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Minimal Impact—Maximum Output, Wuppertal, Germany



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## **Minimal Impact—Maximum Output**

### **A visionary architectural prototype using sustainable light from ERCO**

- Event: Solar Decathlon Europe 21/22, Team MIMO

- Client: Solar Decathlon Europe 21/22
- Architecture: Team MIMO, Düsseldorf University of Applied Sciences
- Photography: Marvin Hillebrand, Jan Buschmann
- Place: Wuppertal
- Country: Germany
- Website: <https://sde21.eu/de/>

As part of the university architecture competition "Solar Decathlon Europe 21/22", Düsseldorf University's MIMO team constructed a prototype for a building that is consistently oriented towards sustainability. According to the motto of "Minimal Impact—Maximum Output", the entry for the competition emphasizes functional architecture in modular timber construction, environmentally friendly building materials and a resource-saving energy concept. The lighting also complies to this guiding principle, implemented in collaboration with ERCO according to Human Centric Lighting principles and thus in a sustainable way. As a result, light is only used where required by the needs of human perception.

## Sustainable building in the architectural decathlon

As the largest university competition for sustainable building and living, "Solar Decathlon" has been providing a platform for innovative architectural projects for the past 20 years. The latest European "Solar Decathlon Europe 21/22" edition was dedicated to the issue of the potential for climate-friendly living in towns and cities. In view of increasing global urbanization and the accompanying heightened demand for living space, this question is more relevant than ever before. Eighteen university teams from eleven countries competed for the most sustainable architecture by constructing a prototype based on existing buildings.

The MIMO team from Düsseldorf took part in the competition under the motto of "Minimal Impact—Maximum Output". Their 1:1 scale prototype focuses on sustainable, urban aggregation: the careful upgrading of an existing early 20th century warehouse in the city of Wuppertal is followed by the addition of 15 residential units in modular timber construction.



### A conscious use of resources

According to the UN, the building sector is responsible for almost 40% of global CO2 emissions. This made it all the more important for the students from Düsseldorf to demonstrate with their competition entry how architecture is able to develop maximum potential for environmental and climate protection with a minimal use of resources. As a consequence, the two-story prototype was constructed using natural building materials such as timber, clay and cork. The facade contributes to the use of renewable energies in the form of a climate-active building shell with integrated photovoltaic cells. In terms of lighting as well it was important for the MIMO team to utilize resources in a conscious way. This means using light only where it is needed, or in other words: light only where human perception requires it.



The luminaires are installed and aligned so that light is only used where required by human perception.



Wallwashers with wallwash distribution illuminate the clay-bricked facade wall, thus increasing the perception of brightness in the room.

### More energy efficiency due to Human Centric Lighting

The concept of planning light only where human perception needs it is called Human Centric Lighting

(HCL). This method of lighting design refrains from a standard general lighting, instead analyzing the interplay of architectural effect, atmosphere and visual task. As well as the energy efficiency of the luminaires, the lighting technology used and accurate light distribution are decisive for the realization of such sustainable lighting concepts—only if the luminaire projects the light onto the target surface without light spill does the lighting contribute to minimal energy consumption.

"ERCO luminaires proved to be the best choice for our ambitious objectives because they achieve the highest illuminances in lux per watt on the target area with minimal use of resources," explains Max Brouckerhoff, responsible for lighting design in the MIMO team. In contrast to the frequently used "lumens per watt" indicator, "lux per watt" includes an overall energy consideration of the lighting design, not just that of the luminaire. It can thus be ensured that the lighting is not only energy-efficient but also maximally effective with "minimal impact", compliant to the goals of the MIMO building.



ERCO track as an ideal basis for a flexible lighting concept.



With the lighting technology of Parscan spotlights, 25% more light reaches the target area with the same connected load than with comparable spotlights.

## Exploiting the potential of vertical lighting

With reference to sufficiency, the individual living modules of the MIMO design are spatially reduced to a minimum. The foyer on the ground floor, as a communal space, forms the core of the building. With a ceiling height of seven meters, the entire cubature of the building comes to the fore. This space is also characterized by a wooden staircase leading to the upper floor as the building's most important circulation zone. The requirements for a zonal lighting concept that could be programmed for different scenes were appropriately high.

Using ERCO Parscan LED track-mounted spotlights, the lighting in the foyer could be adjusted to its specific functional requirements thanks to different light distributions. Wallwashers with wallwash distribution illuminate the clay-bricked facade wall, thus increasing the perception of brightness in the room. Wallwashing in particular exploits the potential of human perception for sustainable architecture. A vertically illuminated surface appears brighter than a floor illuminated to the same extent. As well as saving energy, this method of lighting makes rooms appear more spacious. This effect is also achieved by Lightgap grazing light wallwashers in the adjacent communal kitchen, where general lighting is ensured by extremely uniform flooding of the rear wall due to the low ceiling height.



The foyer on the ground floor, as a communal space, forms the core of the building.

## Optimized lighting through interchangeable lenses

Parscan spotlights with flood and spot distributions in the foyer are directed at the central dining and work table and ensure glare-free visual comfort, while elsewhere illuminating the staircase as a linear circulation zone with oval flood, a light distribution that is as precise as it is efficient. The Parscan spotlights can be adapted to their respective visual task thanks to interchangeable lenses. The light is projected precisely onto the target surface. With this lighting technology, 25% more light reaches the target area with the same connected load than with comparable spotlights.

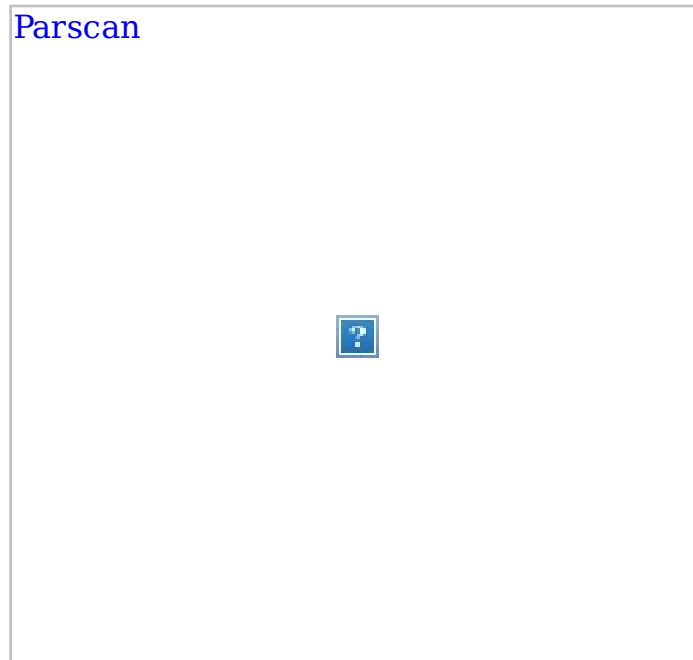
The especially flat luminaire dimensions of Opton spotlights prove to be advantageous in the residential modules. With interchangeable lenses, Opton enables perception-oriented and thus effective general

lighting here. For the outside, Team MIMO specified path lighting with Castor bollard luminaires. Dark Sky Technology means their light radiates exclusively in the direction of the ground. Nocturnal protection from light pollution rounds off the "minimal impact" of the architecture.

Team MIMO achieved 4th in the overall competition ranking as well as further successes in competition prizes, such as 1st place for "communication & education". For their building concept, including the use of natural building materials and renewable energy and lighting according to Human Centric Lighting, they were awarded 2nd place in the category "feasibility & socio-economic context".

For further information and aspects of sustainable lighting see: [www.erco.com/greenology](http://www.erco.com/greenology)

## Luminaires used



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**Parscan**  
Luminaires for track



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**Opton**  
Luminaires for track



- [\*\*Lightgap\*\*](#)  
[Recessed luminaires](#)



- [\*\*Castor\*\*](#)  
[Bollard luminaires](#)

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