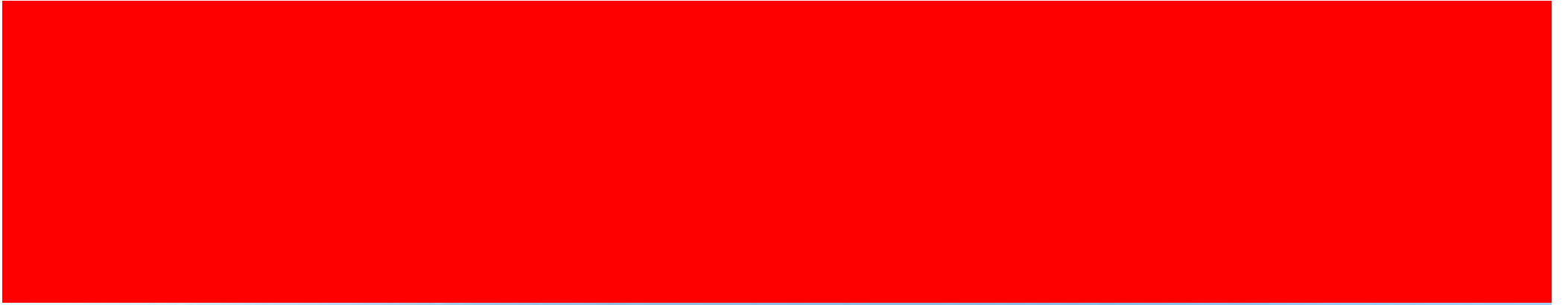


MODULAR DRIVE SOLUTIONS FOR  
CONVERTIBLE ROOF AND FAÇADE SYSTEMS

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Pantheon Plaza, Larissa, Greece, carriage and controls made by elnic GmbH

# MODULAR DRIVE SOLUTION FOR CONVERTIBLE ROOF AND FAÇADE SYSTEMS

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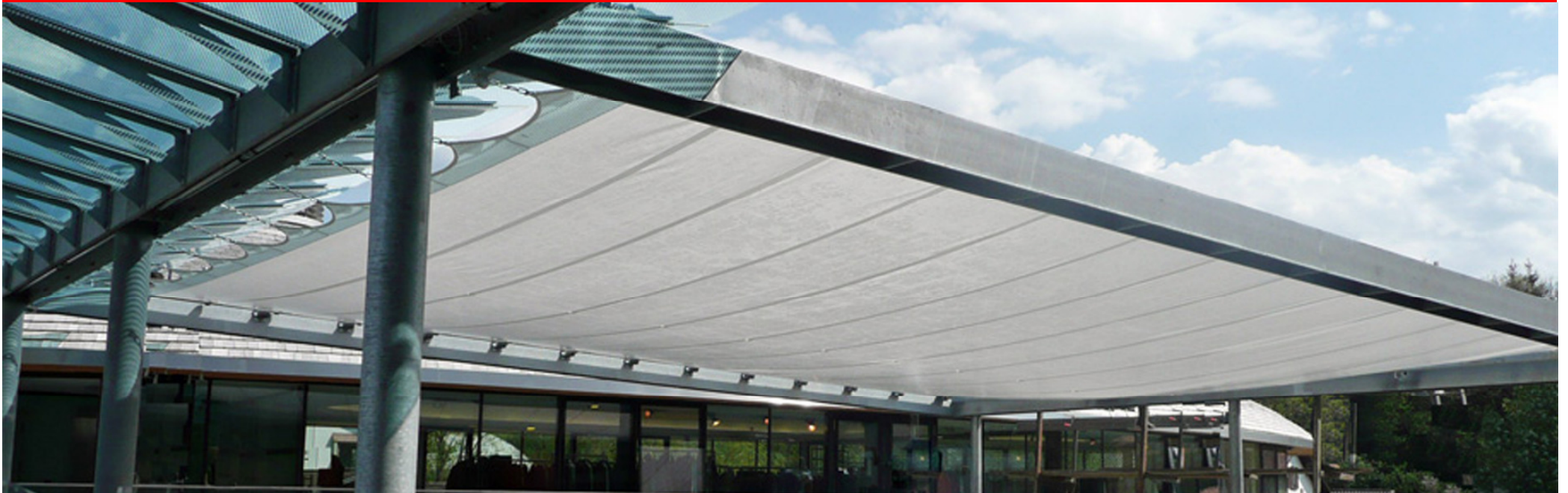
- Individual custom-built constructions



:envihab, German Aerospace Centre, Cologne, Germany, made by elnic GmbH



## Convertible roof and façade constructions



Marc O'Polo, Stephanskirchen, Germany, carriage and controls made by elnic GmbH

## Convertible roof and façade constructions

Convertible constructions are widely implemented and have become very popular with builders and architects.

As openable roofs for sports stadiums like Wimbledon Centre Court and the Schalke football stadium, for shopping centres, indoor swimming pools and buildings for research institutes, there is a huge need to open and close medium and large roofs and façades.

In order to guarantee a safe and error-free operation the convertible elements need to be moved considering their static properties. This takes place using a combination of rails or cable systems, slide and drive carriage, driving motors, sensors and control systems.

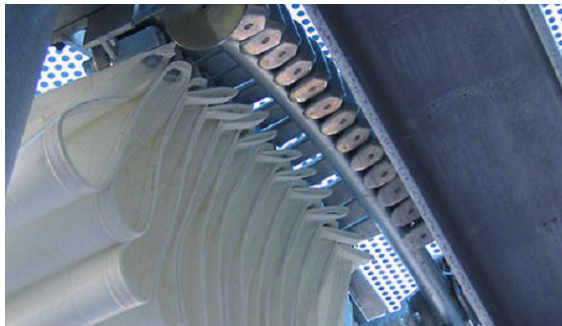
Apart from developing individual project-specific systems, elnic reacted to the requirements of the growing market for convertible systems for small and medium sized projects and has therefore designed modular system solutions.

By reducing convertible roof solutions to a modular system with tested, durable components, architectural ideas may be based on basic elements and still be implemented individually.

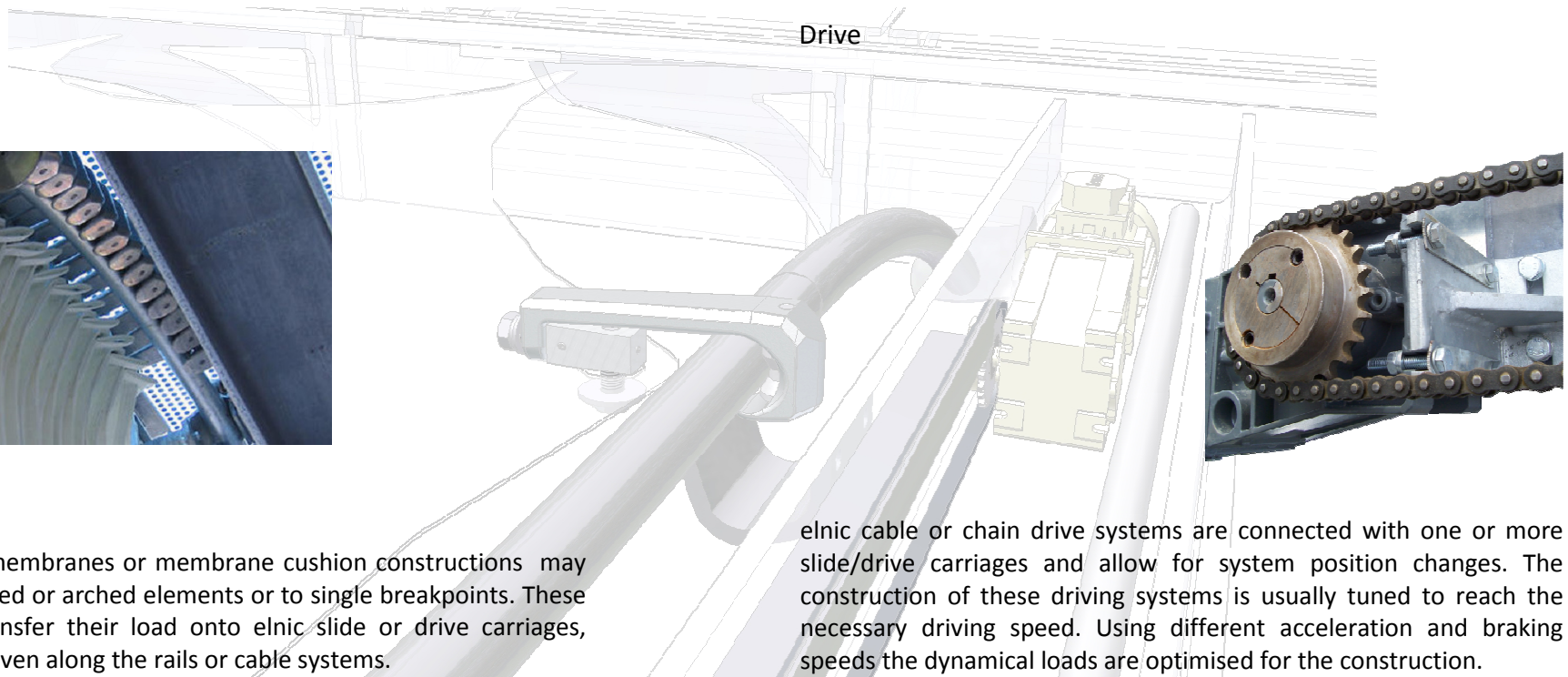
The modules consist of running, driving and controlling components, which are compatible thanks to the interfaces and allow for an efficient production, installation and maintenance.

## Dynamic processes

Sliding/rolls



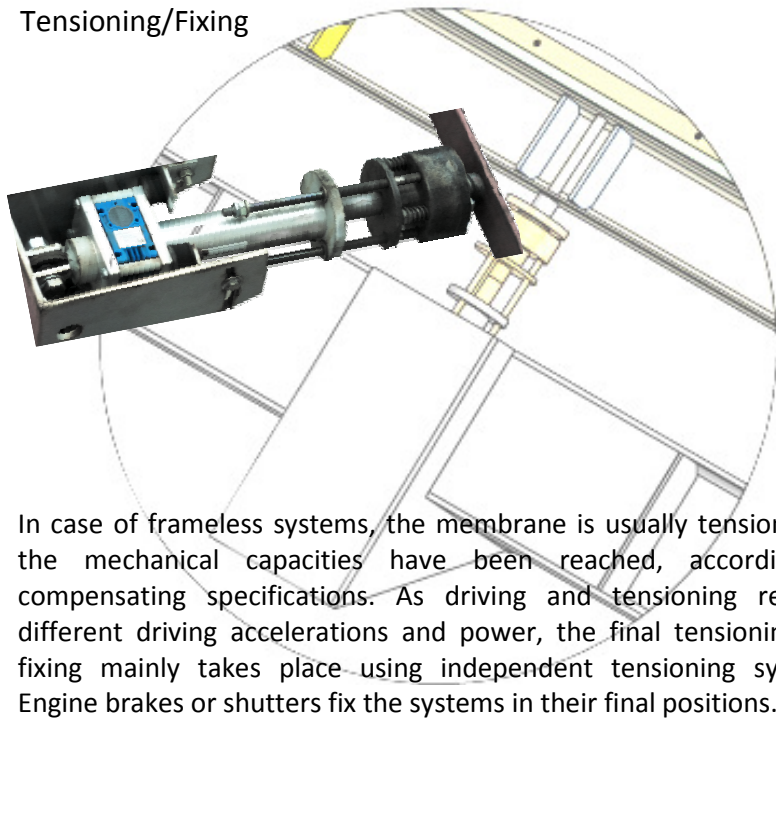
Drive



Single-layered membranes or membrane cushion constructions may be fixed to framed or arched elements or to single breakpoints. These fixed points transfer their load onto elnic slide or drive carriages, which can be driven along the rails or cable systems.

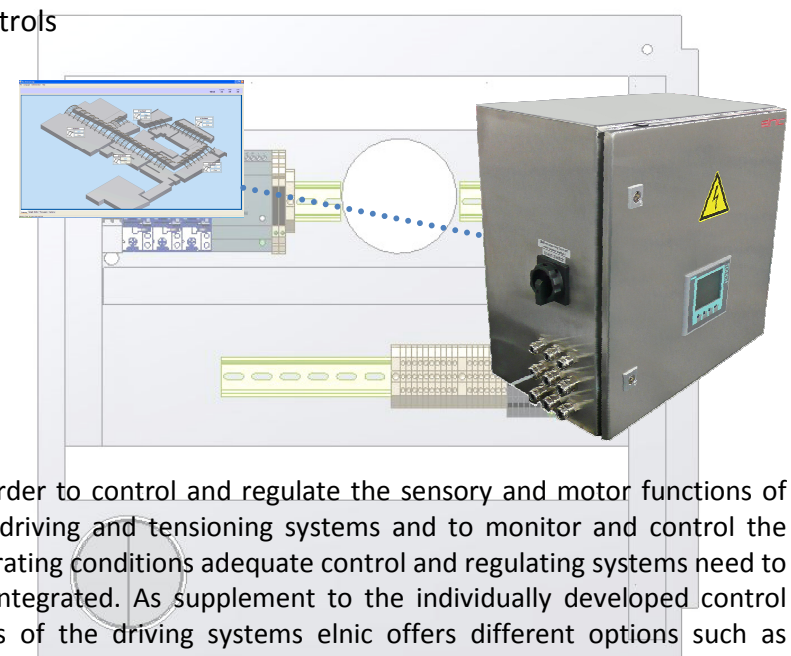
elnic cable or chain drive systems are connected with one or more slide/drive carriages and allow for system position changes. The construction of these driving systems is usually tuned to reach the necessary driving speed. Using different acceleration and braking speeds the dynamical loads are optimised for the construction.

## Tensioning/Fixing



In case of frameless systems, the membrane is usually tensioned till the mechanical capacities have been reached, according to compensating specifications. As driving and tensioning requires different driving accelerations and power, the final tensioning and fixing mainly takes place using independent tensioning systems. Engine brakes or shutters fix the systems in their final positions.

## Controls



In order to control and regulate the sensory and motor functions of the driving and tensioning systems and to monitor and control the operating conditions adequate control and regulating systems need to be integrated. As supplement to the individually developed control units of the driving systems elnic offers different options such as weather sensors, remote control displays, access for remote diagnostics, etc.

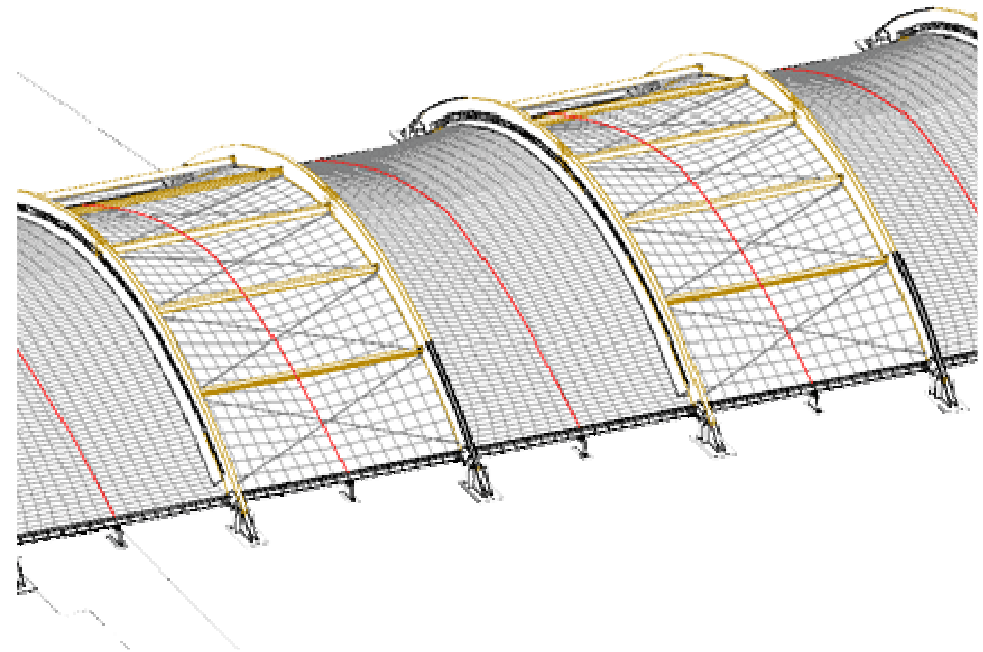
## Modular system solutions - Foldable membrane constructions

### Foldable membrane constructions

For solutions, which do not require a high amount of air tightness but offer the largest possible opening space and optimum reduction of the parking space, the foldable elnic system offers the best option. Standardised elements for driving carriage with membrane accommodation, rail systems, driving motors with chain drive and pulling cylinder for tensioning the membrane guarantee a simple installation and low-maintenance operation.

#### Key features:

Geometry: Single field, width up to approx. 10m, length up to approx. 35m  
Form: straight, inclined or arched parallel  
Materials: flexible single-layered membranes (PVC, Tenara)  
Costs: Driving and control system including rails approx. 220 - 270 €/m<sup>2</sup>  
(support structure not included)





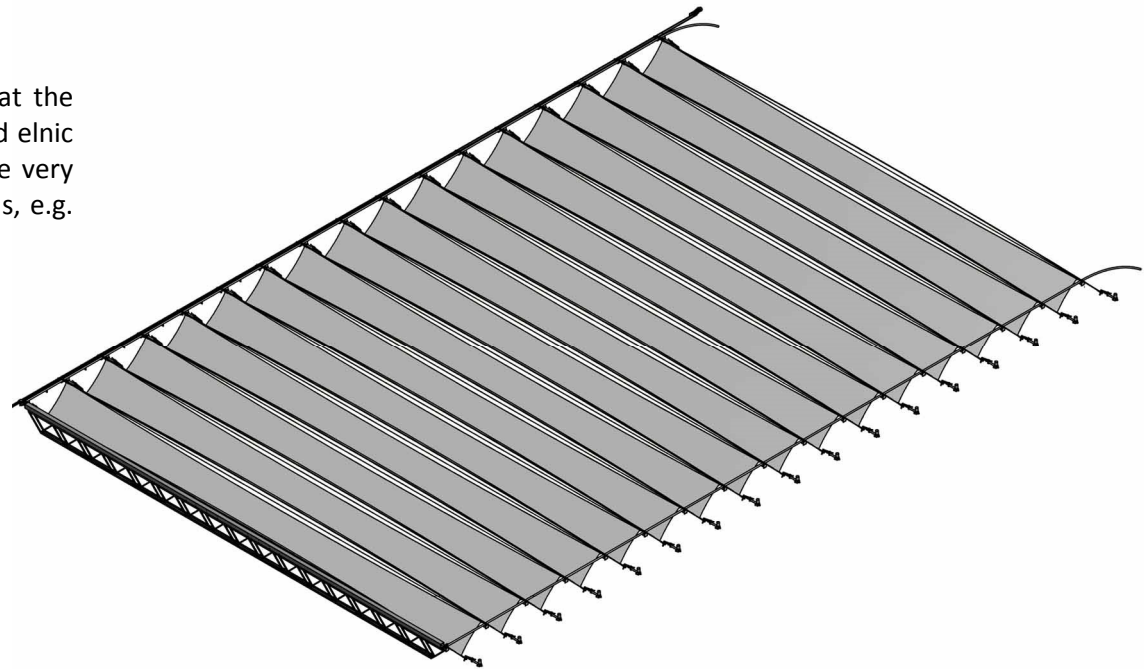
## Modular system solutions - Folded membrane constructions

### Folded membrane constructions

For solutions that need protection against rain and sun, but at the same time have to fulfil a high demand of esthetics. This folded elnic system offers all possibilities to protect against the above. The very flexible roof construction can also be easily installed afterwards, e.g. to protect inner courtyards, etc.

#### Key features:

Geometry: Single field, width up to approx. 22m, length up to approx. 35m  
Form: straight  
Materials: flexible single layered membranes (PVC, Tenara)  
Costs: Driving and control system including rails and pulling cylinders approx. 220 - 290 €/m<sup>2</sup> (support structure not included)



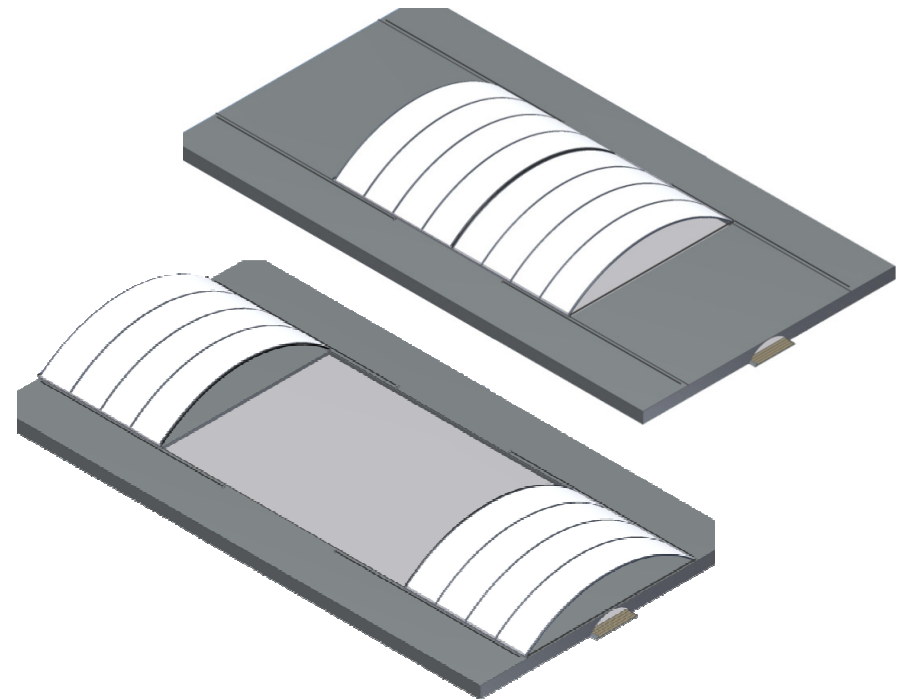
## Modular system solutions - Drive systems for framed constructions

### Drive systems for framed constructions

Electric drive systems for framed constructions allow precise driving, positioning and fixing of individually designed framed constructions. These construction systems make it possible to construct windproof and thermally optimised movable building envelopes (roof or façade) by implementing multi-layered membranes and airtight connections.

#### Key features:

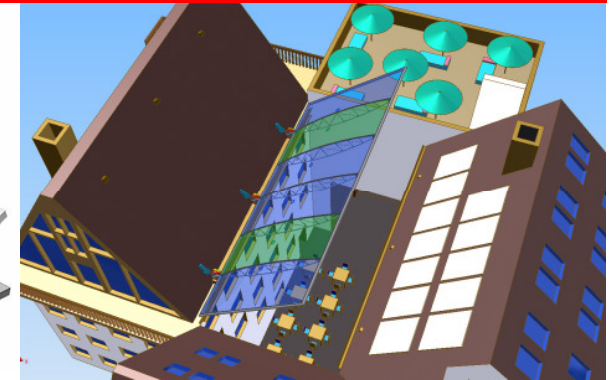
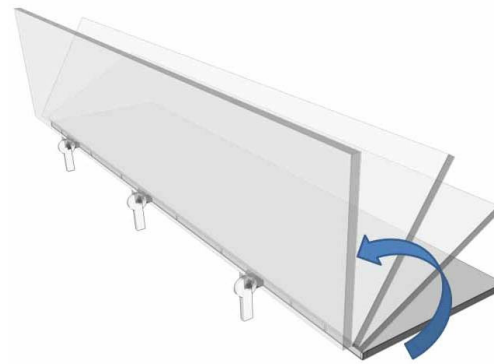
**Geometry:** Single field, width up to approx. 20m, length up to approx. 35m  
**Form:** Parallel, trapezoidal or arched  
**Materials:** single and multi-layered membranes (cushions too)  
**Costs:** Driving and control system including rails approx. 120 - 180 €/m<sup>2</sup>  
(Frame and support structure not included)



## Modular system solutions - Folding constructions

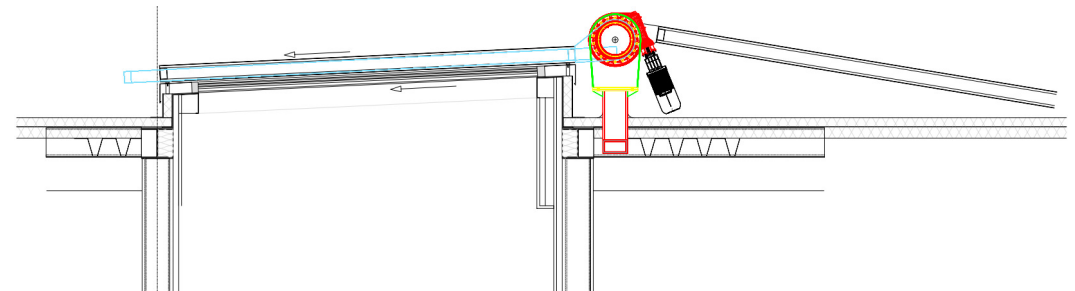
### Folding constructions

Roof or façade surfaces may be opened and closed by custom-built folding structures. In cases where a horizontal or vertical moving system is not possible, these folding structures may be fully or partly laid down using a folding mechanism. The frame constructions of the folding elements can be planked/covered with different materials such as membranes or light metal.



### Key features:

Geometry: Width up to approx. 5m, length up to approx. 30m  
Form: Individually  
Materials: Covered with membrane or frame planked with light metal  
Costs: approx. 380 – 420 € / m<sup>2</sup>



## Individual solutions


### Individual custom-built constructions

Movable frame systems, folding systems and supply air- supported membrane cushions offer architects and engineers a broad range to develop new constructions. Apart from modular systems, elnic also offers an extensive know-how for the design and implementation of such individual constructions.

The sensory, driving and controlling technique is well entrusted to us and we would be glad to jointly develop sustainable and economically realistic custom-built solutions.



BC Place Stadion, Vancouver, Canada, air supply system made by elnic GmbH



elnic GmbH based in Rosenheim has been a reliable partner for over 15 years for technical project and system solutions in the field of membrane constructions.

Both the range of air supply systems called eluft and edach, the development and implementation of solutions for convertible components offer multiple possibilities for achieving ambitious parts of a project.

Our experts are ready to plan, develop, implement and maintain your project. We would be glad to hear from you.

The logo for elnic, featuring the word "elnic" in a bold, lowercase, sans-serif font. The letters are red and have a slightly stylized, blocky appearance.

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