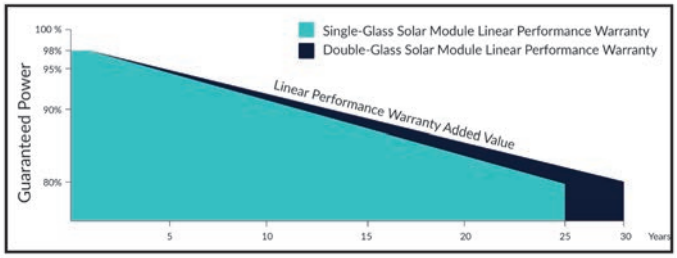
BACK VIEW



ELECTRICAL CURVES



LINEAR PERFORMANCE



ClearVue^{PV} Greenhouse Glass Specifications

Max-Generation P-type Bifacial Double-Glass Module

ClearVue's Max-Generation Greenhouse Glass prioritizes high-efficiency energy generation with additional solar cells across the glass surface. This solution can be intermixed with ClearVue's Max-Transmittance and Black Laminate solutions to augment energy production across the greenhouse.

Product Features

- Up to 132 watts peak per square meter dependent on installation conditions and desired design
- Four rows of high-efficiency solar cells maximize energy generation
- IP68-rated water resistance
- Purpose-engineered for agricultural greenhouse environments
- Supports ESG goals and obligations

MECHANICAL SPECIFICATIONS

Cell Type	Mono Crystalline
Solar Cells	88 (4*22)
Module Dimension (mm)	2131*994*5
Weight (Kg)	24
Front Glass (mm)	2.0 Semi tempered coated glass
Interlayer	EVA
Back Glass (mm)	2.0 Semi tempered glass
Panel & Junction Box	IP68 Rated, 2 bypass diodes
Connector	IP68 MC4 (or equiv)
Frame	No Frame
Maximum Load Capacity (Pa)	2400(back side)/2400(front side)

SCOPE OF WORK

Maximum System Voltage	1000 or 1500 DC (IEC)
Operating Temperature	-40~+85˚C
Nominal Operating Cell Temperature	45±3˚C
Maximum Series Fuse Rating	20A
Fire Rating	Class C

TEMPERATURE COEFFICIENTS

Temperature Coefficient of Pmaxx	-0.35%/˚C
Temperature Coefficient of Voc	-0.28%/˚C
Temperature Coefficient of Isc	0.046%/˚C

ELECTRICAL CHARACTERISTICS

	Module Type	CPV-RT-PDJ44H(S)-280T
STC	Max Power (P_{max})	280W
	Open Circuit Voltage (V_{oc})	30.74V
	Short Circuit Current (I_{sc})	11.56A
	Voltage at Max Power Point (V_{mp})	25.50V
	Current at Max Power Point (I_{mp})	10.98A
	Power Tolerance	0~+5%
	Module Efficiency	13.2%
NMOT	Max Power at NMOT (P_{max})	209W
	Open Circuit Voltage (V_{oc})	28.7V
	Short Circuit Current (I_{sc})	9.32A
	Voltage at Max Power Point (V_{mp})	23.4V
	Current at Max Power Point (I_{mp})	8.94A
	Power Tolerance	0~+5%

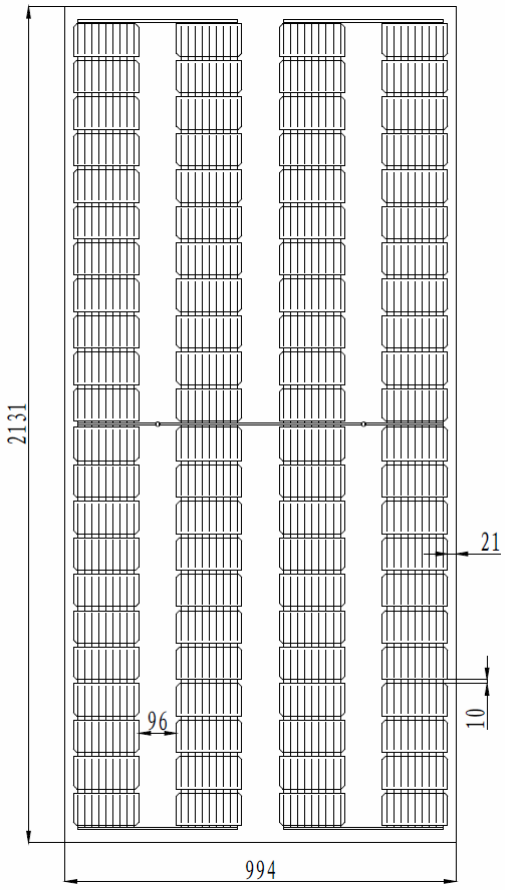
STC: Air Mass AM1.5, Ir-radiance 1000W/m², Cell temperature 25°C. NMOT: Air Mass AM1.5, Ir-radiance 800W/m², Ambient temperature 20°C, wind speed 1m/s. Bifaciality = 75±5%

ClearVue^{PV} Greenhouse Glass Specifications

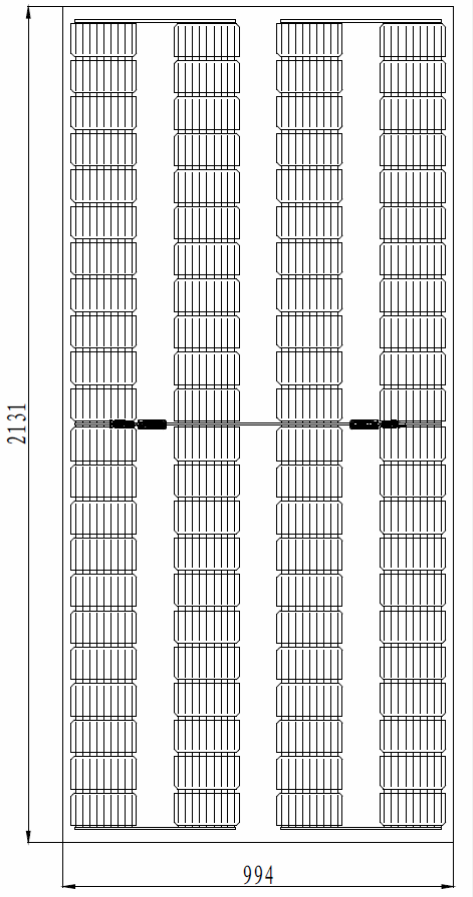
Max-Generation P-type Bifacial Double-Glass Module

ENGINEERING DRAWINGS

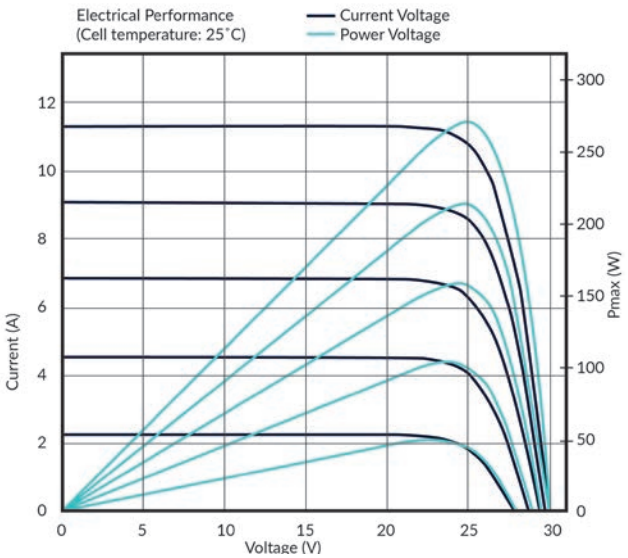
FRONT VIEW



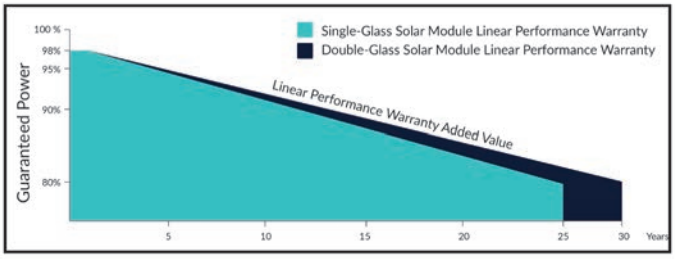
BACK VIEW



ELECTRICAL CURVES



LINEAR PERFORMANCE



ClearVue^{PV} Greenhouse Black Laminate Specifications

P-type Black Double-Glass Module

ClearVue's Black Laminate Greenhouse solutions are engineered to maximize energy generation to offset greenhouse energy requirements.

Product Features

- Up to 165 watts peak per square meter dependent on installation conditions and desired design
- High-efficiency solar cells maximize energy generation
- IP68-rated water resistance
- For use in greenhouse surfaces where light transmittance is not required
- Purpose-engineered for agricultural greenhouse environments
- Supports ESG goals and obligations

MECHANICAL SPECIFICATIONS

Cell Type	Mono Crystalline
Solar Cells	60 (6*10)
Module Dimension (mm)	1170*986*5
Weight (Kg)	13
Front Glass (mm)	2.0 Semi tempered coated glass
Interlayer	EVA
Back Glass (mm)	2.0 Semi tempered glass
Panel & Junction Box	IP68 Rated, 3 bypass diodes
Connector	IP68 MC4 (or equiv)
Frame	No Frame
Maximum Load Capacity (Pa)	2400(back side)/2400(front side)

SCOPE OF WORK

Maximum System Voltage	1000 or 1500 DC (IEC)
Operating Temperature	-40~+85˚C
Nominal Operating Cell Temperature	45±3˚C
Maximum Series Fuse Rating	15A
Fire Rating	Class C

TEMPERATURE COEFFICIENTS

Temperature Coefficient of Pmaxx	-0.35%/˚C
Temperature Coefficient of Voc	-0.28%/˚C
Temperature Coefficient of Isc	0.046%/˚C

ELECTRICAL CHARACTERISTICS

	Module Type	CPV-DMJ30H(S)-190T
STC	Max Power (P_{max})	190W
	Open Circuit Voltage (V_{oc})	41.82V
	Short Circuit Current (I_{sc})	5.77A
	Voltage at Max Power Point (V_{mp})	34.69V
	Current at Max Power Point (I_{mp})	5.48A
	Power Tolerance	0~+5%
	Module Efficiency	16.5%
NMOT	Max Power at NMOT (P_{max})	142W
	Open Circuit Voltage (V_{oc})	39.1V
	Short Circuit Current (I_{sc})	4.65A
	Voltage at Max Power Point (V_{mp})	31.8V
	Current at Max Power Point (I_{mp})	4.46A
	Power Tolerance	0~+5%

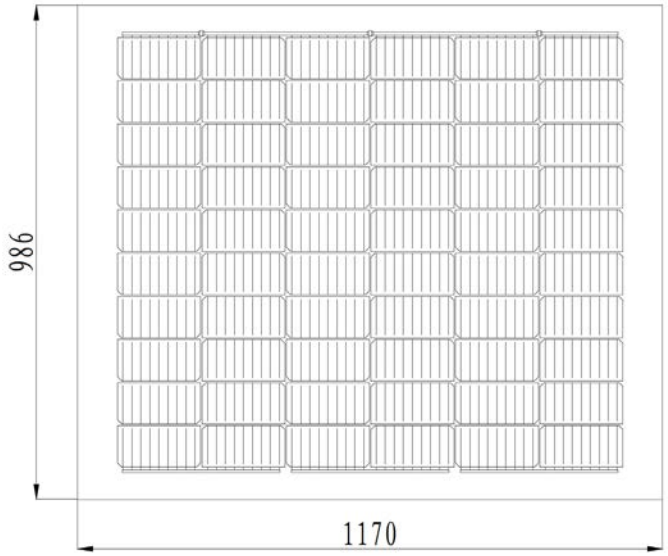
STC: Air Mass AM1.5, Ir-radiance 1000W/m², Cell temperature 25°C. NMOT: Air Mass AM1.5, Ir-radiance 800W/m², Ambient temperature 20°C, wind speed 1m/s.

ClearVue^{PV} Greenhouse Black Laminate Specifications

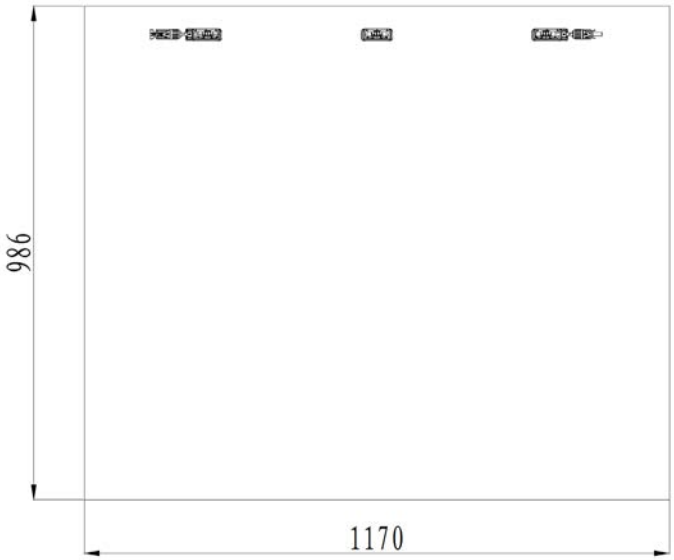
P-type Black Double-Glass Module

ENGINEERING DRAWINGS

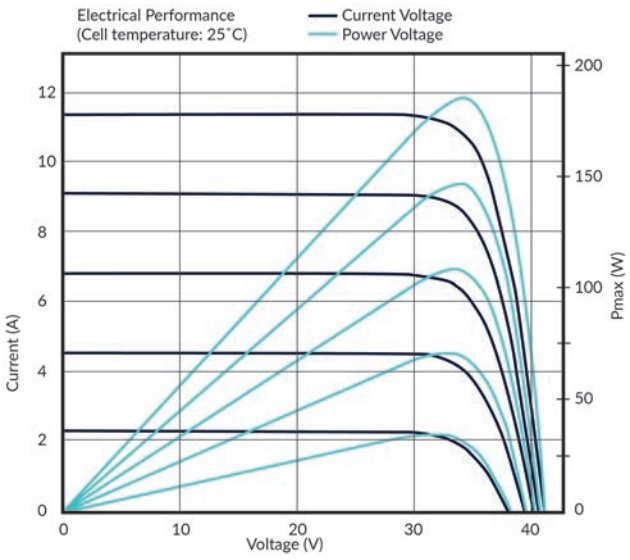
FRONT VIEW



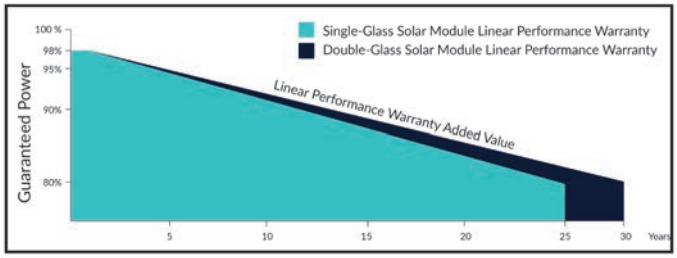
BACK VIEW



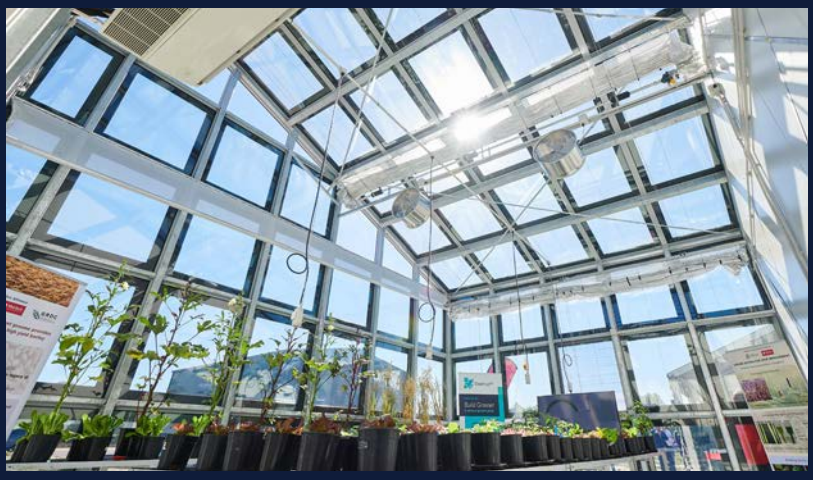
ELECTRICAL CURVES



LINEAR PERFORMANCE



Solar Vision Glass



ClearVue^{PV} Vision Glass promotes sustainable greenhouse operations by providing energy generation that helps offset operational energy requirements.

What were once Insulated Glass Units (IGUs) that were an area of energy losses, can now be a source of clean, renewable energy.

Now it is possible to generate energy from truly transparent greenhouse surfaces.

ClearVue^{PV}

Solar Vision Glass

ClearVue^{PV} Vision Glass facilitates clean energy generation into the very fabric of the modern greenhouse.

Clear Glass
solar glazing

Clean Energy
generation offsets building energy requirements

Supports
green initiatives in agriculture

ClearVue^{PV} Vision Glass combines several patented, proprietary technologies to generate clean, renewable energy from clear building glazing surfaces. ClearVue is compatible with the majority of glass compositions.

Benefits

- Generates up to 30 Watts/m^2 peak
- Fire certified by TÜV SÜD under the EN 13501-1:2018 A2-s1, d0 classification rating for combustibiity
- Provides maximum natural lighting with transparency that is the same as standard glazing products
- Decreases use of traditional energy sources and offsets energy use with renewable solar energy
- Compatible with most glass compositions and low emissive (low-e) coating technologies
- Compatible with most standard curtain wall and framing systems
- IGU seal equivalent to standard IGUs (Certified by Insulating Glass Certification Council)
- Project-specific sizes available (up to 3.5m x 1.6m)
- Connected reporting supported

ClearVue^{PV} Vision Glass Specifications

ClearVue^{PV} Vision Glass allows visible light to pass through the glass at up to 70% visible light transmission (VLT). Energy is generated through a patented nanoparticle interlayer that directs Ultraviolet (UV) and Infrared (IR) light to the edge of the Insulted Glass Unit (IGU), where it is harvested through solar cells on the perimeter of the IGU.

The ClearVue^{PV} Vision Glass System is comprised of:

- Silicon solar collectors
- Extruded support frame and connection system
- Fully sealed power system
- Proprietary PVB with photo luminescent nanoparticles

Internal IGU solar collection delivers enhanced reliability

- All electrical connections are solid metal for enhanced reliability
- All electrical connections are within the desiccated IGU cavity forming a completely airtight, dry environment
- Friction assembly system delivers a high quality and fast production rate, streamlining mass production that is comparable with standard IGUs
- Power exit is via an IP67-certified system that is waterproof to 1m of depth for 30 minutes

ClearVue^{PV} Vision Glass meets stringent construction-grade fire safety requirements and is approved for high rise buildings. TÜV SÜD certified.

TECHNICAL PROPERTIES

IGU size: 1.2 x 1.2 meters

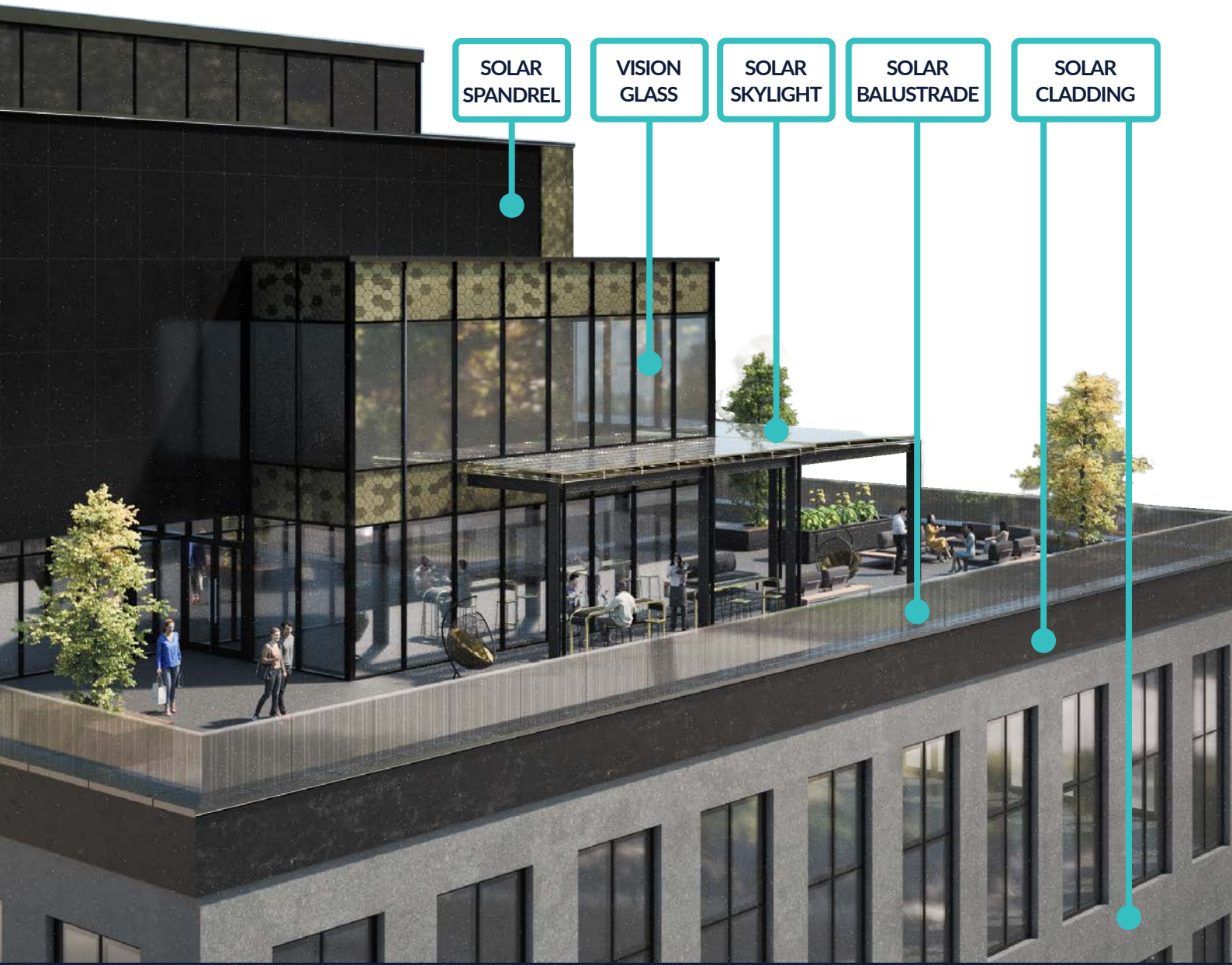
Parameters	Values
Maximum Power Output	Up to 30 Watts peak per m^2
Visible Light Transmission	Up to 70%
U Value	Dependent on glass composition
SHGC	Dependent on glass composition
Voltage Open Circuit V_{oc}	58V
Amperes Short Circuit I_{sc}	0.95A
Maximum Power Voltage V_{mp}	49V
Maximum Power Current I_{mp}	0.87A
Tolerance	±5%

Solar Façade Solutions

For a Sustainable Building Envelope

ClearVue also offers a full line of building products making nearly every façade surface energy generating.

Learn More



ClearVue^PV

Quality Control & Quality Assurance

Testing & Inspection

Visual inspection of solar cells and testing for quality & performance

Electroluminescence

Inspection and testing of interlayer and solar wafers

Environmental & Stress Testing

Water infiltration, weight bearing, impact, heat, cold, and humidity

We are dedicated to delivering high-performance, high-quality, long-lasting, and safe greenhouse solutions.

Quality and Lifespan

ClearVue^{PV} Greenhouse Glass and Greenhouse Black Laminate products are engineered to meet and/or exceed industry standards for quality, lifespan, and safety.

All products undergo rigorous testing, compliance, and certifications, to satisfy product reliability and suitability requirements for deployment in agricultural greenhouse environments. This ensures optimal energy production and efficiency. Adherence to these standards underscores our commitment to deliver high-quality, dependable products that contribute to sustainable and resilient growing environments.

Certifications & Compliance

ClearVue^{PV} Greenhouse Glass & Black Laminate

- 30-year linear power performance warranty
- 12-year product warranty
- High resistance to high temperatures, high humidity, sand, acid, and alkali environmental conditions
- Reliable seal and IP68 connectors

QUALITY & SAFETY TESTING

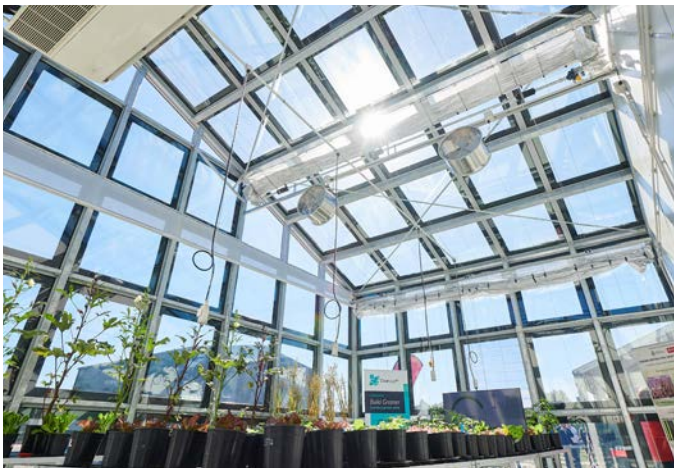
IEC 61215-1	Terrestrial photovoltaic modules - Design qualification and type approval - Part 1 test requirements
IEC 61215-1-1	Terrestrial photovoltaic modules - Design qualification and type approval - Part 1-1: Special requirements for testing of crystalline silicon photovoltaic modules
IEC 61215-2	Terrestrial photovoltaic (PV) modules - Design qualification and type approval - Part 2: Test procedures
IEC 61730-1	Photovoltaic (PV) module safety qualification - Part 1: Requirements for construction
IEC 61730-2	Photovoltaic (PV) module safety qualification - Part 2: Requirements for testing
Clean Energy Council (CEC) of Australia	Certification - Approved for installation and meets safety standard
ISO	9001 Certified manufacturing facility

COMPLIANCE & CERTIFICATIONS

Certifications & Compliance

ClearVue^{PV} Vision Glass

- 30-year linear power performance warranty
- 10-year product component warranty
- High resistance to high temperatures, high humidity, sand, acid, and alkali environmental conditions
- Fire certified by TÜV SÜD under the EN 13501-1:2018 A2-s1, d0 classification rating for combustibility
- Reliable IGU seal and IP67 connectors



QUALITY & SAFETY TESTING

EN 1279-2	Long term test method and requirements for moisture penetration. Intertek Europe (June 2024)
EN 1279-3	Long term test method and requirements for gas leakage and for gas concentration tolerance. Intertek Europe and SQI (Q3 2024)
ASTM E2190	Insulating Glass Unit Performance and Evaluation. Testing completed and certified by Insulating Glass Certification Council (IGCC)
IEC 61730 and IEC 61215	Electrical Safety Testing by TÜV SÜD (June 2024)
Underwriters Laboratories (UL) UL 61730	PV module safety testing for electrical and mechanical operation by Underwriters Laboratories (Q4 2024)
EN 13501-1	For vertical wall application. by TÜV SÜD Classified as A2-s1, d0 rating; Can be deployed on buildings over 18M high and high-risk environments like hospitals, schools, hotels, etc.

COMPLIANCE & CERTIFICATIONS

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