

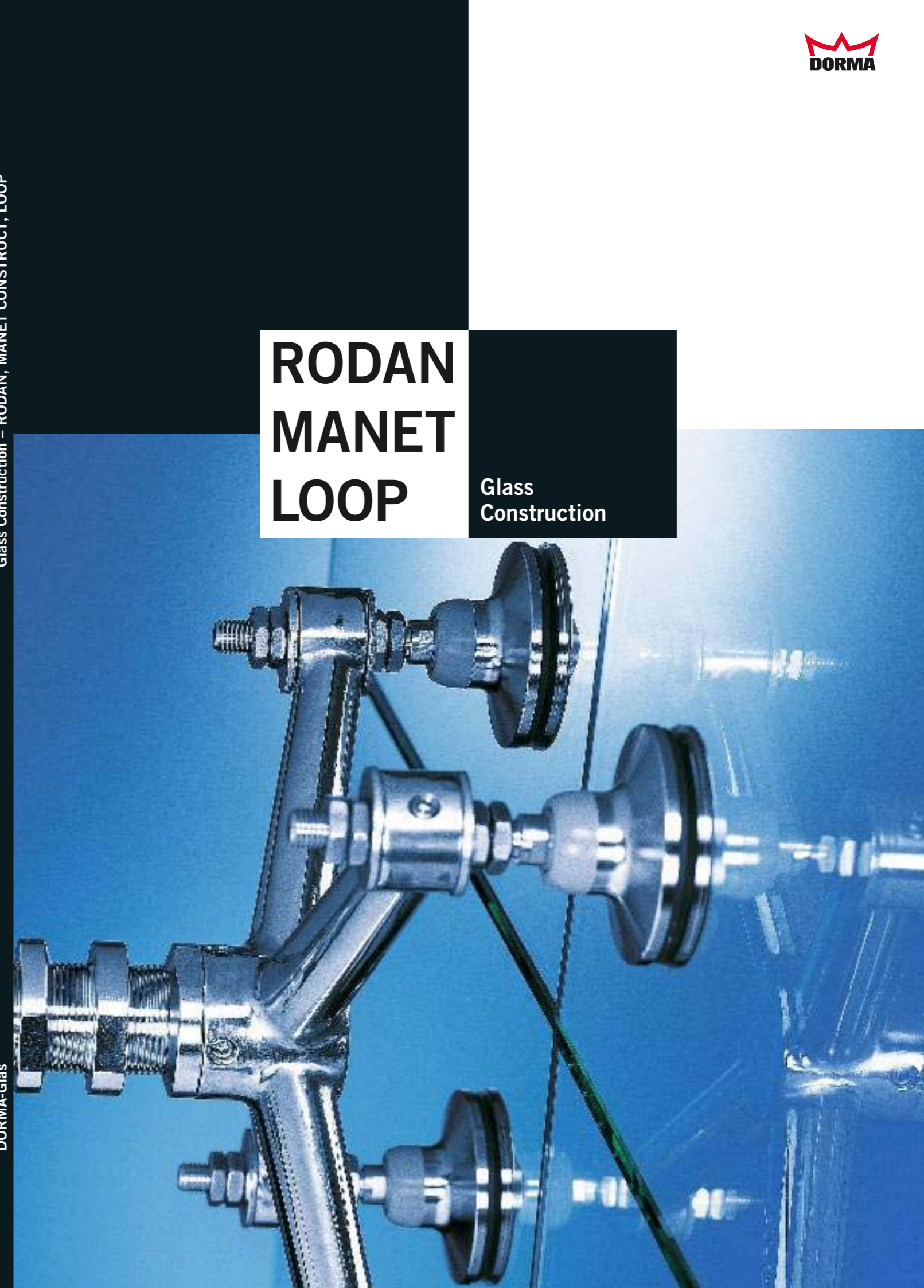
Glass Construction – RODAN, MANET CONSTRUCT, LOOP

RODAN MANET LOOP

Glass
Construction

DORMA-Glas

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DORMA RODAN

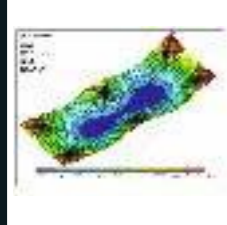
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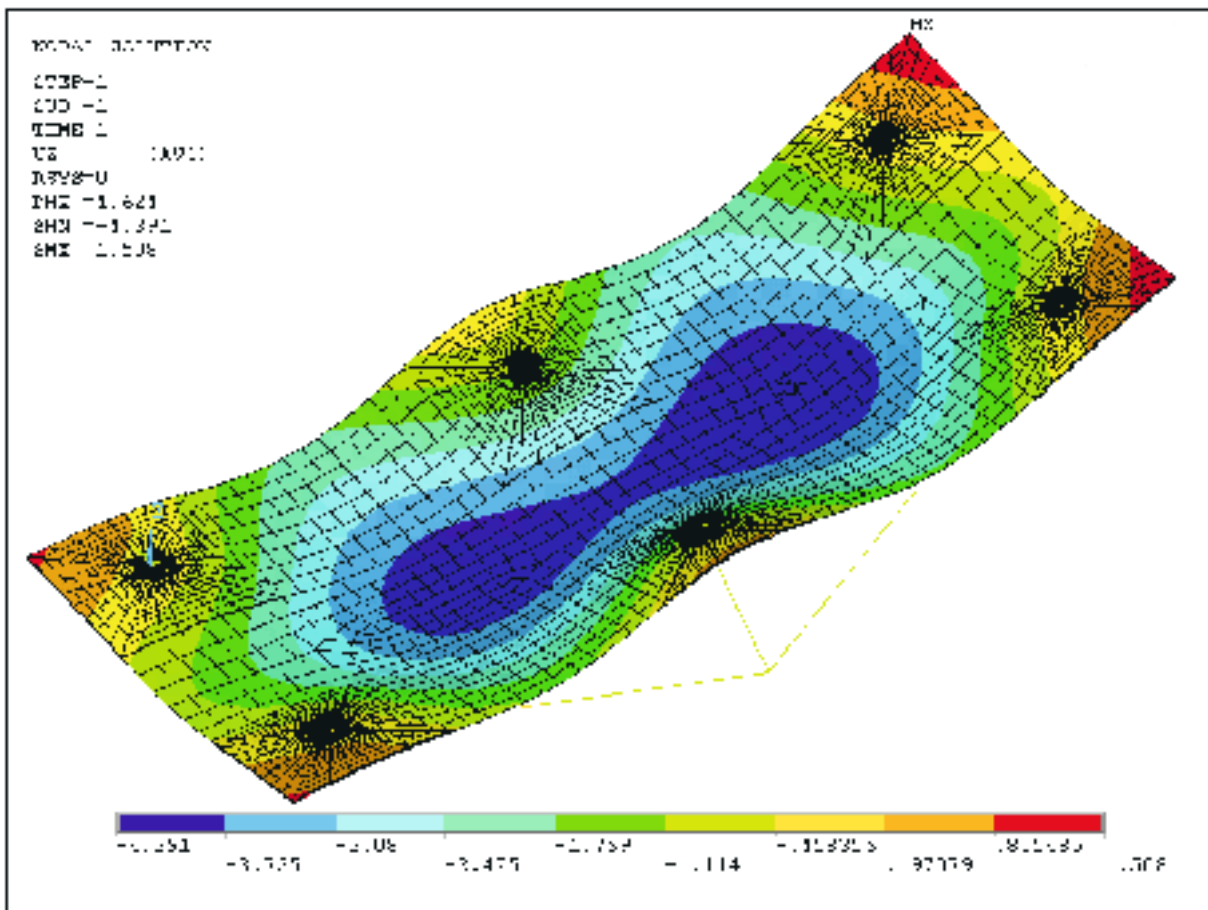
DORMA for safety's sake

DORMA offers sophisticated solutions right from the start. The specialists of our Glass Fittings and Accessories division are committed to innovation and development work involving glass and its unique range of application possibilities. Consistently setting high standards with respect to design, functionality and longevity, DORMA has grown into a leading proponent of the art of structural glass engineering. Glass panels mounted on single-point fixings can be used for a wide range of applications: as canopies and overhead glazings, as façades, balustrades, banister systems and fall hazard protection guards as well as

many other structures and constructions. The planning and execution of these designs often represents a major challenge for metal fabricators, with demanding system details challenging their skills and capabilities. Simply paying for the glass and mountings is not enough. Installers and fabricators also need to be able to rely on the support of the system supplier, often only the source of the necessary expertise. Approvals for glass constructions mounted on single-point fixings often have to be obtained on a case-by-case basis, and the costs involved are difficult to predict.

DORMA glass construction hardware not only meets the desire for maximum transparency but also ensures the necessary safety and reliability for the planning and implementation of sophisticated glass constructions. Our proven and patented RODAN, MANET CONSTRUCT and LOOP systems all come with the necessary basic structural analyses, type test certificates and reports, certificates of suitability, and certificates of general building approval (including European Technical Approvals/ETAs). Where application correlation can be evidenced, these simplify the downstream approval processes which may be neces-

sary. We also supply detailed technical documents to support each individual project, prepared in close consultation and through design collaborations with users of DORMA products. DORMA is a reliable system supplier and our in-house application engineers can be relied upon to provide effective technical support whenever questions, issues and problems arise. They will also assist users in obtaining necessary permits and approvals for each individual application – with DORMA products and the excellent design credentials that come with them, this is rarely a problem.



Glass as a building material

There is hardly another material that enjoys as much popularity with architects and construction engineers as glass. Within just a few decades, glass has developed from a simple window glazing element into a construction material which, through its enormous potential, has significantly influenced the further development of the building art. This fact is amply demonstrated by numerous spectacular structures in steel and glass which have either been constructed in the last few years or are currently at the planning and execution stages.

The reasons for this rapid evolution essentially lie in the technological developments that glass has undergone, leading to improved mechanical strength values and enhanced physical properties for building applications. Aside from glass being used in its primary guise as a containment and dividing material with the allure of high transparency, it is also now being increasingly applied as a load-bearing element. Consequently, glass has a high standing among the materials used in architecture.



Vanity Opera St. Petersburg

Glass as a load-bearing element

Transparent constructions in glass can be found today in virtually every area of architecture. Until recently, the material was primarily used as an ancillary adornment for applications such as façades, interior partitions or roof cladding, based solely on its ability to fill space. Glazing systems can be fixed to the substructure either by linear or point mounting arrangements. It is also possible to combine both processes.

The application of a point bearing system is currently not covered by general building regulations and, in Germany as in most countries, it is therefore subject to approval on a case-by-case

basis by the highest building supervisory authority of the administrative jurisdiction in which the application is made.

Now, a new concept has been introduced into the world of construction, namely that of “load-bearing glass”, which refers in effect to load-bearing structures of glass such as beams, supports, struts, bracing elements etc.

“Load-bearing transparency” means that glass as a construction material with all of its inherent advantages is structurally integrated not only within the primary support system of the glass application itself but also in

that of the building. Naturally, these constructions in glass need to meet the same safety standards as structures using conventional, proven building materials such as steel, timber or concrete. More than this, however, load-bearing glass constructions need to be able to withstand not only the standard stress load types such as wind, snow or impact but also the invidious scourge of vandalism.



Casino Stuttgart

Ebersbach
bus terminus



Overview of DORMA's range of glass construction hardware

Vertical glazing systems

Safety-relevant vertical glazing systems are said to exist in applications in which the assembly is inclined to the vertical by up to 10 degrees and the top edge is located more than 4 m above a pedestrian or wheeled traffic zone.

Consequently, shop windows and glass dividing walls are not generally subject to the same approval conditions as defined vertical glazing systems. This is because the danger of injury with such glazing systems is significantly lower in the event of failure than in the case of large-height glazing systems or overhead glazing systems.

DORMA systems suitable for vertical glazing

RODAN KH/KU/SKU/F
MANET CONSTRUCT
EA/ESA
LOOP

Overhead glazing systems

Overhead glazing systems are all those glass constructions which are inclined by more than 10 degrees to the vertical, including those with a smaller angle of inclination if they are required to absorb bending stresses and are secured by single-point fixings. With overhead glazing systems, residual load-bearing capacity analyses have to be carried out in addition to the usual static analyses.

In experiments, it has been discovered that glass panels secured with single-point fixings essentially exhibit a better level of residual load-bearing capacity than glazing

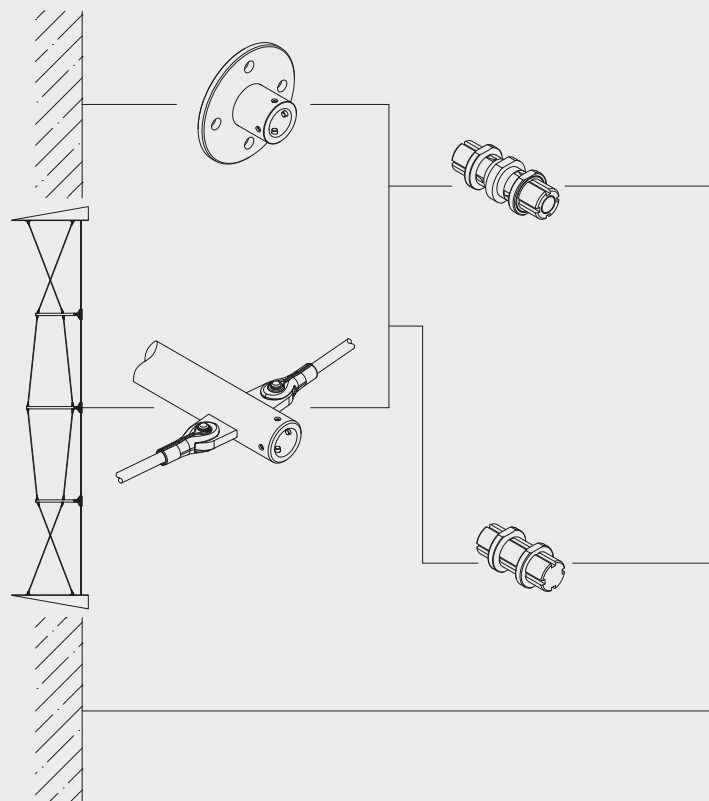
systems with linear bearing supports. The resistance of the single-point fixings to detachment is a decisive factor for residual load-bearing capacity. This resistance increases when disk-shaped mountings are used. Glass roof constructions with downwardly directed countersinking should be avoided.

DORMA systems suitable for overhead glazing

RODAN KH/KU/F
MANET CONSTRUCT EA



System structure



Fall protection safety glazing

Glass panels in stairwells, on parapets and in balustrades are often required to perform protective and safety functions.

This is the case if such glass applications between traffic zones protect a height differential of more than 1m. Because there is the danger of people impacting the glazing and falling through, the load-bearing capacity of the glass elements must be appropriately verified for impulsive and impact loading.

In order to obtain approval, mechanical tests have to be carried out in individual cases in order to investigate the system behaviour on im-

part and fracture.

The general rule reads: The greater the rigidity of the impact surface, the higher the likelihood of fracture.

Consequently, where glass panels are used for fall hazard protection, a resilient bearing system has to be generally applied such as that available with the MANET CONSTRUCT EV system.

DORMA systems suitable for fall hazard protection

**RODAN KH/KU/F
MANET CONSTRUCT EA/
Series EV**

Traffic-accessible/step-on glazing systems

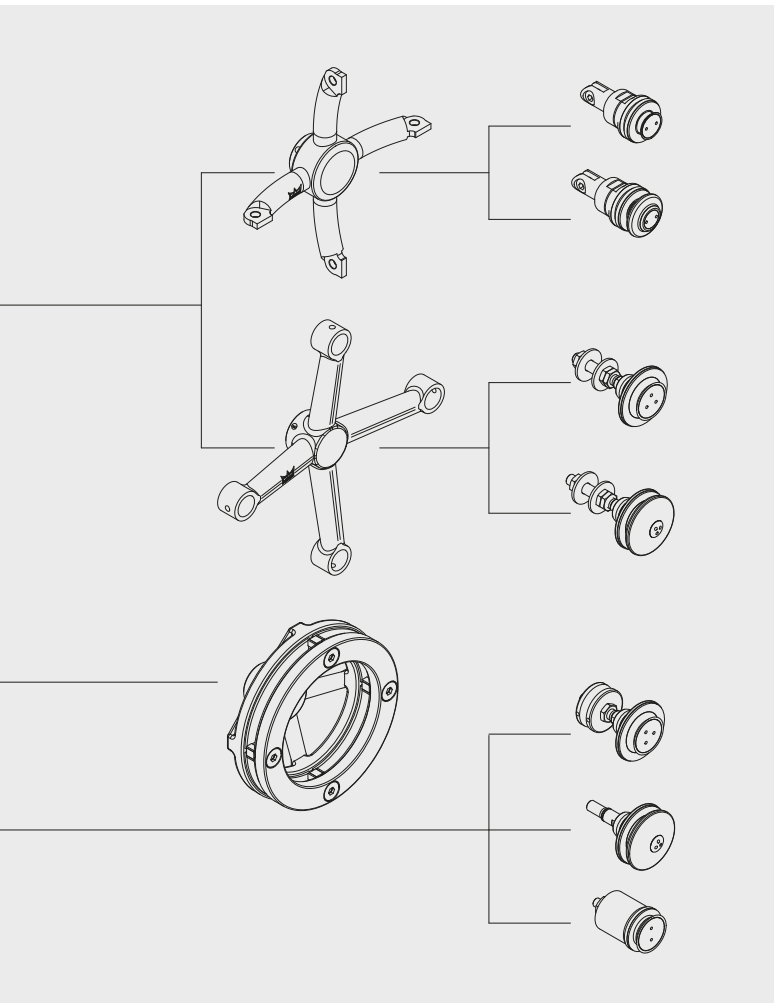
With glass elements, there is a distinction between step-on load-bearing capacity and the higher requirement of traffic accessibility. The need for step-on load-bearing capacity applies to glazing systems which are only intended to be accessible for erection, maintenance or cleaning work. If a continual or recurring live load has to be supported – such as in the case of public usage – we speak of traffic accessibility.

Traffic-accessible glass components must offer sufficient protection against falling objects (impact loading).

This means that the glass component, on impact, must not completely fracture and must certainly not be penetrated by the falling object. And such glazing systems must, of course, also be able to reliably bear their own weight and that of live loads or other bodies acting upon them without falling onto the traffic area below.

DORMA systems suitable for step-on/traffic-accessible glazing systems

**RODAN KH/KU/SKU/F
MANET CONSTRUCT EA/
Series EV**





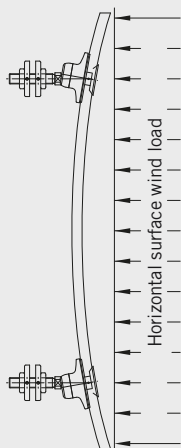
Types of point bearing support

1. Point of articulation in/at the glass (free articulation)

Because the point of articulation is within the plane of the glass panel, the deadweight of the glass G does not give rise to any additional stresses at the fitting.

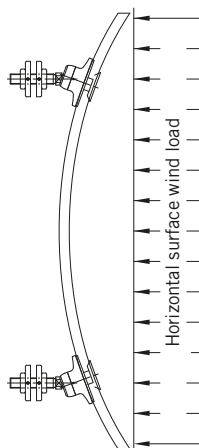
Consequently, the glass does not need to absorb any differential torque occurring at the point fixing.

When using an articulated fitting, the glass thickness can be reduced to a minimum.



2. Point of articulation outside the glass plane (free articulation)

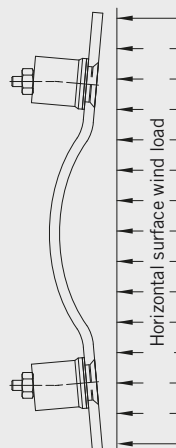
The glass has to absorb the differential torque arising from the eccentricity ($M = G \times e$) at the point fixing. This gives rise to high stresses in the area of the glass around the fitting, which has an effect on the glass thickness needed.



3. Flexibly articulated fittings

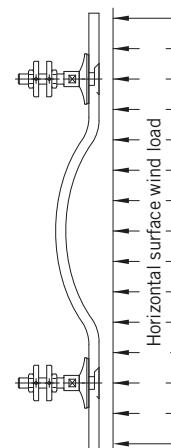
Through the use of a flexible fitting that is not freely rotating within the point-fixed construction, it is possible to fill the gap between an ideally articulated and a rigidly clamped glass fitting system. This gives rise to a reduced degree of glass deformation across the span combined with a reduction in glass stresses in the area of the fitting bore, enabling the achievement of more economic glass dimensioning.

As a positive side effect, the flexibility directly vertical to the glass panel plane in the event of impact loads (e.g. in fall protection glazing systems) means that high, brief and sudden loads can be cushioned by fitting deformation.



4. Rigid, non-articulated fitting

The ability of the glass to rotate is hindered. This gives rise to very high stress peaks around the rigid point fittings in terms of load per unit area. A cogent static analysis of the glazing panels would result in the requirement to either drastically reduce the spans between the fittings or to use very thick panels.



Interaction of fittings and glass and how this affects dimensioning requirements:

1. Articulated fittings

– point of rotation in the glass

2. Articulated fittings

– point of rotation outside the glass plane

3. Flexible fittings

4. Rigid mountings