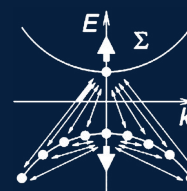


1

THE FIRST GLOBAL
ATOMIC LAYER DEPOSITION TECHNOLOGY
USED IN PROFESSIONAL, CERTIFIED BUILDING MATERIALS

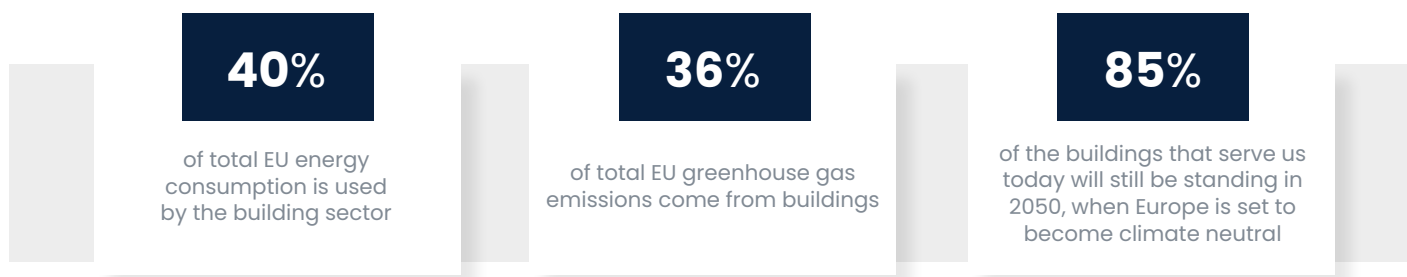


PHOTOVOLTAIC
PANELS TILES

BIPV – New approach to sustainable construction

What is BIPV ? – Building Integrated Photovoltaics is a modern field of creation of new technology of building materials responding to the needs of improving our planet. It replaces traditional building materials such as roof tiles, glass, elevation (facade) panels, roof coverings, curtain walls or sunshades offering the same functions and safety norms approving the materials for the use in construction industry. However additionally or – most importantly it is an active photovoltaic material which reduces the carbon footprint, increases the energy efficiency of buildings and very often improves utility functions.

Building sector is the single largest energy consumer in the EU.



Better and more energy efficient buildings will improve the quality of citizens' life and alleviate energy poverty while bringing additional benefits such as reach the goals set out in the European Green Deal. Great response for the demand of energy- saving new construction and also for renovating both public and private buildings – essential point of European Green Deal – is BIPV technology.

ML System throughout the 15 years of its existence not only produced or installed but also actively participated in creating technology by scientific research leading straight to commercialization.



1

THE FIRST GLOBAL

ATOMIC LAYER DEPOSITION TECHNOLOGY

USED IN PROFESSIONAL, CERTIFIED BUILDING MATERIALS



TECHNOLOGICAL

SOLUTIONS

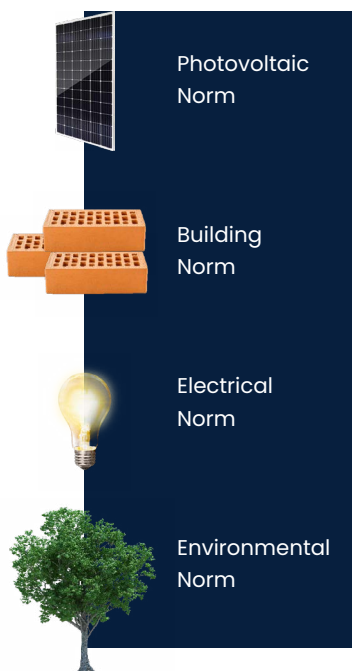
PROTECTED BY

16 PATENTS

GOALS

- Reducing energy consumption and using energy from renewable sources, primarily by using solar energy technology
- Reducing greenhouse gas emissions, reducing the scale of energy poverty in the European Union, as well as reducing dependence on imports of fossil fuels from Russia
- EU countries have been obliged to introduce legal and administrative provisions, the effect of which is to harmonize energy efficiency standards in construction

TIMELINE



Safety parameters met by ML System

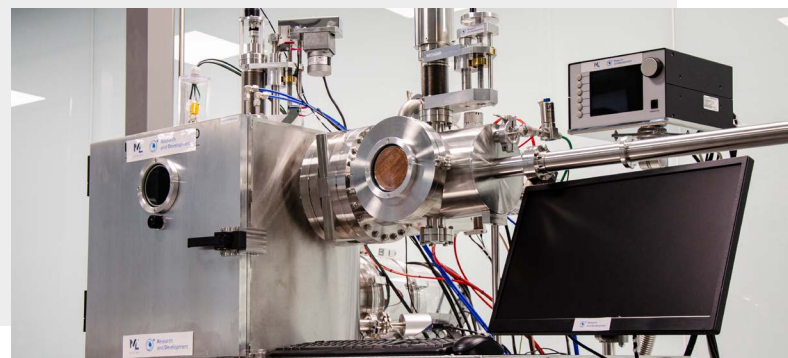
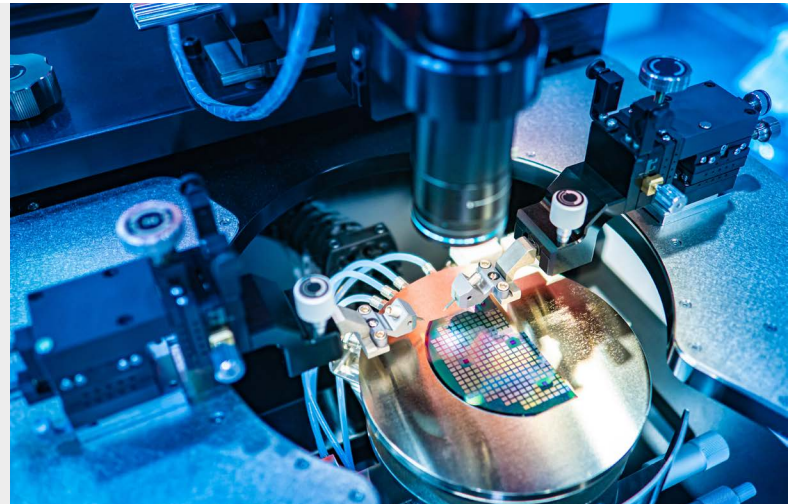
PN EN 13501 – Fire classification of construction products and building elements
PN EN 13823 – Reaction to fire tests of construction products
PN B 02867 – Testing and classification of fire spread through walls
PN EN 1990 – Fundamentals of structural design
PN EN 1991 – Actions on structures
PN EN 16612 – Glass in building
PN EN 12150 – Glass in building – Thermal toughened safety glass
PN EN 14449 – Laminated glass and laminated safety glass
PN EN IEC 61730 – Evaluation of the safety of the photovoltaic module(PV)
IEC 61215 – Photovoltaic (PV) Modules for Ground Applications – Design Qualification and Type Approval
IEC 62716 – Corrosion test in ammonia atmosphere
IEC 61701 – Testing photovoltaic (PV) modules in a corrosive salt fog environment
IEC 62804 – PID resistance
EN 15804 – Sustainability of buildings
ISO 14001 – environmental management
ISO 14064-1:19 GHG Protocol – Specification and guidelines for quantifying and reporting greenhouse gas emissions and removals at the organization level
ISO 14025 –EPD Product Environmental Declaration
LVD 2014/35/UE – (new low voltage directive) Electrical equipment operating within certain voltage limits
LVD 2006/95/WE (old directive) Electrical equipment operating within certain voltage limits

Thanks to this – it makes available the portfolio of its products which use the latest technologies unobtainable earlier for building materials. It improves the parameters of its products confirming them with certification and tests not only within photovoltaic aspect but also construction materials and environmental declarations.



TECHNOLOGY COMPANY

Glass is a very popular building material with a wide range of applications. ML System offers many production and processing possibilities of this unique material: both initial and advanced processing of glass panes – cutting out any size or shape, drilling holes, as well as precise edge polishing and effective laser engraving. The offer also includes glazing units with a heating function, with switchable transparency, capable of producing electricity from insulation. Modern technological lines in which the ML System's machinery park is equipped guarantee precise and aesthetic execution of each individual project.



We are the first company in the world using the ALD (Atomic Layer Deposition) technology in mass production, which means that our products are better, more durable and achieve a lot higher scores within the scope of all parameters than everything that was done until now.

The use of optical waveguide allows for selective beam guidance of the electromagnetic wave from a selected range which results in high energy yields. Optimally selected parameters of quantum nanotubes are resulting in both high resistance to external factors, reduction of reflection losses, achieving desired visual effect (design, color) and prevents embedding of impurities and dirt.

The base for our technology forms glass to which We add ceramic and titanium layers using quantum technologies and Atomic Layer Deposition and We firmly combine them in the heat tempering and ion exchange processes. Thanks to this We have decreased the use of materials which have gained unprecedented durability and resistance to external atmospherical factors – including fire.

In result We can offer you products that are safe, durable and improve environment and quality of life.

The combination of noble and durable materials with Atomic Layer Deposition technology provides reliability and long lasting quality what is assured by the 100 year long product durability.

All of this is so that our life was safer more comfortable, the environment beautiful and not degraded as well as preserved for the future generations.

ML SYSTEM KEY POINTS



European producer of BIPV modules and BIPV systems with an established position on the Polish market and a key player overseas.



First and only of the world manufacturer of Glass with quantum coating – energy-active glass



Very well equipped **Photovoltaic Research and Development Center**



Technological advantage thanks to high investment expenditures



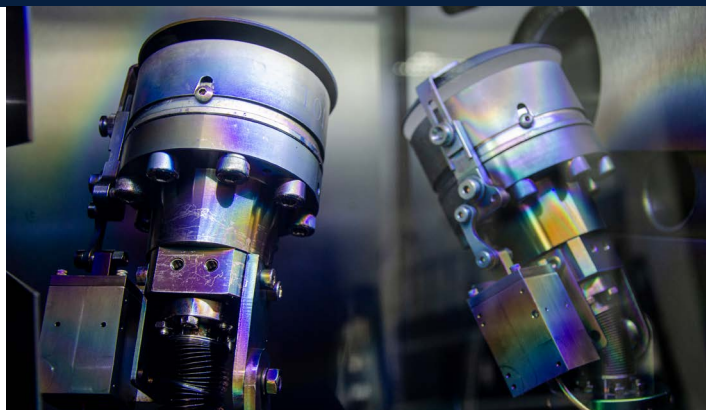
Product diversification, industry diversification and geographic diversification



The leader of innovative solutions with **16 granted patents and 6 patents pending**



BIPV modules manufactured by ML System has Environmental Product Declaration (EPD) to comply with the requirements and environmental standards required in sustainable construction

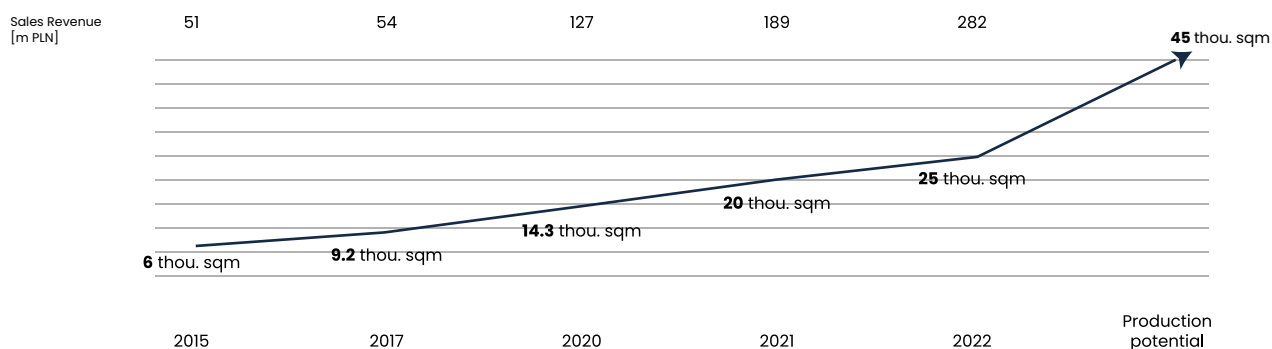


R&D Photovoltaic Center

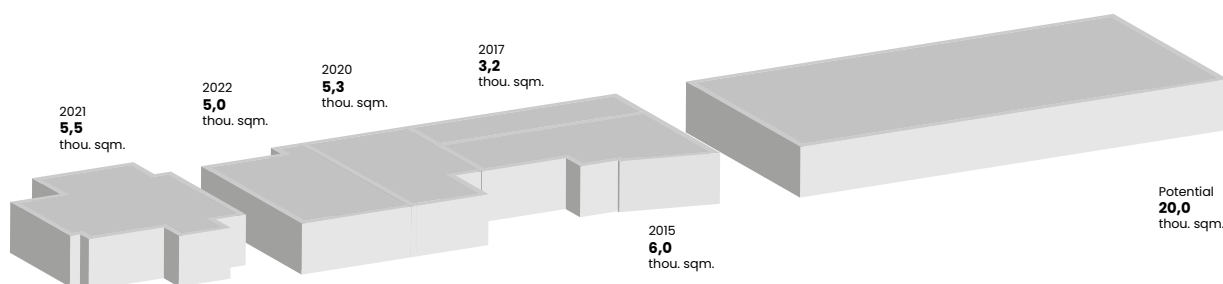


R&D Photovoltaic Center

Dynamic increase in production capacity and efficiency



☐ Total usable area



PV TILE FLAT GRAY



SINGLE

Power per roof m²:

90 Wp

Dimension:

286 x 444 mm



6 MODULE

Power per roof m²:

120 Wp

Dimension:

1461 x 444 mm

PV TILE FLAT BLACK



SINGLE

Power per roof m²:

120 Wp

Dimension:

286 x 444 mm



6 MODULE

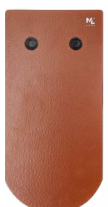
Power per roof m²:

160 Wp

Dimension:

1461 x 444 mm

PV TILE BRICKY RED



SINGLE

Power per roof m²:

95 Wp

Dimension:

180 x 380 mm



6 MODULE

Power per roof m²:

95 Wp

Dimension:

1080 x 380 mm

PV TILE BRICKY RUSTICAL



SINGLE

Power per roof m²:

80 Wp

Dimension:

180 x 380 mm



6 MODULE

Power per roof m²:

80 Wp

Dimension:

1080 x 380 mm

PV TILE BRICKY GRAY



SINGLE

Power per roof m²:

90 Wp

Dimension:

180 x 380 mm



6 MODULE

Power per roof m²:

90 Wp

Dimension:

1080 x 380 mm

PHOTOVOLTAIC ROOF TILE

- ✓ **No water absorption comparing to regular ceramic tiles**
- ✓ **Perfect flatness**
- ✓ **Perfect rectilinearity**
- ✓ **Resistant for chemically aggressive environment**
(salt and ammonia chamber test)
- ✓ **Dirt and moss grow resistant**
- ✓ **Temperature resistance** – from -50 to +90
- ✓ **Wind resistance** – up to 250 km/h (tested)
- ✓ **Hail resistance** – diameter 75mm with 140km/h
- ✓ **No fire spread in the roof**
- ✓ **Scratch resistant** – Mohs hardness 8
- ✓ **Repeatable colors**
- ✓ **No color degradation** (climatic UV chamber test)



NO FIRE SPREAD
IN THE ROOF



TEMPERATURE
RESISTANCE



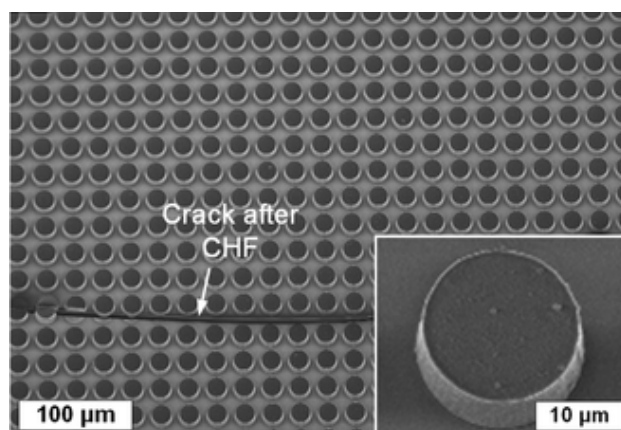
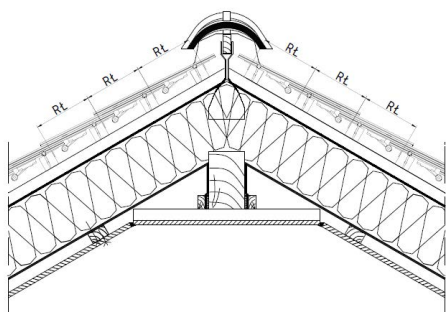
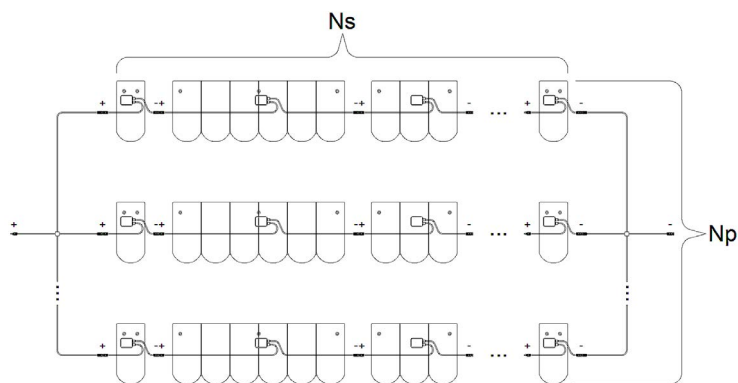
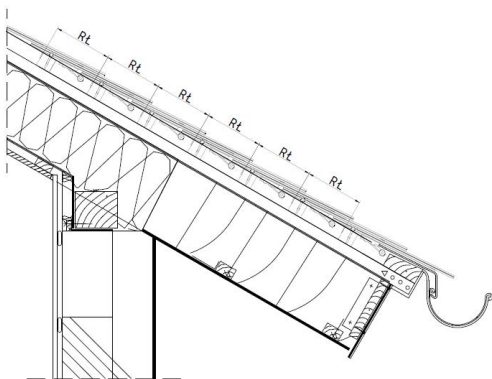
WIND GUSTS
RESISTANCE

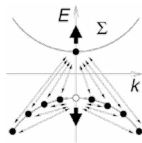


HAIL
RESISTANCE



TYPE III
ENVIRONMENTAL
DECLARATION





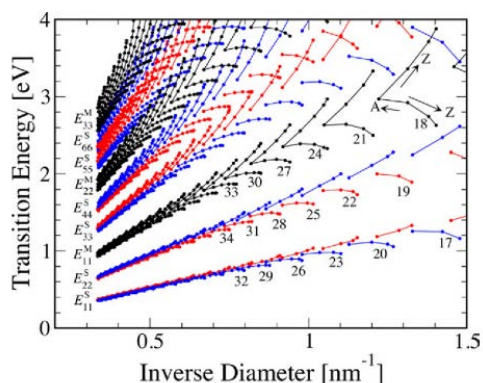
PV FLAT TILE

Shape matching the standard ceramic roof tile solutions.
Attention to every detail – interlocking compatible with the products of renowned manufacturers, such as solutions dedicated to water drainage channels within ceramic roof tiles.
Curved front part of the roof tile fits perfectly within the ceramic roof coverings.

With the use of the latest technologies our systems are complete and resistant to external factors, including the extreme ones – such as hail, storm, aggressive environment and other anomalies.

First global production
based on
ATOMIC LAYER DEPOSITION
technology
ensures low consumption
of noble ceramic or titanium materials
and guarantees

30 years
of our products durability



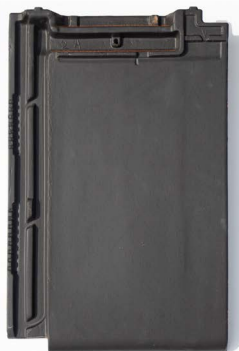
$$n(\omega) = \sqrt{\frac{(\epsilon_1^2 + \epsilon_2^2)^{1/2} + \epsilon_1}{2}}$$

$$\epsilon_1(\omega) = 1 + \frac{2}{\pi} \int_0^\infty \frac{\epsilon_2(\omega') \omega' d\omega'}{\omega'^2 - \omega^2}$$

$$\epsilon_2(\omega) = \frac{\hbar^2 e^2}{\pi m^2 \omega^2} \sum_{n,n'} \int_k d^3 k |\langle \vec{k}_n | \vec{p} | \vec{k}_{n'} \rangle|^2 [1 - f(\vec{k}_n)] \delta(E_{\vec{k}_n} - E_{\vec{k}_{n'}} - \hbar\omega)$$



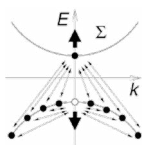
Tile from a well-known manufacturer



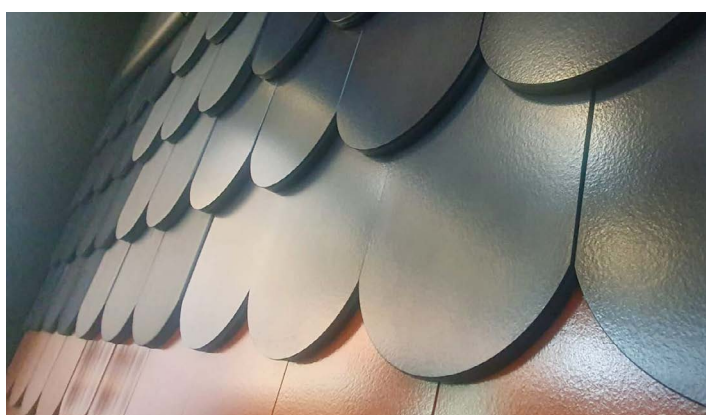
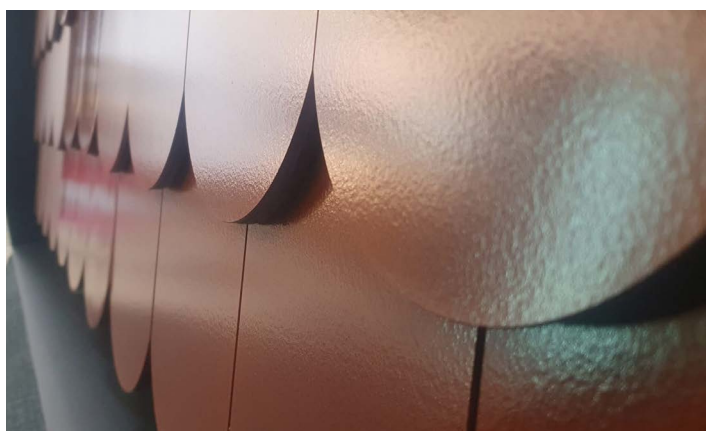
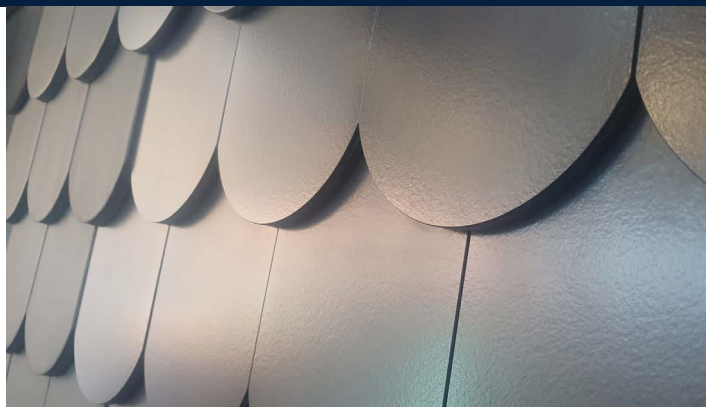
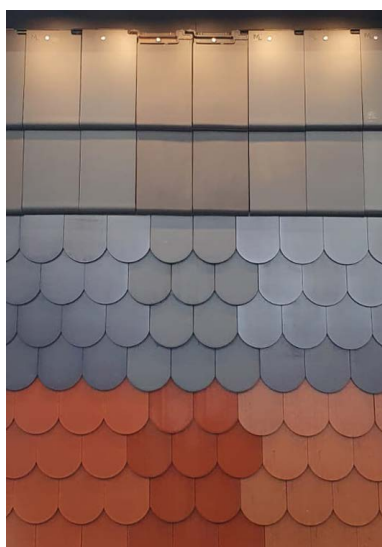
ML System Roof Tile



PV BRICKY TILE



Complemented roof tile offer is especially desired by landmark building and monument conservators. Used for production natural ceramic materials, reflect the noble origin of the product and improve its utility properties in the form of durability, efficiency and safety. The product was designed in a way not to differ from always used tiles on the European roofs. ML System made sure that the appearance, color, dimensions, Surface, weights, fire resistance and fixing system was not different than in traditional products. The durability of the product is confirmed with a 30-years long product warranty as well as recommendation for use by monument conservators and fire service. It is a perfect product for renovation of historical landmark buildings. It prevents degradation of the landscapes and environment. It meets also the expectations of investors wanting to maintain the traditional, elegant style.



Tile from a well-known manufacturer



ML System Roof Tile



WOOD



HI
Power:
340 W
Dimension:
909x2659 mm

ECO
Power:
190 W
Dimension:
733x2131 mm

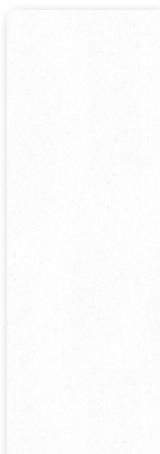
CONCRETE



HI
Power:
370 W
Dimension:
909x2659 mm

ECO
Power:
200 W
Dimension:
733x2131 mm

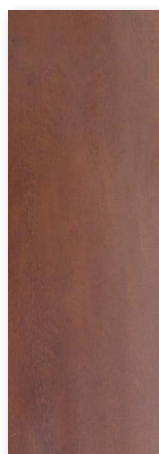
GRANITE



HI
Power:
360 W
Dimension:
909x2659 mm

ECO
Power:
200 W
Dimension:
733x2131 mm

CORTEN



HI
Power:
345 W
Dimension:
909x2659 mm

ECO
Power:
190 W
Dimension:
733x2131 mm

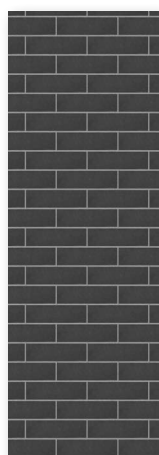
RED BRICK



HI
Power:
345 W
Dimension:
909x2659 mm

ECO
Power:
190 W
Dimension:
733x2131 mm

ANTHRACITE BRICK



HI
Power:
340 W
Dimension:
909x2659 mm

ECO
Power:
190 W
Dimension:
733x2131 mm

PHOTOVOLTAIC FACADE PANELS

- ✓ **d0 category** – no burning droplets (according to EN 13501)
- ✓ **s1 category** – no smoke emission (according to EN 13501)
- ✓ **No fire spread in the facade** (tested)
- ✓ **No elements falling from the wall while fire** – successfully tested for min 60 minutes resistance
- ✓ **Safety glass 1/B/1** according to EN 12600
- ✓ **Temperature resistance** – from -50 to +90
- ✓ **Wind resistance** – up to 250 km/h (tested)
- ✓ **Hail resistance** – diameter 75mm with 140km/h
- ✓ **Scratch resistant** – Mohs hardness 8 (while aluminium cladding below 3, regular ESG glass below 6)
- ✓ **Thermal linear coefficient** $9 \cdot 10^{-6}$
- ✓ **No water absorption**
- ✓ **No color degradation** (climatic UV chamber test)

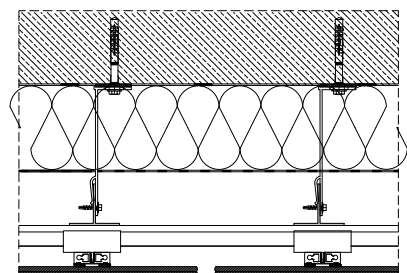
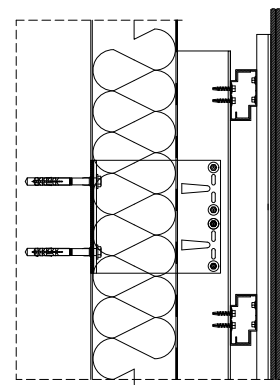


First global production
based on
ATOMIC LAYER DEPOSITION
technology
ensures low consumption
of noble ceramic or titanium materials
and guarantees

30 years
of our products durability



**TECHNOLOGICAL
SOLUTIONS
PROTECTED BY
16 PATENTS**

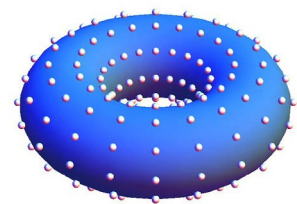
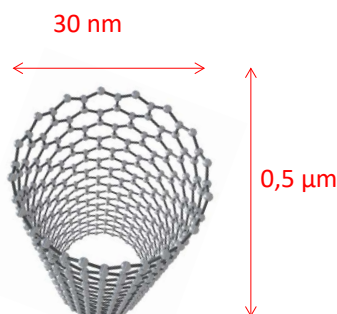
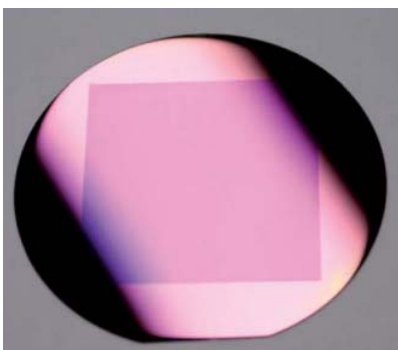
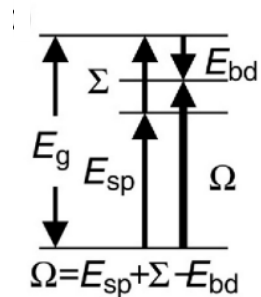
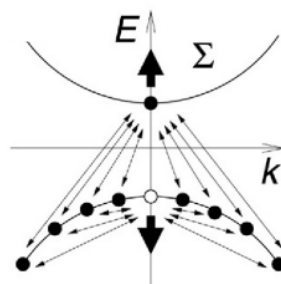
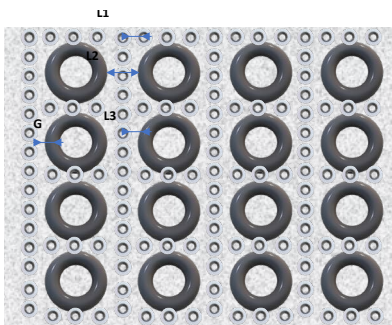


1

THE FIRST GLOBAL ATOMIC LAYER DEPOSITION TECHNOLOGY USED IN PROFESSIONAL, CERTIFIED BUILDING MATERIALS

Photovoltaic elevation panels

Photovoltaic elevation panels are a complete solution supplied together with mounting system. The whole set has been tested by accredited renowned European Testing institutions within the scope of environmental, construction and photovoltaic norms as well as fire safety regulations. The mounting system has been designed in a way which allows for minimalisation of usage of the material, the same aluminium profile can be used for mounting the panel vertically and horizontally. The specially prepared structure of the material's surface retains its natural form and proves the nobility and innovation of the world's first production process used commercially. The professionalism of ML System is confirmed by being fully prepared to complex co-operation within the whole construction process starting at idea and design, co-ordination of the construction works finishing on achieving higher energy efficiency grade of the building. The company's product offer is complemented by its own Building Energy Management System which can be interated with other superior Management systems, or can co-operate with other management softwares. The use of ML System's Building Energy Management System provides online service helpline during and after the warranty period.



PHOTOVOLTAIC FACADE PANELS



CONCRETE



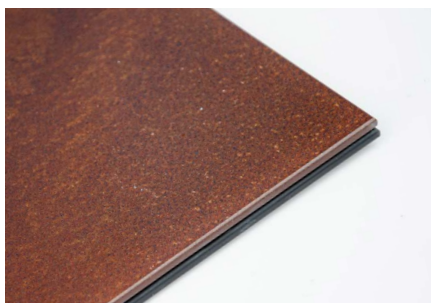
RED BRICK



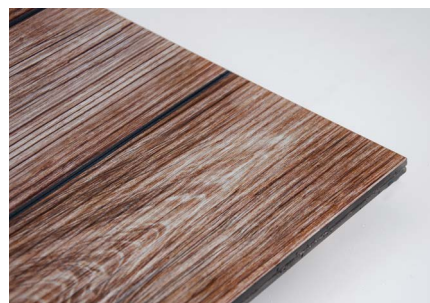
GRANITE



ANTHRACITE BRICK

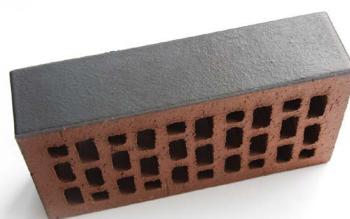


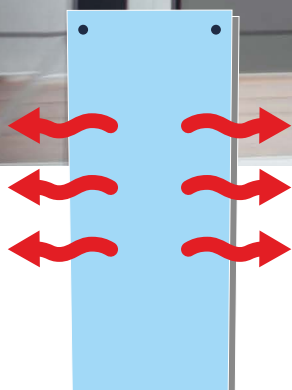
CORTEN



WOOD

Attention to every detail





An innovative heater with a glass heating surface and electronic control.

Glass heater available in colors:



Marble



Concrete



Wood



Corten



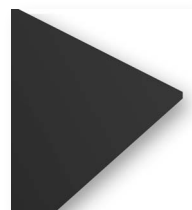
Red brick



Anthracite brick



Granite



Black



Possibility of
color and pattern
personalization



Scan the code
and check ML Glass
products



Designs matching elevation/facade appearance

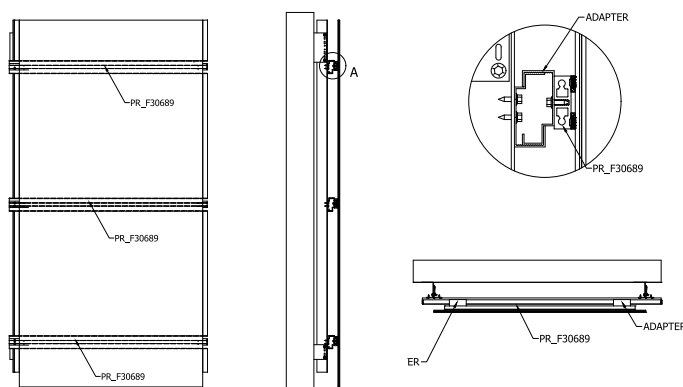
Design and execution

Glass heater is the combination of warmth comfort with an innovative design and the highest quality of the workmanship. It is designed for people who want to equip their interior with an unconventional device and, above all, ensure optimal thermal conditions.

Intelligent thermal comfort

High performance together with unique hidden touch, electronic control ensure comfort of use. The maximum temperature that the user can set for the device is 70°C and is electronically limited, which provides additional safety of use.

Easy assembly system



Technical parameters

Dimensions*	600 x 1200 mm
Max heating power	2500 W/m ²
Power supply	230 V/50 Hz, integrated power cord
Max. radiator temperature	70°C limited electronically
Heating speed	up to 10°C/min
IP Protection degree	IP 65
Weight	17 kg
Control system	Electronic, touch
Additional functions	<ul style="list-style-type: none"> • overheating protection • maintaining the set temperature • LED display

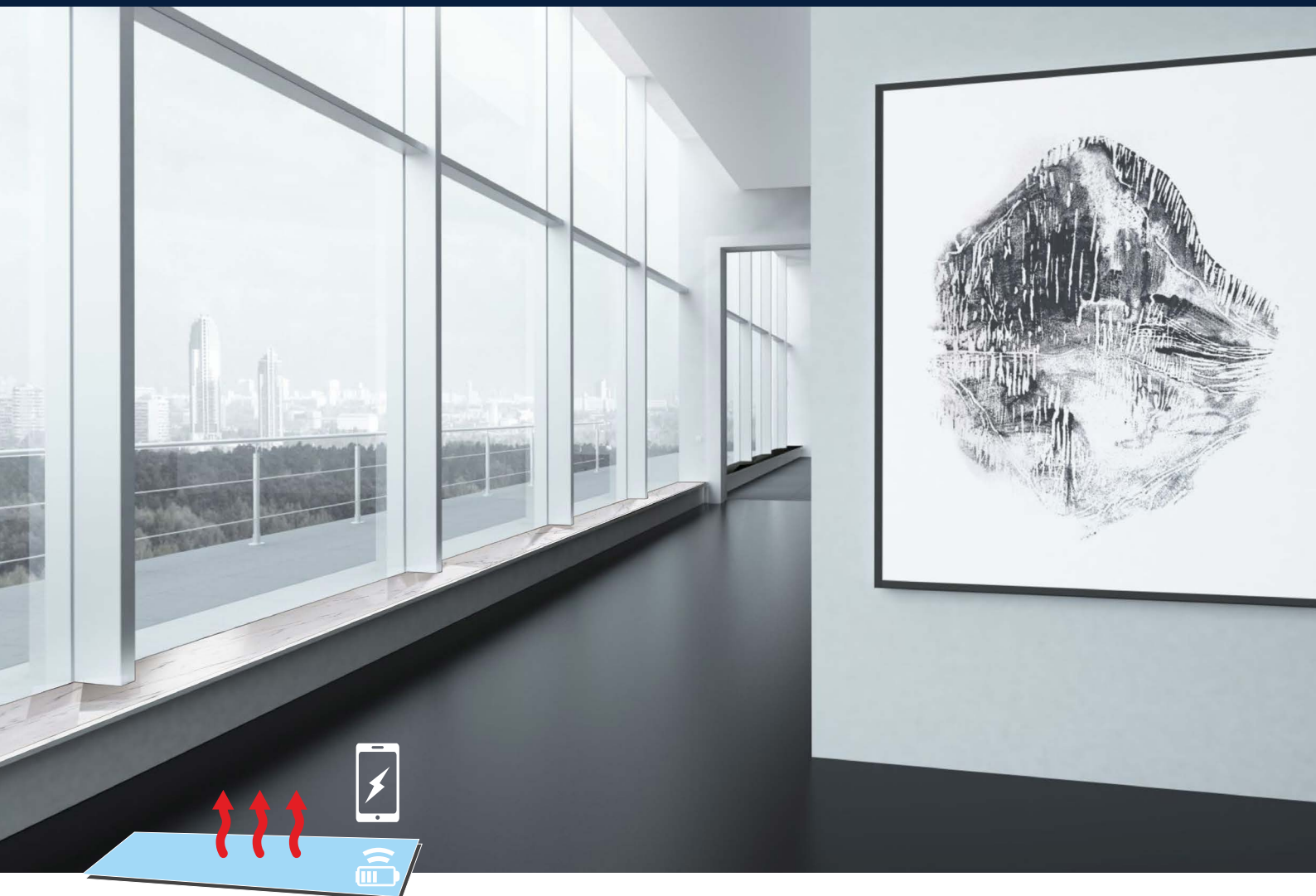
EN 55014-1; EN 55014-2; EN 61000-3; EN 62233; EN 60335-1; EN 60335-2-30
Compliant with: RoHS, EMC, LVD

* larger dimensions require an analysis of technical production possibilities

WE ARE CHANGING THE WORLD FOR FUTURE GENERATIONS



discreetly placed controller



The glass heating sill helps to maintain proper air circulation in the interiors and serves as an inductive charger.

Sill glass available in colors:



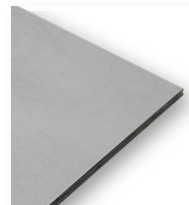
Possibility of
color and pattern
personalization



Scan the code
and check ML Glass
products



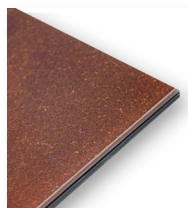
Marble



Concrete



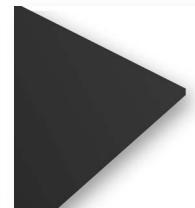
Wood



Corten



Granite



Black

Designs matching elevation/facade appearance

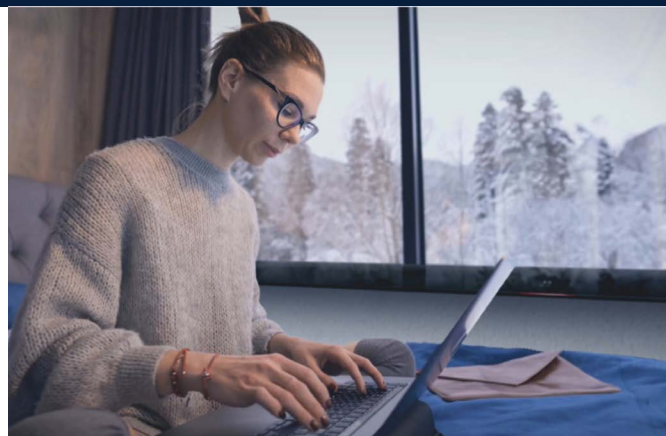
GLASS HEATING WINDOW SILL

Design and execution

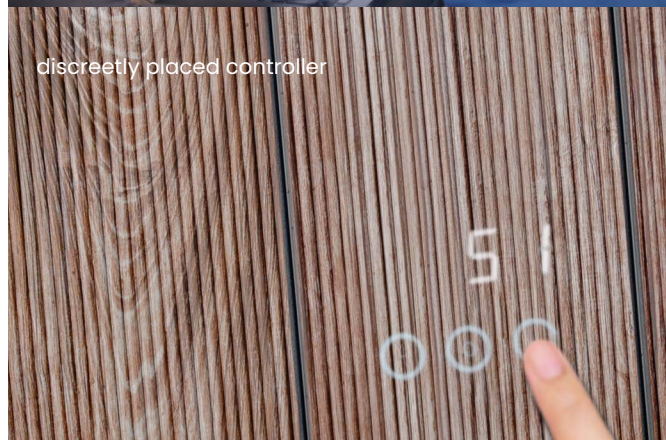
Glass heating window sill is an innovative product with a heating function, the possibility of wireless charging, and additionally helps to maintain the proper air circulation in interiors. Regardless of its usability, the window sill can emphasize the character of a given room, satisfying even the most sophisticated tastes.

Technical parameters

Dimensions*:	1500x300 mm	950x300 mm
Power consumption:	max 1050 W	max 750 W
Additional functions:	<ul style="list-style-type: none">• touch control• display showing the current temperature of the radiator integrated with the indicator of its operation status• adjustable temperature in the range of 20-70°C	
Led backlight:	<ul style="list-style-type: none">• heating - red,• inductive charging - blue• heating and charging (red and blue color displayed simultaneously)	
Parameters	<ul style="list-style-type: none">• compliance with the Qi standard• possibility of charging in 4 modes depending on the power used by the receiver - 5 W / 7.5 W / 10 W and 15 W	



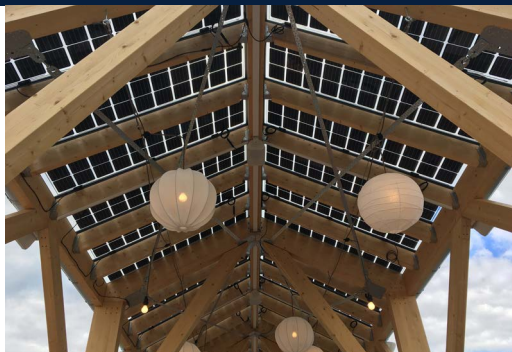
discreetly placed controller



*the table shows exemplary parameters, any dimension can be made
EN 60529; EN 60335-2; EN12150-1+A1:2019-06; EN ISO 12543-2:2011



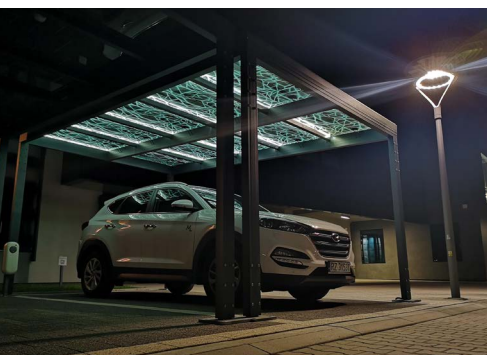
COLOR PHOTOVOTAIC FACADE PANELS
Voldslokka Skole, Norway



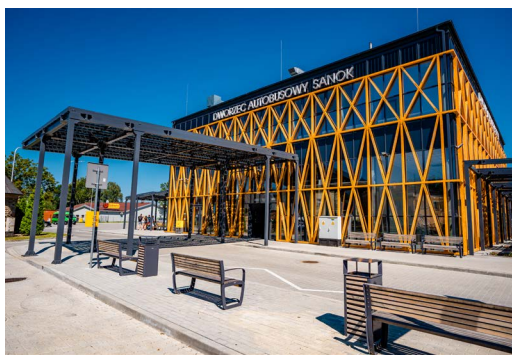
PHOTOVOLTAIC ROOFING,
Hamar, Norway



WHITE PHOTOVOLTAIC FACADE PANELS
Stavanger, Norway



PHOTOVOTAIC ROOFING
Zaczernie, Poland



PHOTOVOLTAIC ROOFING AND FACADE PANELS,
Bus station, Sanok, Poland



ML Glass
Airport, Warsaw, Poland



PHOTOVOTAIC FACADE PANELS
Kielce, Poland



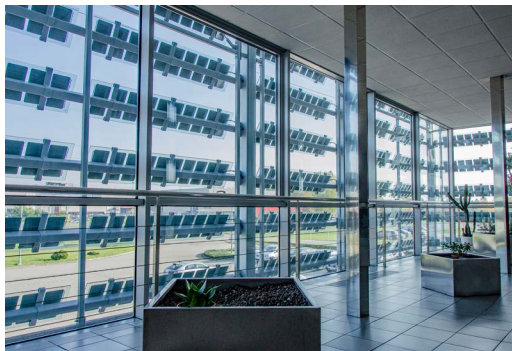
PHOTOVOLTAIC RAILING,
Växjö, Sweden



PHOTOVOLTAIC ML Glass
Orebro, Sweden



PHOTOVOTAIC CAR PARK ROOFING
Jasionka, Poland



PHOTOVOLTAIC SUNSHADES,
Mielec, Poland



GREY PHOTOVOLTAIC FACADE PANELS
Tarnów, Poland

COOPERATION WITH ML SYSTEM benefits and additional services



Design
consultations



Energy
analysis



Selection
of solutions



BIM
Libraries



Comprehensive
implementation



Customizable
products



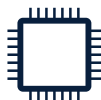
ML SCADA
energy management system



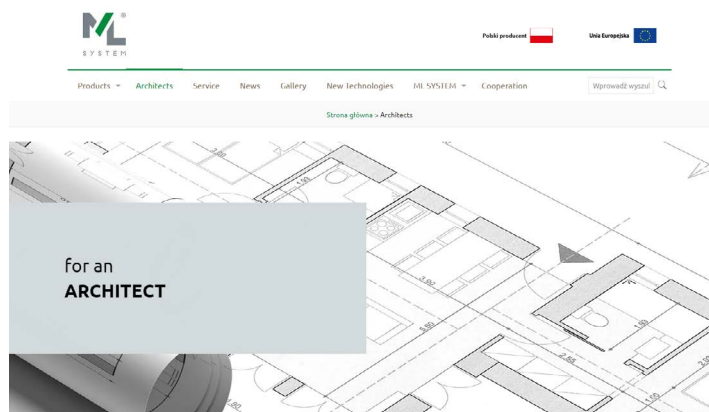
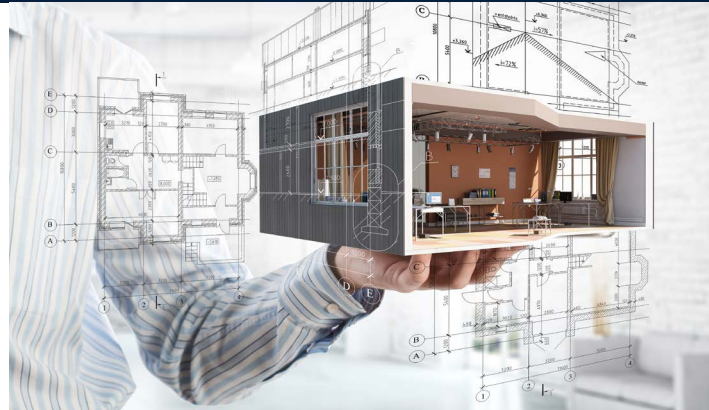
3D Scanning
Drone and thermal imaging camera



3D Modeling



SYSTEM
DRIVERS





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THE FIRST GLOBAL ATOMIC LAYER DEPOSITION TECHNOLOGY IN BIPV

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