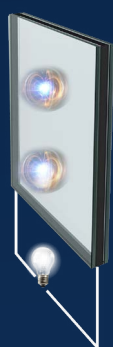




**BUILDING INTEGRATED
PHOTOVOLTAICS**
SUSTAINABLE ARCHITECTURE
FOR SAFER FUTURE





BIPV – New approach to sustainable construction

Building construction is one of the most dynamic economic sectors with huge positive impact for highly global development but is also facing serious economic, environmental, technical, and social challenges caused mainly by the unprecedented global and regional climate change, overpopulation, intensive urbanisation and excessive use of resources. Buildings are the single largest energy consumer in the EU. And one of the largest carbon dioxide emitters. Governments around the world are increasingly recognizing the potential of investing in green energy technologies for new and existing buildings and see it as an opportunity to meet greenhouse gas reduction targets. The energy efficiency of buildings has become the main decision-making factor for architects and designers guided by the principles of sustainable development.

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

40%

of total EU energy consumption is used by the building sector

36%

of total EU greenhouse gas emissions come from buildings

85%

of the buildings that serve us today will still be standing in 2050, when Europe is set to become climate neutral

POWERING A SAFER FUTURE

Better and more energy efficient buildings will improve the quality of citizens' life and alleviate energy poverty while bringing additional benefits such a 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.

Various photos of ML System realizations

Photo: <https://www.bipvnederland.nl/hermans-technigloaz-aeres-hogeschool/>



BIPV AWARD 2021
for best BIPV Project

Aeres Hogeschool, Almere
The Netherlands



SCANDINAVIA'S FIRST ZERO ENERGY HOTEL

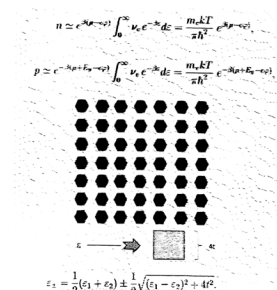
Nationalarenan 3, Solna,
Sweden



ZERO ENERGY PUBLIC FACILITY

Local Bus Station Rzeszow,
Poland

REVOLUTION IN SUSTAINABLE ARCHITECTURE BIPV ML SYSTEM SOLUTIONS WITH FULL CONSTRUCTION CERTIFICATION



TECHNOLOGICAL SOLUTIONS PROTECTED BY 16 PATENTS

BIPV ML SYSTEM SOLUTIONS BEST ANSWER FOR EUROPEAN ENERGY EFFICIENCY OF BUILDINGS DIRECTIVE (EPBD)

Building Integrated Photovoltaic is a new type of building material which is can be use not only as a part of construction but first of all as a source of electricity.

BIPV SOLUTIONS with PHOTOVOLTAIC AND CONSTRUCTION CERTIFICATION			
PN EN 13501	Fire classification of construction products and building elements	IEC 61215	Photovoltaic (PV) Modules for Ground Applications – Design Qualification and Type Approval
PN EN 13823	Reaction to fire tests of construction products	IEC 62716	Corrosion test in ammonia atmosphere
PN B 02867	Testing and classification of fire spread through walls	IEC 61701	Testing photovoltaic (PV) modules in a corrosive salt fog environment
PN EN 1990	Fundamentals of structural design	IEC 62804	PID resistance
PN EN 1991	Actions on structures	EN 15804	Sustainability of buildings
PN EN 16612	Glass in building	ISO 14001	Environmental management
PN EN 12150	Glass in building – Thermal toughened safety glass	ISO 14064-1:19 GHG Protocol	Specification and guidelines for quantifying and reporting greenhouse gas emissions and removals at the organization level
PN EN 14449	Laminated glass and laminated safety glass	ISO 14025 – EPD	Product Environmental Declaration
PN EN IEC 61730	Evaluation of the safety of the photovoltaic module(PV)	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

MAKING EXISTING AND NEW BUILT AREAS MORE SUSTAINABLE
Every single building can be its own ecological and aesthetic power station



BIPV SOLUTIONS



Range of colours
to match your project requirements



Dimensions and thicknesses
to match your project requirements



GREEN ENERGY
On-site ecological power generation



Application types
Facades, Skylights, Roofs, Canopies, Parking lots, Balustrades, Sunshades



Achieve green building
Helpful in obtaining green building certification



Achieve green building
Helpful in obtaining green building certification



HEATING GLASS | VARIABLE TRANSLUCENCY GLASS | HEATING WINDOW SILL | DISPLAY GLASS

ML GLASS FOR SMART FUTURE

ML Glass is a line of single or multifunctional glass products: with the option of changing the translucency mode, with an integrated heating and/or photovoltaic layer, with very good thermal insulation and high sound absorption. Smart Glass products are intended for use in sustainable architecture and transport, in modern interiors and in energy-efficient buildings.



High Quality

PRODUCED BY A EUROPEAN MANUFACTURER WITH SEVERAL YEARS OF EXPERIENCE

Unique design

PRODUCTS BASED ON INDIVIDUAL PROJECTS CHANGING THE TRANSLUCENCY MODE, HEATING

Variety of functions

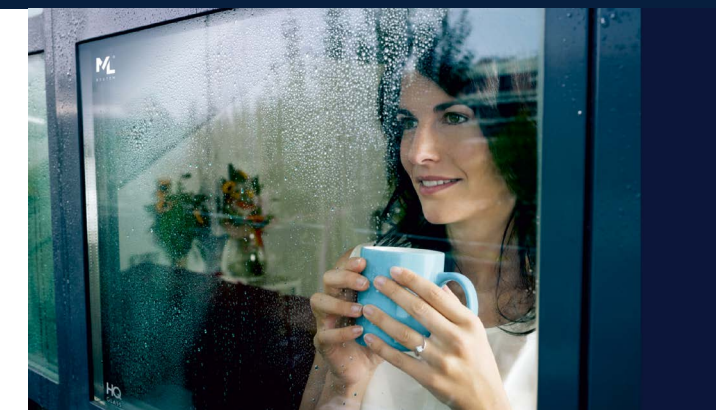
PHOTOVOLTAIC QUANTUM DOTS LAYER, WIRELESS CHARGING, INTERACTION WITH DISPLAY SCREEN



ML GLASS products instead of their assigned functions can be also combined with quantum dots layer to ensure the independent and ecological energy source.

Intelligent heating glass

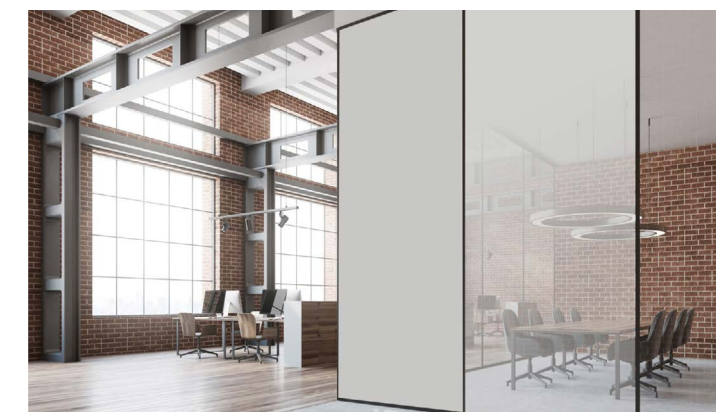
is a modern thermal solution that allows to completely eliminate a traditional heating system. It ensures comfort of warmth inside buildings and is 100% transparent. The integrated control system allows to easily control the temperature. Regardless of the climate, it guarantees high heating efficiency. The heating glass is available in several variants, depending on the power and thermal insulation of the selected option with wide range of colors and illumination as well as glass sizes.



Intelligent heating glass

Variable translucency glass

is a solution that allows to individual space adaptation in terms of visibility to suit the user's needs and circumstances. By choosing one option user can change the space from public (transparent) to private (non-transparent). This product can be combined with heating glass, then at the same time user can mode transparency function and replace a traditional heating system inside the built.



Variable translucency glass

Heating Window Sill

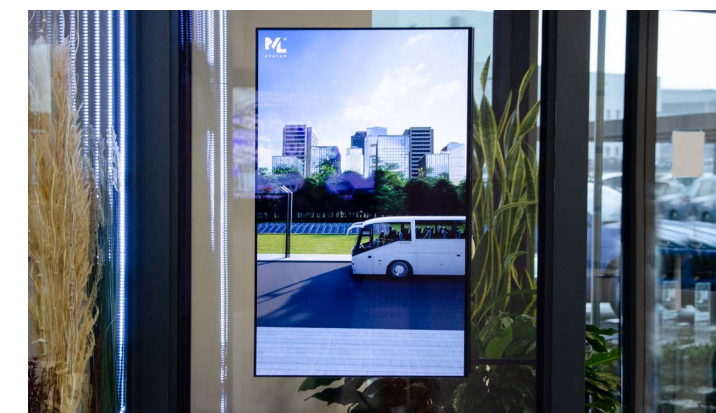
is an innovative product with induction heating and charging functions, and at the same time supporting the maintenance of proper air circulation in the interior. Regardless of the utility values, a windowsill can emphasize the character of a given room and serve as a kind of decoration. Practical and decorative functions are more and more often combined. Regardless of the utility values, a windowsill can emphasize the character of a given room and serve as a kind of decoration. Practical and decorative functions are more and more often combined.



Heating Window Sill

Display Glass

is a transparent glass with the ability to display content and image. Perfect informative solution for all types of public transport, such as trains, trams, buses, etc. The display glass has high visibility even in high light conditions as well as a wide viewing angle. Is resistant to external factors, such as high or low temperature or humidity. Display has a range of possibilities to implement various messages, content, video and graphics.



Display Glass



NEW QUANTUM ERA

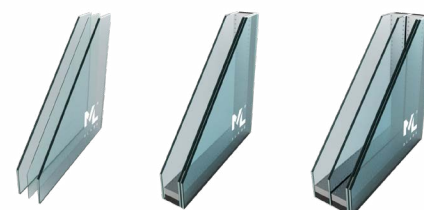


GLASS WITH QUANTUM DOTS LAYER

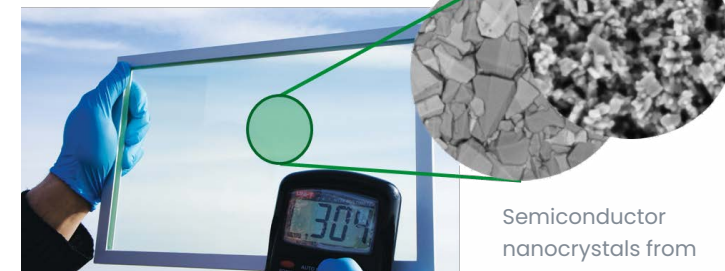
The first solution in the world where a seemingly ordinary glass, in addition to the basic function of insulation from external factors, such as temperature or noise, while providing lighting for the interior of buildings, is an active element generating free ecological energy from the sun. The solution is all the more attractive as it looks no different from traditional insulating glass units commonly used in the construction industry, where the invisible metal oxide coating has been replaced with a quantum dot coating. Q Glass acts as a filter, transmitting light radiation in the visible length, and the unfavorable UV and infrared rays are converted into electricity. As a result, the panes have very good light transmission parameters with additional benefits in the form of generating free energy from the sun, and a significant reduction in unfavorable phenomena in the form of room heating and UV radiation penetration

Glass from New Quantum Era production line have very good light transmission parameters while maintaining a high coefficient of thermal insulation. These glass limits the overheating of interiors, as well as the effect of so- called urban heat Island (UHI), is a breakthrough in the energy balance of cities. Is a QUANTUM REVOLUTION IN GLOBAL CONSTRUCTION

Transparent glass that generates electricity.
A quantum revolution in global construction



Single laminated glass | IGUs
(double- and triple-glazing) with quantum coating.



Semiconductor nanocrystals from a few to several hundred nm in size

Wide range of applications:

- Facades and curtain walls of buildings,
- Roof glazing (skylights),
- Glass balustrades, winter gardens,
- Glass of mobile devices,
- Non-standard projects
- (glass bridges, glass staircases, glass floors),
- Special applications (medical, military, aviation).



TYPE III
ENVIRONMENTAL
DECLARATION

Technical parameters*

Max dimensions	1000 x 2000 mm
Efficiency	from 30 Wp/m ²
QDSC	active coating
Thermal insulation	Ug from 0,4 W/m ² K
Energy insulation	g from 0.22
Light transmission	LT up to 85% (for coated VSG)
Additional functions	<ul style="list-style-type: none"> - weather resistance - resistance to degradation - resistance to mechanical damage - safety of use - tested with fire resistant glass in IGU for EI30 (according to EN 13501)

*default data, any parameters are customizable

QUANTUM REVOLUTION IN GLOBAL CONSTRUCTION



„Żabka” – Polish chain of grocery stores, Store in Warsaw, Poland



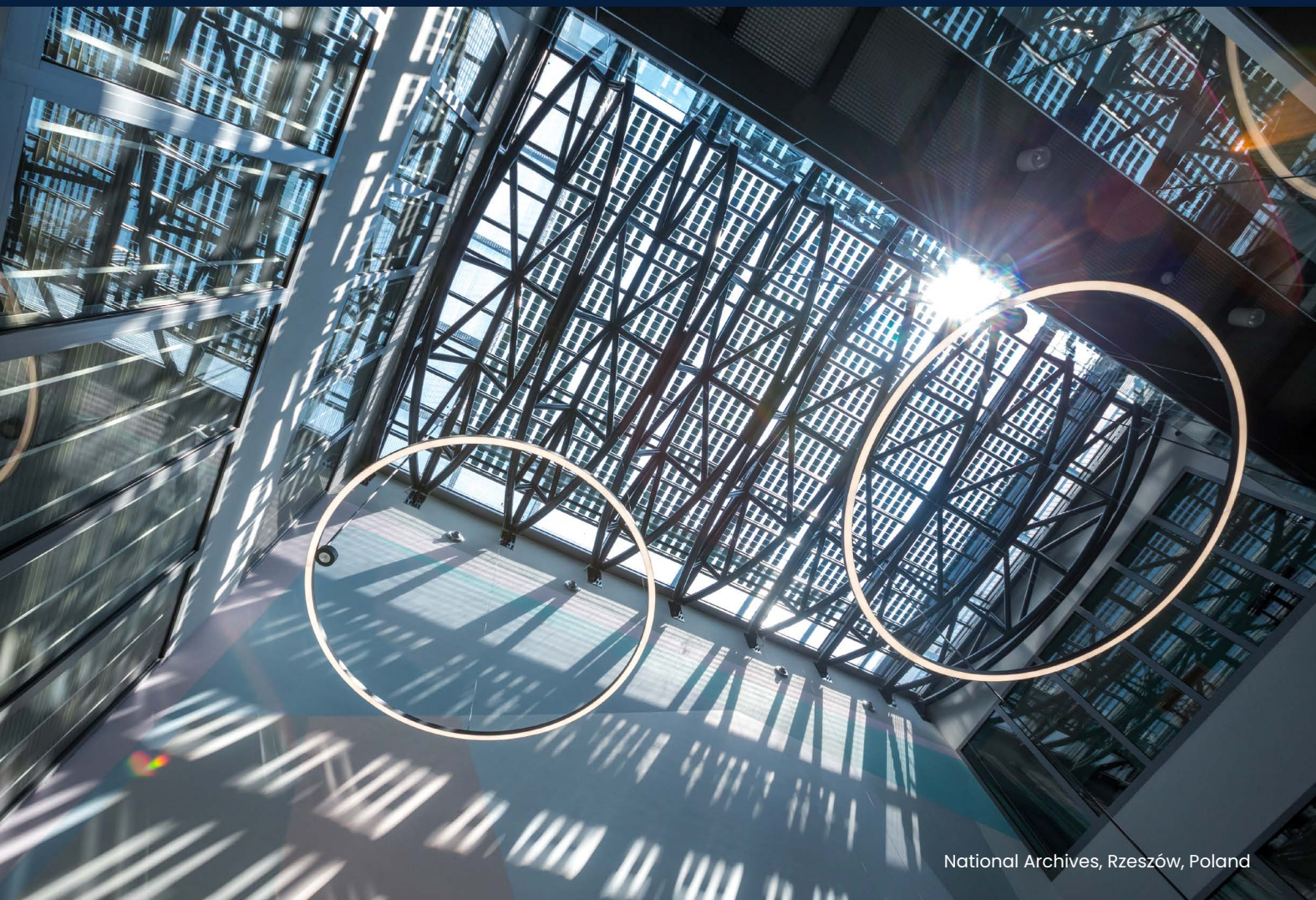
Dalsnibba tourist visitors station, Norway



Building walls with ML Glass – visualisation



Building walls with ML GLASS – visualisation



National Archives, Rzeszów, Poland

PHOTOVOLTAIC ROOFING

The basic function of photovoltaic modules placed in glazing of roofs of buildings is lighting the interior. Modules can be also used as roofing for a terrace or parking or a winter garden. As well as modules for facades, glass for roofing can be integrated with photovoltaic cells. ML System offers single or double chamber insulated glass in which the outer pane is laminated safety glass with photovoltaic cells. Different glass build-ups can be produced, accordingly to requirements of projects. ML System photovoltaic modules are fillings compatible with the majority of aluminum and glass systems.

Advantages of photovoltaic roofing

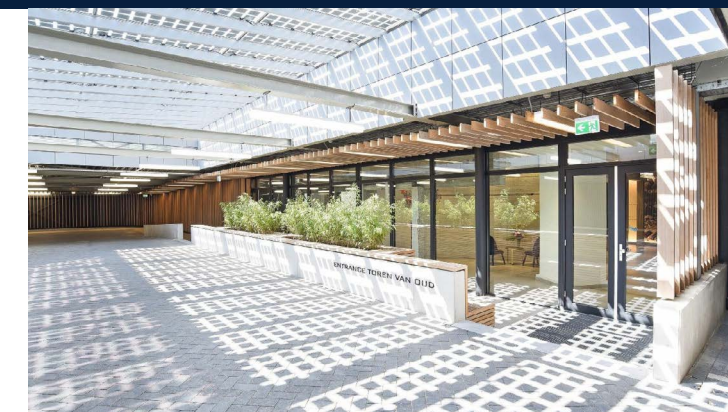
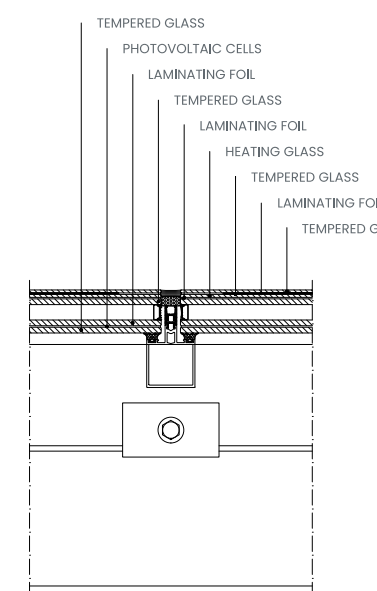
- Free electricity
- No need for snow removal, protection against weather conditions
- Generating savings
- Generation of more electricity in winter
- Stable construction, modern design, simple maintenance custom application
- By using of the ultralight glass, the implementation of the structures on the roofs is possible because of their low carrying capacity
- Choice of transparency level

Technical parameters*



Unit power	max. 220 Wp / m ²
Max. Operating voltage	1000 V
Module types	Monocrystalline incl. Back-contact Polycrystalline Thin layer
Optional	Bifacial NoFrost Printed Quantum dots coating
Structure colour	RAL palette
PV module IGU thickness	Ref. system manufacturer
Types	Double glazing Triple glazing Quadruple glazing
Thermal insulation	Ug from 0.4 W / m ² K
Module transparency	As required
Tested with fire resistant glass in IGU for EI30 (according to EN 13501)	

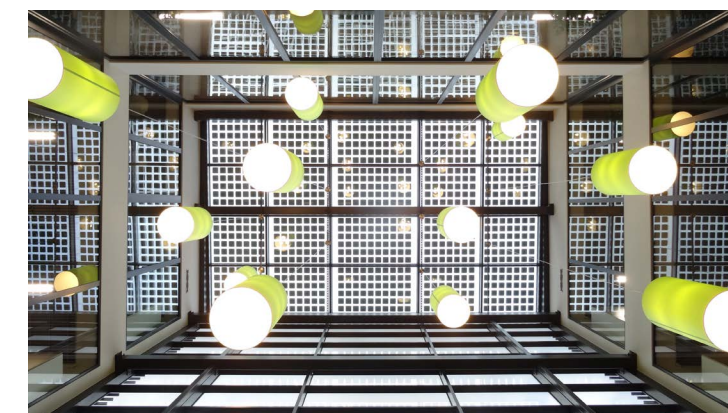
*default data, any parameters are customizable



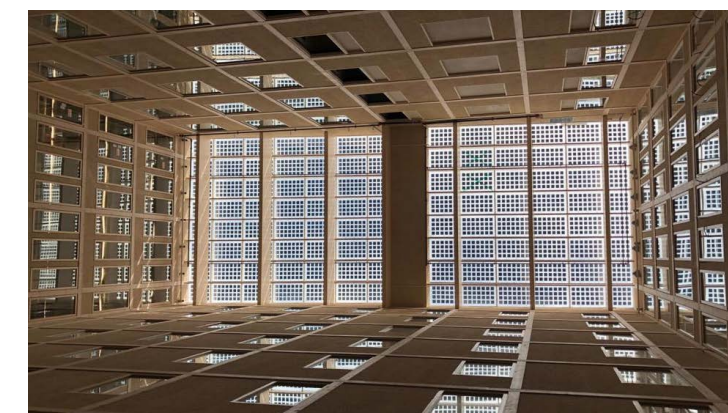
The Hague Tower, Haga, Netherlands



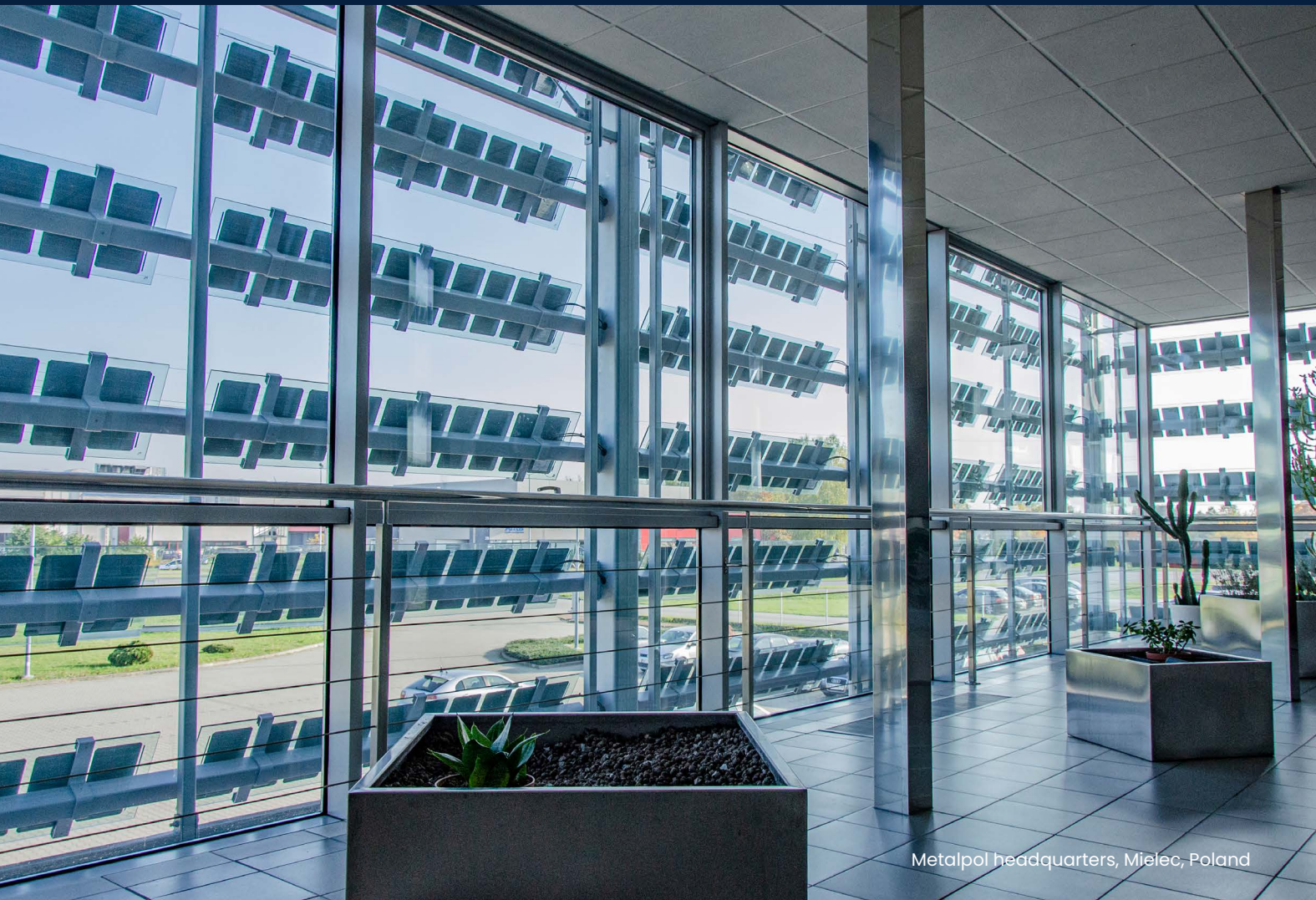
Shell HQ, Holland, Netherlands



Regional Environment Protection & Water Management Fund, Łódź, Poland



Nationalarenan 3, Stockholm, Sweden



Metalpol headquarters, Mielec, Poland

PHOTOVOLTAIC SUNSHADES

ML LAMELA is a complete ML System's product including aluminum substructure and PV glass. Fixed or adjusted sun protection system can replace classic aluminum blinds with photovoltaic laminated safety glass. Photovoltaic modules are placed on the aluminum structure which allows mounting directly to the building wall or to mullion-transom facades.

Photovoltaic sunshades can be installed in a mobile version, allowing you to adjust the angle of the glass element. Photovoltaic sunshades can solve the problem of overheating in buildings, providing a sunshade and at the same time converting solar radiation into electricity that can be used to power the building. ML Lamela is always adapted to the project dimensions.

Advantages of photovoltaic sunshades

- Reducing overheating of rooms
- Generation of electricity
- A wide range of transparency and colours of lamellas
- Stable construction, modern design
- Any adjustment of the tilt angle of lamellas
- No need for snow removal
- By using of the ultralight materials, the load of the building façade is lower
- Easy maintenance
- Generating savings

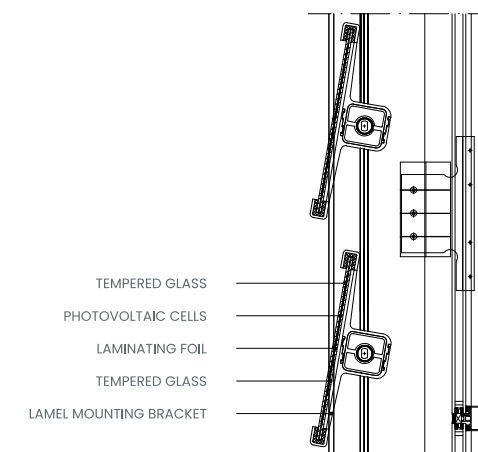
Technical parameters*



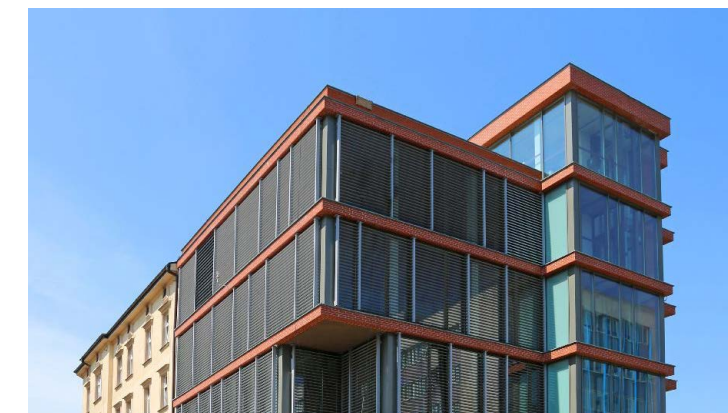
TYPE III
ENVIROMENTAL
DECLARATION

Unit power	up to 170 Wp/m ²
PC cell efficiency	up to 24,5%
Max operating voltage	1000 V DC
Cell types	Monocrystalline incl. back – contact Thin layer
Options	Bifacial NoFrost Printed Transparent Quantum dots coating
Substructure material	Aluminium
Support post width	50 mm
Max. Suport post spacing	4000 mm
Structure colour	RAL palette
Louvre height	380 / 429 mm
Louvre thickness	3 to 20 mm
Louvre tilt adjustment	10 deg. Pitch – Manual/smooth power actuators

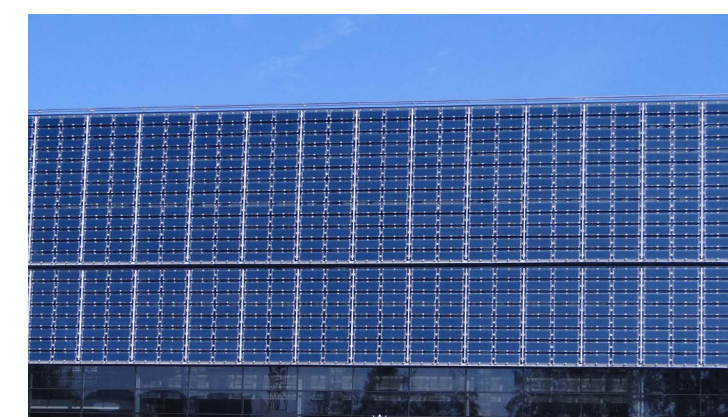
*default data, any parameters are customizable



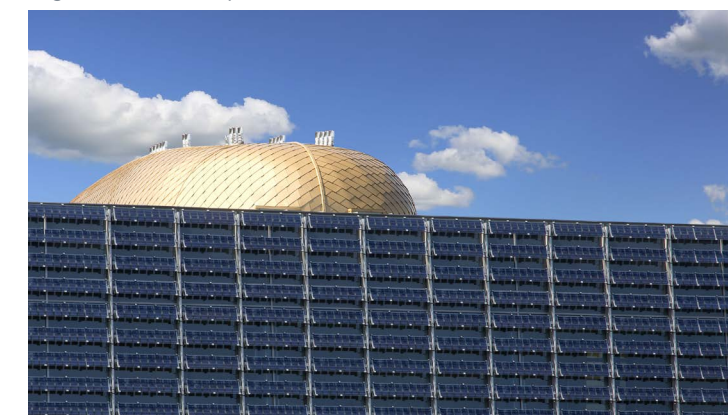
Shopping Centre, Olawa, Poland



Construction laboratory of Cracow University Technology, Cracow, Poland



Jagiellonian University, Cracow, Poland



Border crossing, Budomierz, Poland



PHOTOVOLTAIC VENTILATED FACADE

PHOTOVOLTAIC FACADE – CUSTOMIZED PRODUCT BASED ON PROJECT'S REQUIREMENTS

ML System photovoltaic façade panels are an efficient and safe alternative to classic building materials. The use of a high-resolution print makes that this product is a perfect representation of commonly used materials, but with higher resistance parameters, with the advantage of generating free and ecological electricity from the sun. ML System façade panels are a guarantee of safety, durability and return on investment in the form of savings on electricity bills. ML System's facades panels are a great aesthetic and efficiency solution. Moreover of most important function – energy generation, it provides plenty advantages: facade insulation, façade and balcony glazing, additional thermal properties, noise reduction Photovoltaic facade can also be integrated to existing building facades, modernizing them and turning them energy efficient.

Advantages of photovoltaic facades

- Free electricity, generating savings
- By using of the ultralight glass, the facades become lighter, more resistant to dirt and degradation
- Stable construction, modern design
- Cooling of the modules and temperature reduction of the facade through the ventilation effect
- Custom application
- Reduction of the costs of operating air conditioning
- Possibility of remote access to the system work

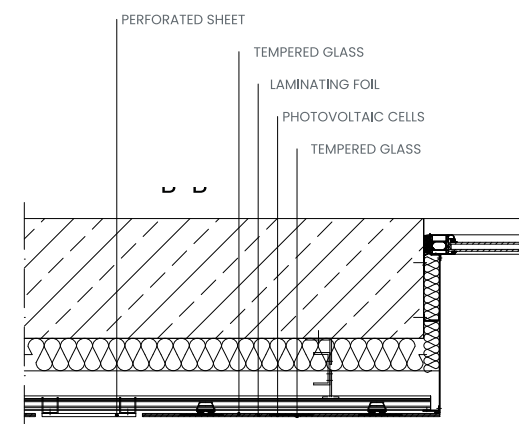
Technical parameters*



TYPE III
ENVIROMENTAL
DECLARATION

Unit power	Max. 220 Wp / m ²
PV cell efficiency	Max. 24,5%
Max operating voltage	1000 V DC
Module types	Monocrystalline incl. back – contact Thin layer Quantum dots coating
Optional	Transparent Printed
Substructure material	Aluminium
Module to module gap V/H	from 10 mm
Maximum module size	3600 x 2200 mm
Structure colour	RAL palette
Module thickness	3 to 22 mm
Parameters	s1 according to EN 13501 d0 according to EN 13501
No fire spread in the facade – tested in Fire Material Institute No elements falling from the wall while fire – tested for minimum 60 minutes resistance	

*default data, any parameters are customizable



Residential building, Amsterdam, Holland



Servitech, Tarnów, Poland



Moon Office Cracow, Poland



Tehnopianti di Maragno, Verona, Italy



Student Halls, Osijek, Croatia

PHOTOVOLTAIC INSULATED GLASS

Insulated glazing is used as a filling of structural facades and glass skylights. Insulated glass units (double-, and triple-glazing) can be integrated with photovoltaic cells as well. As ML System we are able to produce such units with different types of coatings to provide proper thermal and visual parameters of the glass. The arrangement of the cells in each module is also flexible and adaptable according to the required LT value. Photovoltaic insulated glass can be combined with heating function to melt snow and keep the glass transparent.

Advantages of photovoltaic insulated glass:

- Modern and personalized design
- Stable structure
- Generating savings thanks to free electricity
- Compatibility with all systems available on the market
- Thanks to the use of ultra-light glass, the facades become lighter and more resistant to dirt
- Improvement of the thermal insulation parameters of the building

Technical parameters*



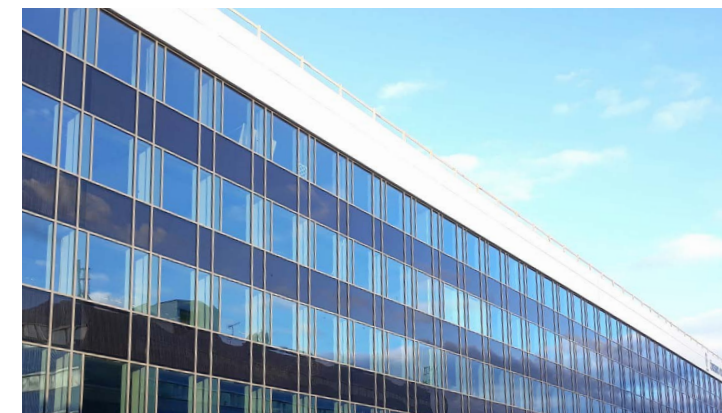
TYPE III
ENVIRONMENTAL
DECLARATION

Unit power	Up to 220Wp/m ²
PV cell efficiency	Max. 24,5%
Max operating voltage	1000 V DC
Modules types	Monocrystalline incl. back – contact Thin layer
Optional	Transparent Heating function Quantum dots coating
Construction colors	RAL palette
Thickness of shaft sets with modules	Ref. system manufacturer
Types	Double glazing Triple glazing Quadruple glazing
Thermal insulation	from 0.4 W / m ² K
Translucency of the module	As required

*default data, any parameters are customizable



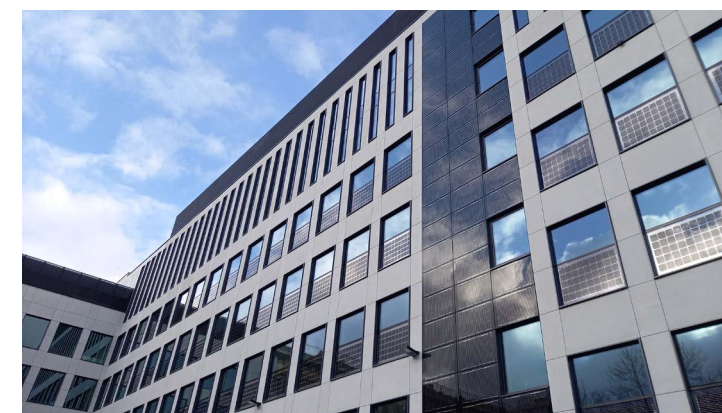
CANPACK, Orzesze, Poland



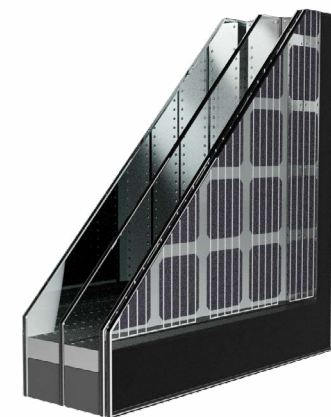
Administration building, Örebro, Sweden



Regional Environment Protection & Water Management Fund, Łódź, Poland

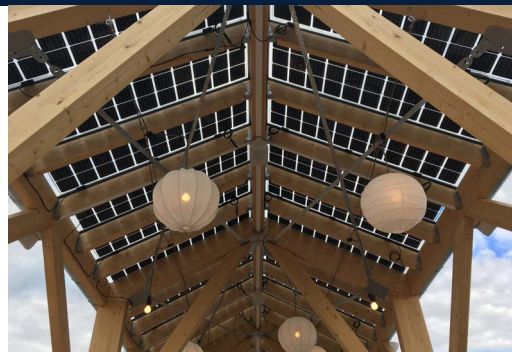


University of Science and Technology, Cracow, Poland





COLOR PHOTOVOLTAIC FACADE PANELS
Voldslokk, Norway



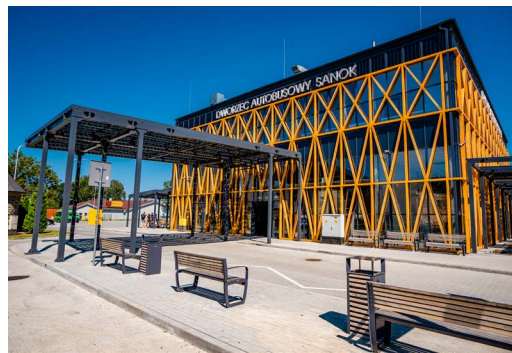
PHOTOVOLTAIC ROOFING,
Hamar, Norway



WHITE PHOTOVOLTAIC FACADE PANELS
Stavanger, Norway



PHOTOVOLTAIC ROOFING
Zacernie, Poland



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



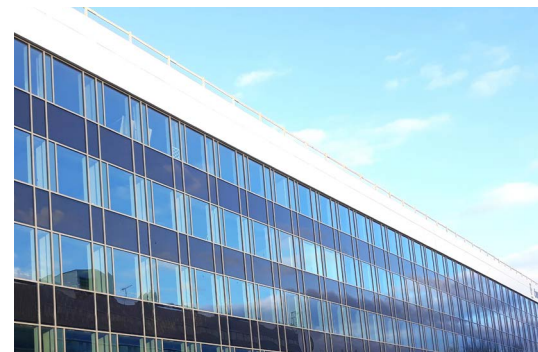
ML Glass
Airport, Warsaw, Poland



PHOTOVOLTAIC FACADE PANELS
Kielce, Poland



PHOTOVOLTAIC RAILING,
Växjö, Sweden



PHOTOVOLTAIC ML Glass
Örebro, Sweden



PHOTOVOLTAIC CAR PARK ROOFING
Jasionka, Poland



PHOTOVOLTAIC ROOFING,
Jasło, 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



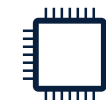
ML SCADA
energy management system



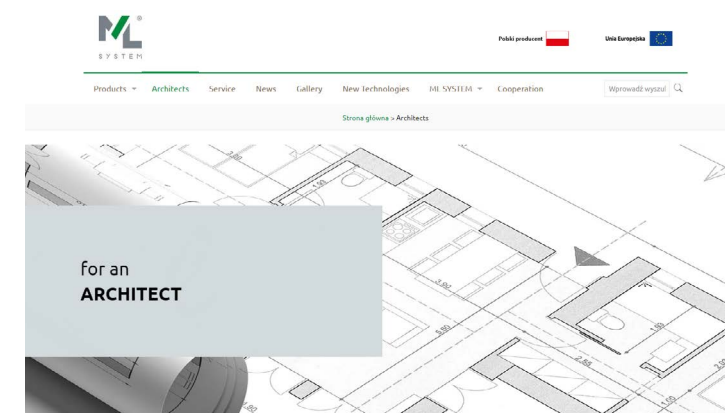
3D Scanning
Drone and thermal imaging camera



3D Modeling



SYSTEM
DRIVERS





ML System HQ, Zaczernie, Poland

ML System S. A.

ML System S.A. – Polish highly specialized technology company with its own production plant and strong R&D Center equipped with world-class laboratory equipment. The company, which has been operating on the market for dozen years (registration date in 2006), specializes in traditional and innovative photovoltaic solutions, of which it is both a producer and a distributor. It has been listed on the Warsaw Stock Exchange since 2018.

ML System's products are a real alternative to many construction products, such as composite or sandwich panels, glass, ceramics, stone, roofing materials, heating mats or even entire heating systems. They provide the basic function of generating electricity from sunlight, and more features that are typical of other construction materials, including: high thermal and sound insulation performance, rain sealing and increased mechanical strength.

ML System is a manufacturer and supplier of complete technologies for use in the building, including assembly, control and building management systems.

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.



Technological advantage thanks to high investment expenditures



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



Product diversification, industry diversification and geographic diversification



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



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

WE ARE CHANGING THE WORLD FOR FUTURE GENERATIONS

GLOBAL RANGE OF OPERATION

ML System company develops breakthrough technologies that are an ideal response to the current needs of the energy transformation proces – the transition from conventional to renewable energy sources. The activities of ML System perfectly match the trends and expectations of the photovoltaic market in whole the world, due. The company sees many opportunities for futher development by creating new, innovative solutions. ML System products are particularly popular among partners from the countries, where environmental awareness and knowledge of economic benefits resulting from the use of photovoltaic solution are relatively the highest.

TECHNOLOGY OF 21st CENTURY



BIPV ONE & ONLY ANSWER FOR SUSTAINABLE ARCHITECTURE AND BUILDINGS

 **Powering** a safer future

“

It's time to stop burning our planet, and start investing in the abundant **renewable energy** all around us.”

ANTÓNIO GUTERRES, *United Nations Secretary-General*



source: <https://www.un.org/en/climatechange/raising-ambition/renewable-energy>

* status for the 31.03.2023

WE ARE CHANGING THE WORLD FOR FUTURE GENERATIONS

1

THE FIRST GLOBAL ATOMIC LAYER DEPOSITION TECHNOLOGY



www.facebook.com/MLSystemSA/



www.instagram.com/ml.system/



www.youtube.com/user/mlsystempl/



www.pl.linkedin.com/company/ml-system-sa

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mlsystem.pl

