

Concepts

Products

Service

# Lindner ECO<sup>®</sup> Facade



**Lindner**

Building New Solutions

# Building new solutions.

Lindner undertakes major worldwide projects in all areas of interior finishes, insulation technology, industrial services and building facades. From pre-planning through to project completion Lindner is your partner of choice.

The Company's extensive manufacturing capability enables quality to be strictly maintained whilst allowing maximum flexibility to meet individual project requirements.

Environmental considerations are fundamental to all Lindner's business principles.

Through partnerships with clients Lindner turns concepts into reality.

## Choosing Lindner you have.

### Lindner Concepts:

Tailored solutions specifically geared to satisfy individual project requirements.

### Lindner Products:

Quality materials and systems to the very highest industry standards.

### Lindner Service:

Comprehensive project management services.

# The Element.

# The ECO®.

# The benchmark.

Lindner ECO® facade as unitised curtain wall system – a new standard in sustainability.

## **Your benefits at a single glance**

- Outstanding heat insulation due to a novel thermal break
- High-capacity production for high quality and short lead-in time
- Fast and safe installation
- Innovative ecological qualities
- High structural load capacity

# Benefits

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# Lindner ECO<sup>®</sup> facade as unitised curtain wall system.

To cope with higher standards for sustainable building innovative solutions are required.

The newly developed Lindner ECO<sup>®</sup> facade system sets new standards by combining maximum thermal insulation with the benefits of prefabricated element design. At the end of the life cycle disassembling the elements is as easy as assembling them and all materials can be reused or recycled – a fact that is evermore important for the sustainability of a project.

Assembly simulation of  
Lindner ECO<sup>®</sup> Facade

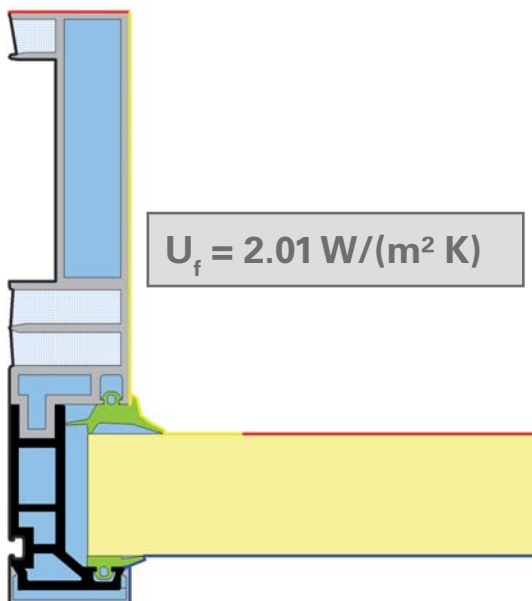


# Novel thermal break concept.

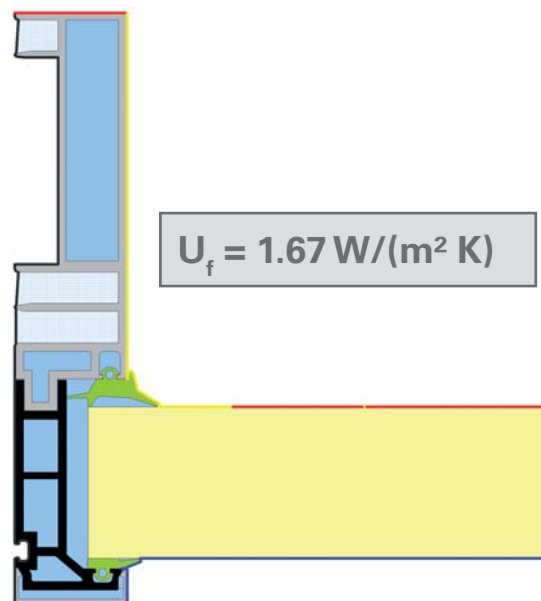
The main item of the system is the novel thermal break which has been patented. The glass panel of a Lindner ECO® facade is packed in an insulating – but thereby high-tensile – material. For this reason waste of energy is decreased effectively. The unitised curtain wall system has an excellent  $U_f$  value (to DIN EN ISO 10077 – part 2). In combination with

a double glazing unit the current requirements of EnEV 2009 can be met. By using triple glazed units future limits, which are expected to be considerably more stringent, won't be a problem! (Calculation of a specific overall situation ( $U_{cw}$  to EN 13947: 2007-03) on demand)

**Lindner ECO® with 33 mm thick glazing (double glazing)**



**Lindner ECO® with 47 mm thick glazing (triple glazing)**

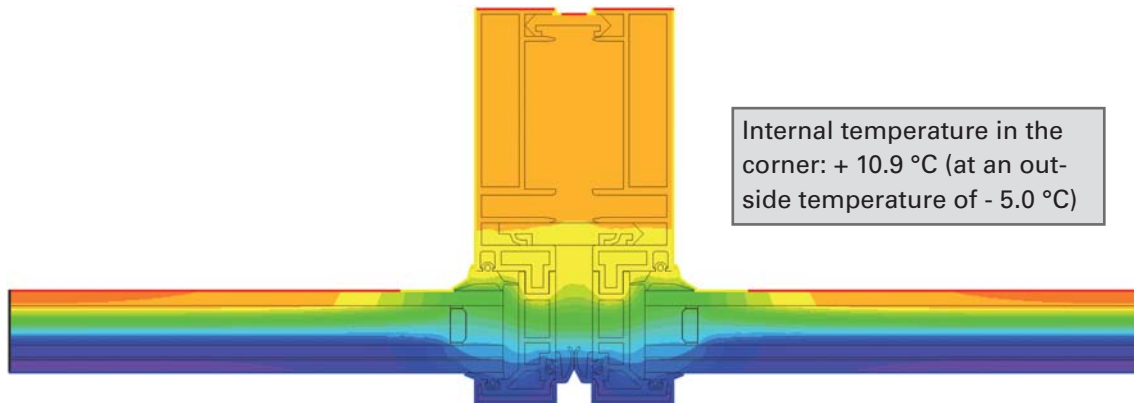


# Outstanding heat insulation.

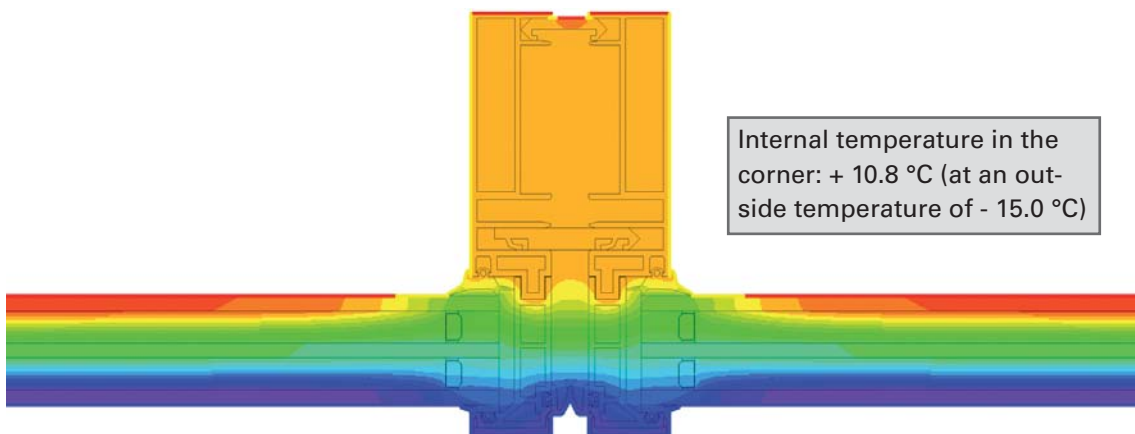
The benefits of the novel high-thermal break are particularly significant when comparing the internal temperatures in the most critical and condensation-

prone corners with usual systems at very low outside door temperatures:

## Lindner ECO® with 33 mm thick glazing (double glazing)



## Lindner ECO® with 47 mm thick glazing (triple glazing)



For comparison, conventional glazing systems, with double glazing incorporating aluminium spacer tubes, other things being equal, have an internal

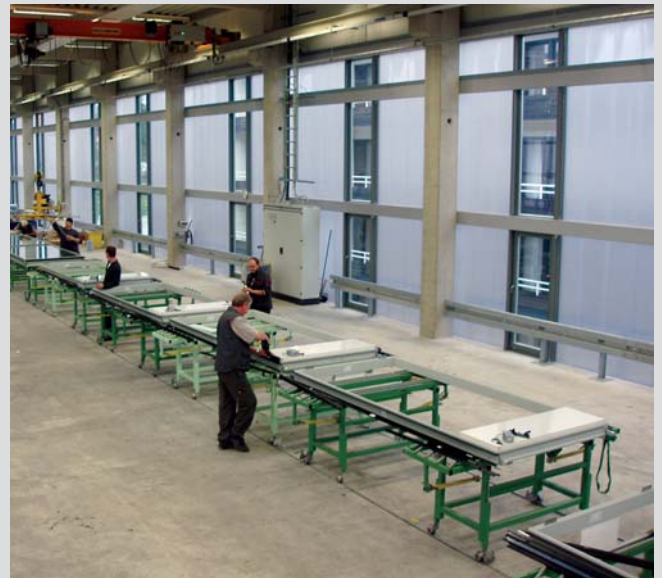
temperature that is 3 – 4 °C lower. These lower temperatures cause a high probability of condensation at the corner!



# High-capacity production.



Lindner Facade Group has ultra-modern production halls with a total of 29,000 square metres of production area which went on line in 2006. Since 2009 facade components are deposited in a new fully automatic high rack profile warehouse. Prefabrication by Lindner of ECO® facade ensures excellent quality of manufacturing together with high flexibility, operating efficiency and rapid production.







Head quarter of the Lindner Group, Arnstorf.

The total size of the site is 115,000 square metres.

Crucial to the successful realisation of a project is meeting deadlines.  
We offer sophisticated logistics and extensive production capacities to achieve  
a maximum of flexibility and reliable delivery.

# Fast and safe assembly.



**ECO® facade has been developed as a unitised curtain wall system.  
The advantages are clear:**

- Extremely fast assembling, thereby quicker completion of a building project
- Less need of storage areas on site
- Excellent adherence to delivery dates by less dependence on weather
- Earlier interior fit out through assembling level by level
- Assembly errors reduced to a minimum
- Extraordinary quality by prefabrication in the factory

# Innovative ecological qualities.

Lindner ECO® facade offers ecological benefits which have been documented by the EPD (Environmental Product Declaration) and the LCA (Life Cycle Assessment).

Thus we are able to make detailed statements about the environmental impact of the facade during its entire life cycle (from production through utilisation phase to disposal). Lindner ECO® system is well prepared for even more stringent environmental specifications anticipated in the future, including DGNB (German Sustainable Building Council) and

LEED (Leadership in Energy and Environmental Design) certifications. On application it's possible to make a project-specific assessment concerning the environmental impact of particular components as created for the Life Cycle Assessment. The Assessment according to ISO 14040/ ISO 14044 have been drawn up by a neutral nameable internationally renowned institute and provides the following information:

Lindner ECO® Facade			Type of element		
Parameter		Unit	Type 100	Type 110	Type 130
Global Warming Potential (GWP)		kg CO <sub>2</sub> - eqv./ m <sup>2</sup>	94.99	81.67	119.06
Acidification Potential (AP)		kg SO <sub>2</sub> - eqv./ m <sup>2</sup>	0.30	0.19	0.31
Nitrification Potential (EP) (over-fertilization)		kg PO <sub>4</sub> - eqv./ m <sup>2</sup>	4.49E-02	2.20E-02	3.89E-02
Photochemical Ozone Creation Potential (POCP)		kg C <sub>2</sub> H <sub>4</sub> (Ethen) - eqv./m <sup>2</sup>	2.49E-02	1.39E-02	2.59E-02
Ozone Depletion Potential (ODP)		kg R11 (cooling agent) - eqv./m <sup>2</sup>	5.20E-06	8.38E-06	1.97E-05
Abiotic Depletion Potential (ADP)		kg Sb (Antimon) - eqv./m <sup>2</sup>	0.52	0.43	0.65
Primary energy demand	renewable	MJ	56.20	96.15	116.96
	nonrenewable	MJ	1286.40	1202.62	1727.35

Data refer to 1 m<sup>2</sup> of facade, the whole life cycle was considered (production, transportation for utilization, disposal).  
For illustration of different façade element types, see page 16.

Careful material selection, in accordance with DGNB and LEED criteria leads to ECO® facade systems being highly sustainable.



Environmental Product Declaration according to ISO 14021  
Life Cycle Assessment according to ISO 14040/ISO 14044  
Production according to ISO 14001

# Innovative ecological qualities.

DGNB certification for new buildings, offices and administration buildings, dated 2009.

Criteria which can be influenced positively by the Lindner ECO® facade.

Characteristics		Explanation
<b>Ecological Quality</b>		
6	Risks for the local environment	During the choice of the materials for Lindner ECO® Facade attention was paid to their environmental compability. All materials conform with the requirements of the highest quality classification four.
<b>Economical Quality</b>		
16	Building related costs during a life cycle	Well engineered technical solutions for the ECO® Facade enable a significant decrease of building energy demand
<b>Socio-cultural and Functional Quality</b>		
18	Thermal comfort in winter	High indoor temperatures at the critical corner areas, which are well above the minimum value, can be achieved through highly insulating frame constructions of the element facade combined with excellent insulation glass.
19	Thermal comfort in summer	Integrable sunblind-systems, special glass coatings and opening windows support individual thermal comfort during summer time.
20	Indoor air hygiene	All materials of the Lindner ECO® facade have very low or no VOC-content. Materials containing VOC make up less than 1 % by weight of a facade element and are always clearly under the required limits.
22	Visual comfort	Depending on type and proportion of glazing as well as on the construction, it is possible to provide daylight for a major part of the building.
23	Control-possiblity of user	Integral opening windows allow room by room and zonal influence of air exchange, separately operated sunblinds provide glare reduction and sun-protection.
28	Change of floor plans	Due to the modular construction of the ECO® facade, changes of floor plan layouts can be done with comparably little effort.

Characteristics		Explanation
<b>Technical Quality</b>		
33	Fire protection	The facade mainly consists of incombustible materials like glass, aluminium and steel. The choice of material aids not only the realization of high fire ratings but also reduces the emission of noxious smoke.
34	Sound proofing	Depending on glazing and location of a building the facade construction exceeds in most of the noise scenarios the requirements according to DIN 4109 by 1 dB.
35	Heat insulation and moisture proofing quality of the building shell	By using Lindner ECO® facade heat flow rates are reduced to a minimum as a result of the excellent insulation value. Furthermore the construction with the patent-registered glass or glazing system avoids the usual thermal bridge associated with aluminium facades.
40	Cleanability and ease of maintenance of the building	To minimise effort in cleaning, extreme weather-proof materials are used and easily cleanable constructions are realized.
42	Deconstruction, ease of recycling, ease of dismantling	ECO® system is designed to allow rapid and easy dismantling as well as recycling of materials.

# Innovative ecological qualities.

**LEED certification for new buildings and renovation, dated 2009.  
Criteria which can be influenced positively by the Lindner ECO® facade.**

Credit / Prerequisite		Explanation
<b>Energy &amp; Atmosphere</b>		
SSc8	Light Pollution Reduction	The radiation of the interior lightning on the immediate environment can be reduced by the optional installation of blinds on the Lindner ECO® facade.
EAp2	Minimum Energy Performance	Excellent thermal insulation values of the Lindner ECO® facade meet the demands of this credit concerning energy consumption.
EAc1	Optimize Energy Performance	Various components such as the patent-registered glazing systems or special glass coatings help to reduce the building energy demand.
EAc2	On-Site Renewable Energy	The construction of the facade provides the opportunity to integrate photovoltaic modules to generate energy.
MRc2	Construction Waste Management	Due to great experience in developing construction-waste-management-plans, Lindner is able to achieve high recycling rates. The high prefabrication of the element facade is advantageously in reducing waste.
MRc4	Recycled Content	The Lindner ECO® facade mainly consists of glass, aluminium and steel. With the associated high recycling rates it is made up of over 20 % recycled materials.
MRc5	Regional Materials	Global activities of the Linder Group require a diversified network of suppliers and local suppliers are used where feasible.
EQc4.1	Low-Emitting Materials - Adhesives and Sealants	Materials of the element facade containing VOC make up less than 1 % by weight. The few existing VOC are far below permitted limits.



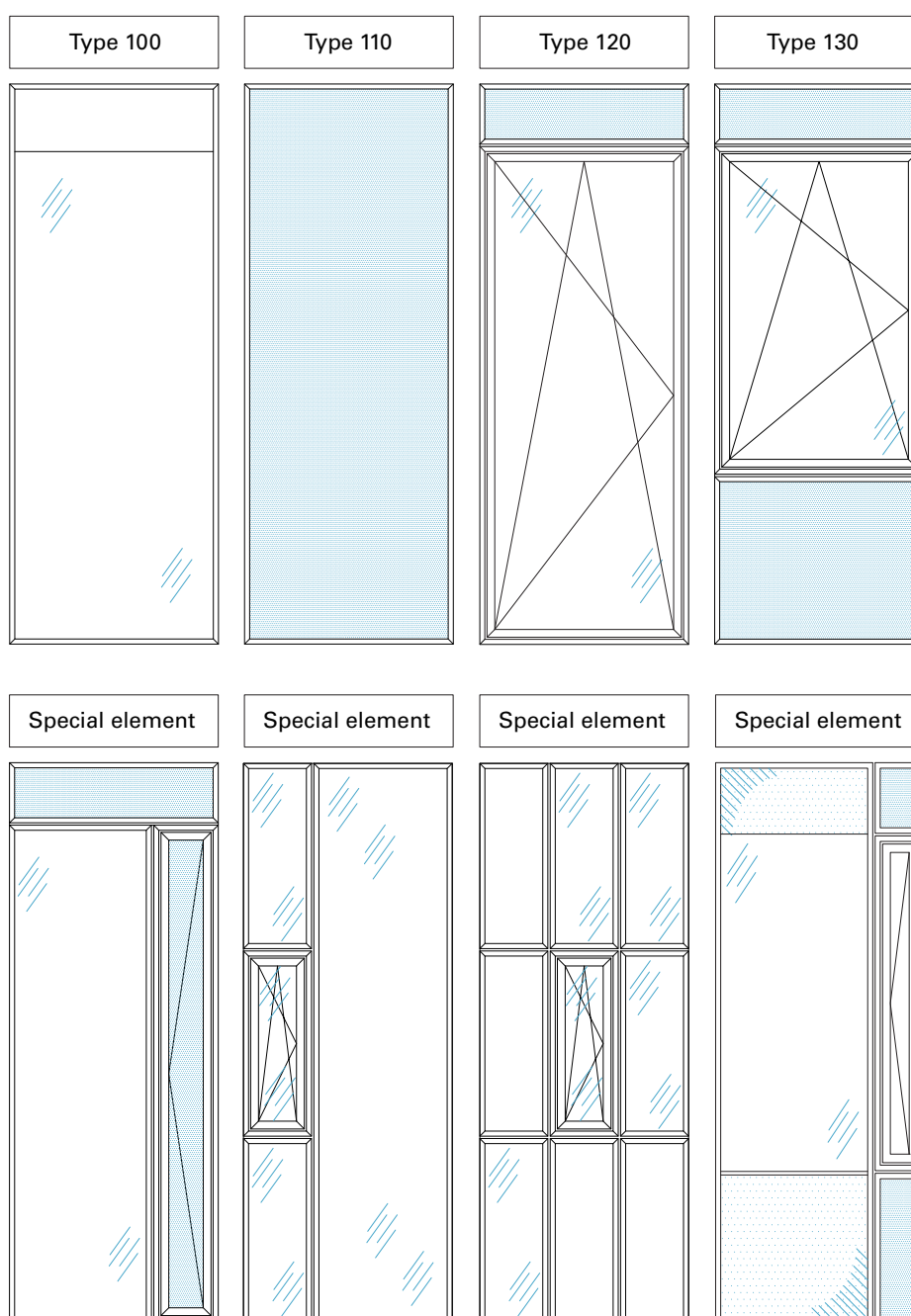
Credit / Prerequisite		Explanation
EQc4.2	Low-Emitting Materials - Paints and Coatings	For Lindner ECO® facade there are only coatings in use that contain no VOC.
EQc6.2	Controllability of Systems - Thermal Comfort	Element by element operated sunblind-systems as well as opening windows allow an individual regulation of room- and radiation temperature.
EQc7.1	Thermal Comfort - Design	Company expertise in areas of climate technology enables Lindner Group to integrate the ECO® facade during the planning phase of a project into a coordinated design or thermal comfort.
EQc8.1	Daylight and Views - Daylight	Depending on type and proportion of glazing as well as on the construction, it is possible to provide daylight for the majority of users.
EQc8.2	Daylight and Views - Views	With a type 100 facade construction a maximum line of sight to the outside can be assured.
IDc1.1	Innovation in Design	Project specific there's the possibility to score this credit by using innovative products such as the patent-registered thermal break of the Lindner ECO® Facade.



# Costumer focused design.

Lindner ECO® Facades meet the highest standards of appearance, engineering and economy. Following drawing show an extract of the possible element types.

In addition the visible outer cover caps are highly variable in design and can be made out of different materials such as stainless steel or brass!



Bespoke facade based on Lindner ECO® combined with vertically and horizontally extending fins and a ventilation panel with a glass panel outside.

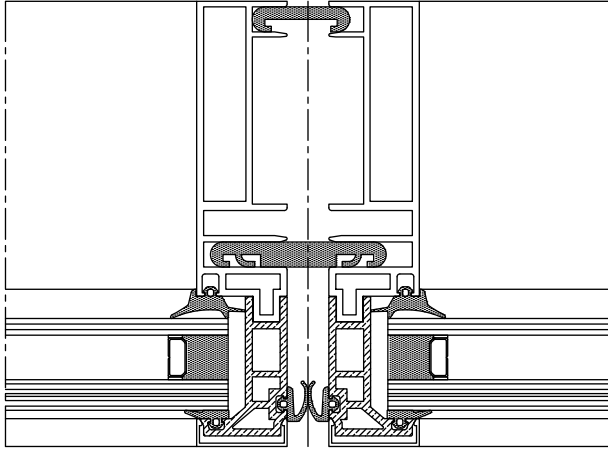
View from inside



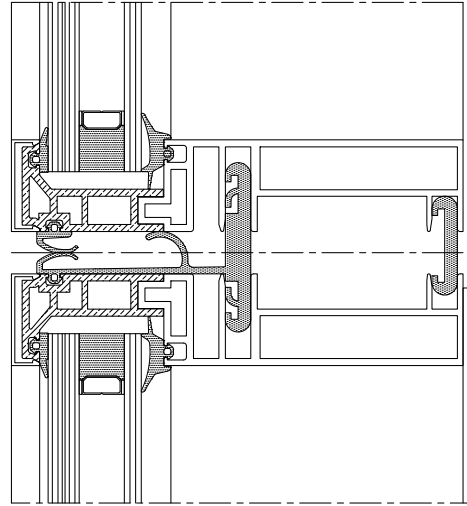
View from outside



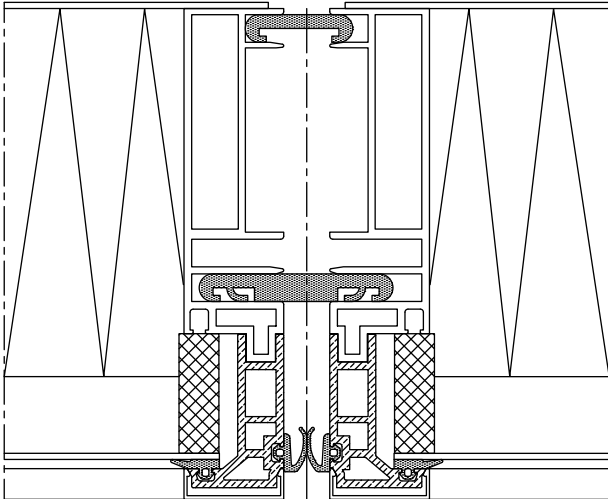
# Well-engineered details.



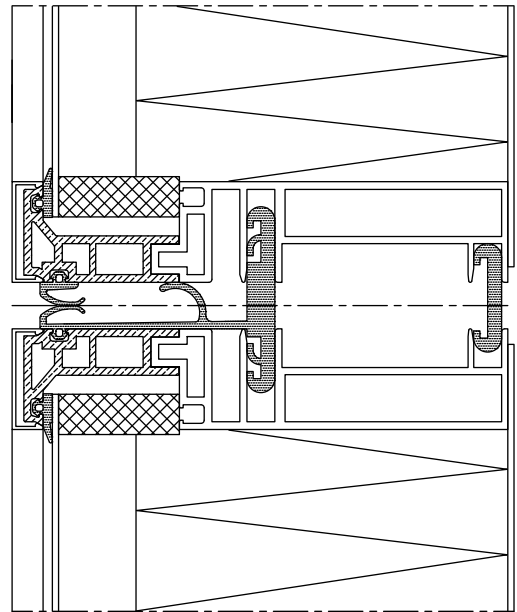
Horizontal section frame capped/capped



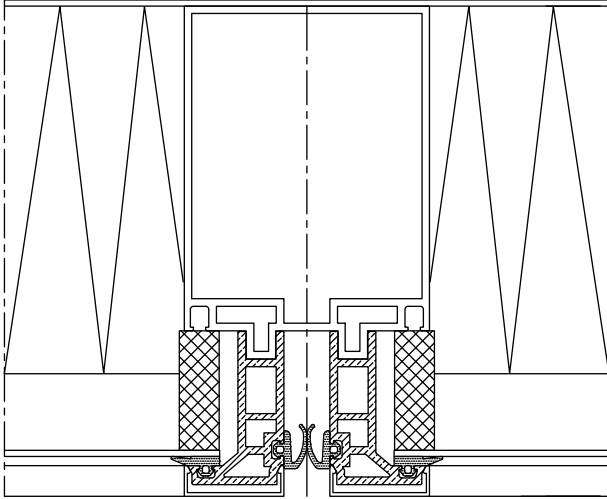
Vertical section frame capped/capped



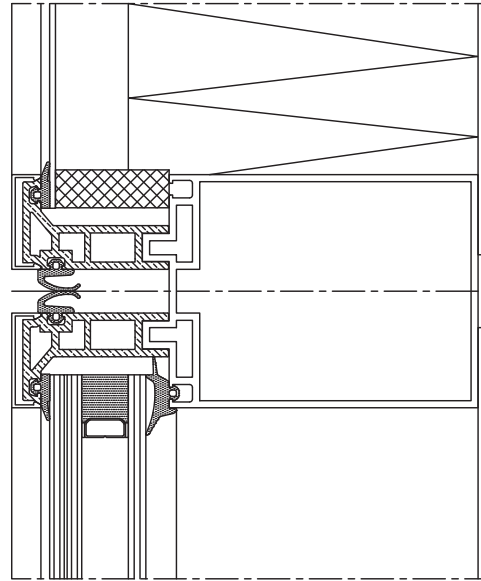
Horizontal section frame panel/panel



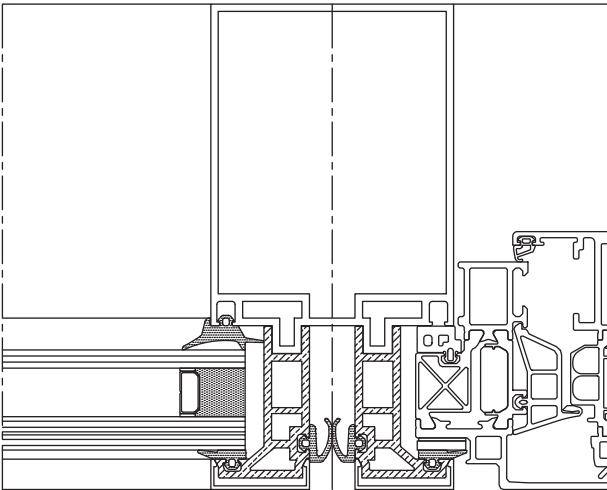
Vertical section frame panel/panel



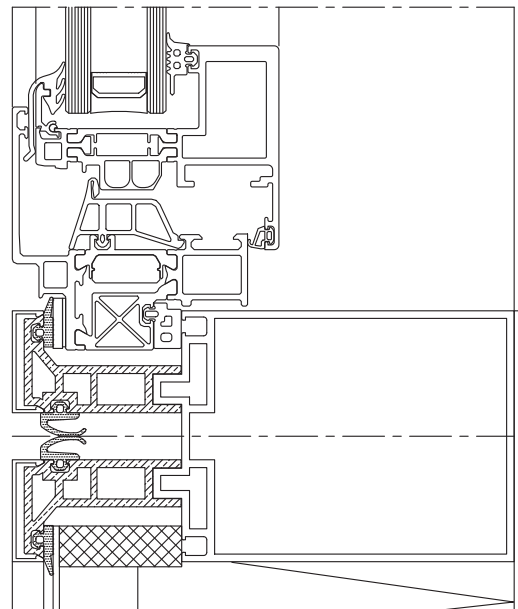
Horizontal section intermediate mullion panel/panel



Vertical section intermediate transom panel/panel

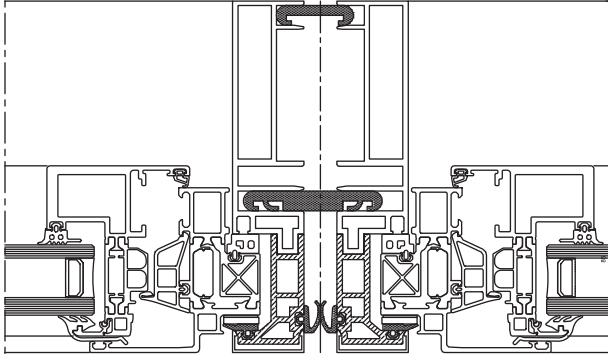


Horizontal section intermediate mullion capped/sash

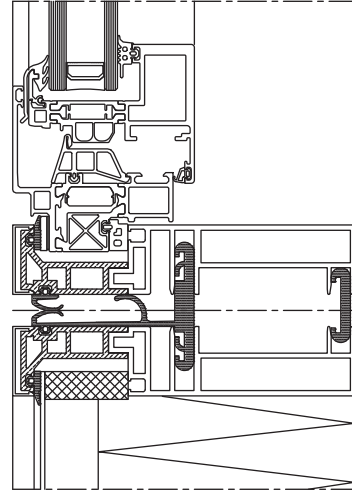


Vertical section intermediate transom sash/panel

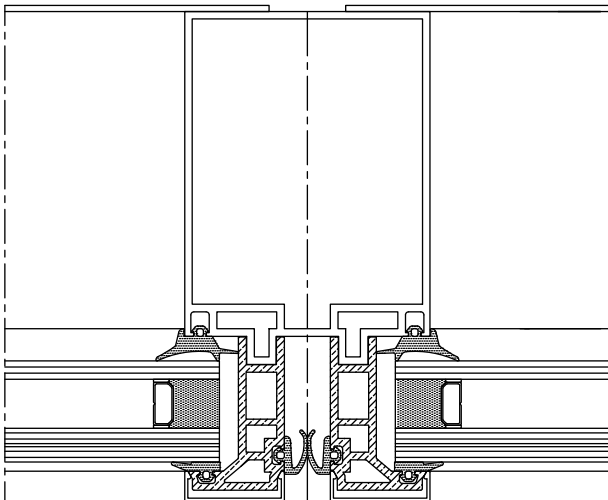
# Well-engineered details.



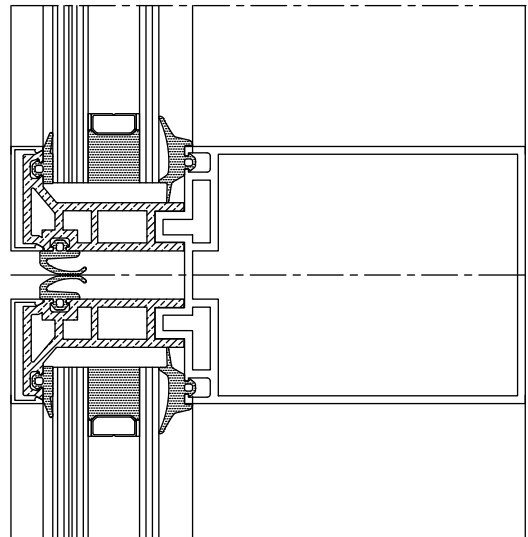
Horizontal section frame vent/vent



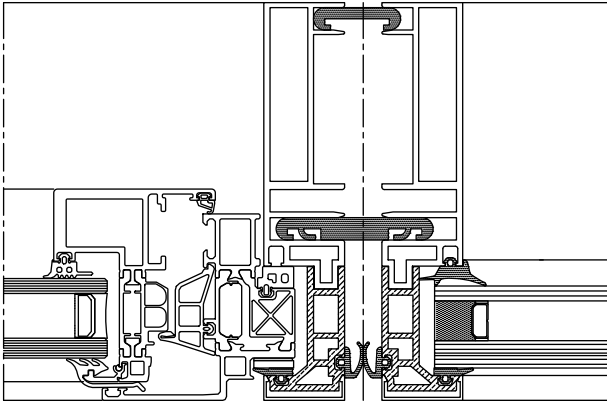
Vertical section frame vent/panel



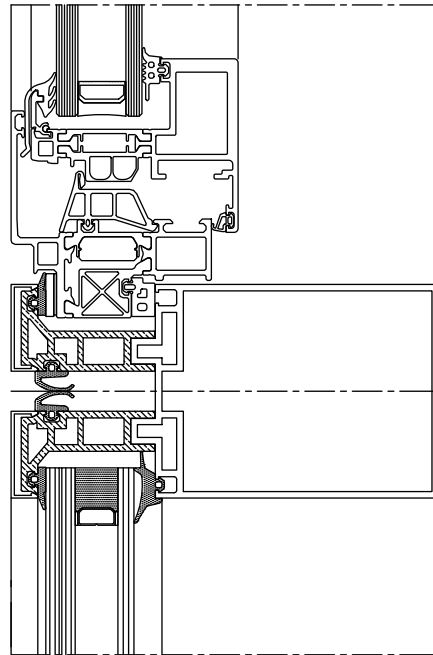
Horizontal section intermediate mullion capped/capped



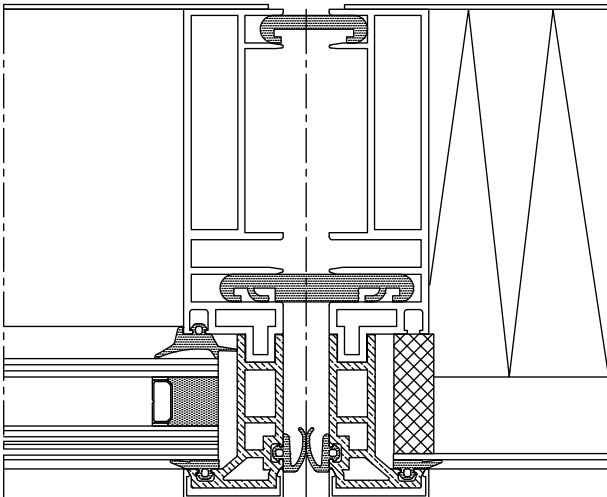
Vertical section intermediate transom capped/capped



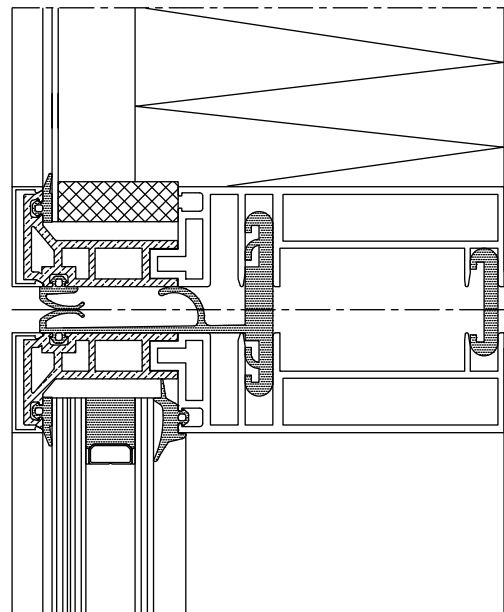
Horizontal section frame vent/capped



Vertical section frame vent/capped

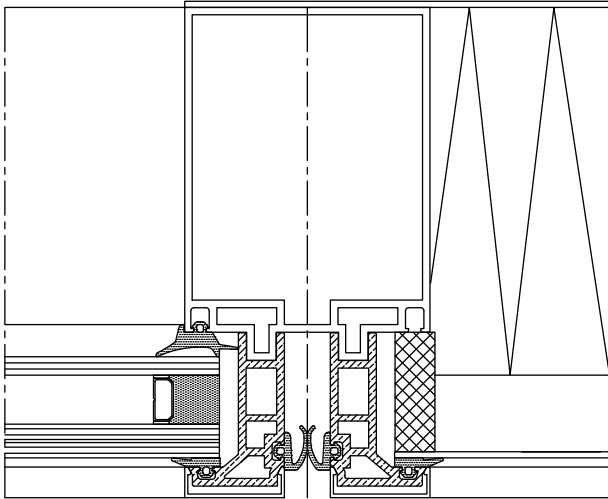


Horizontal section frame capped/panel

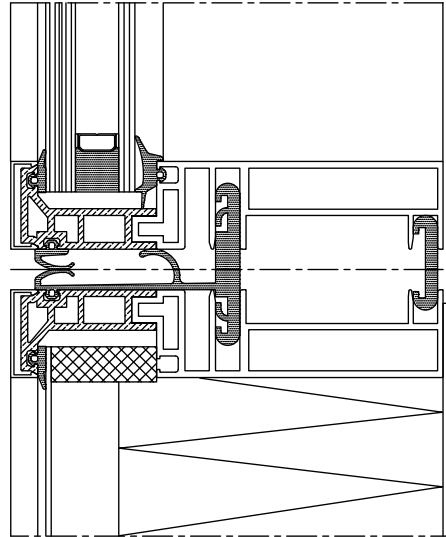


Vertical section frame capped/panel

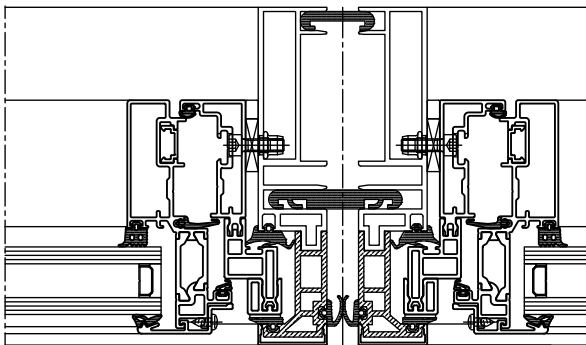
# Well-engineered details.



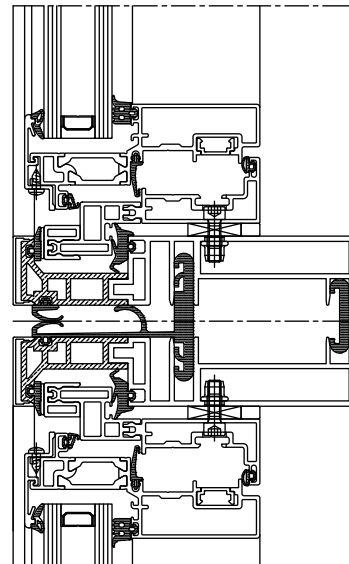
Horizontal section intermediate mullion capped/panel



Vertical section frame vent/panel

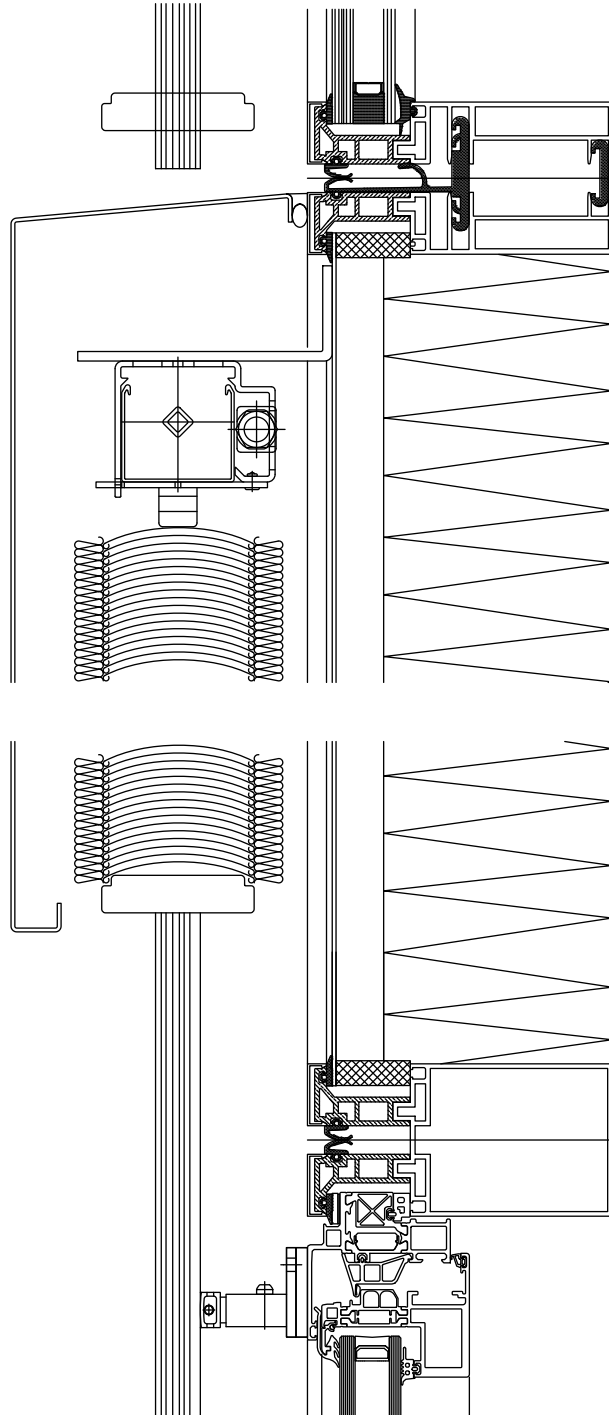


Horizontal section vent opening to the outside



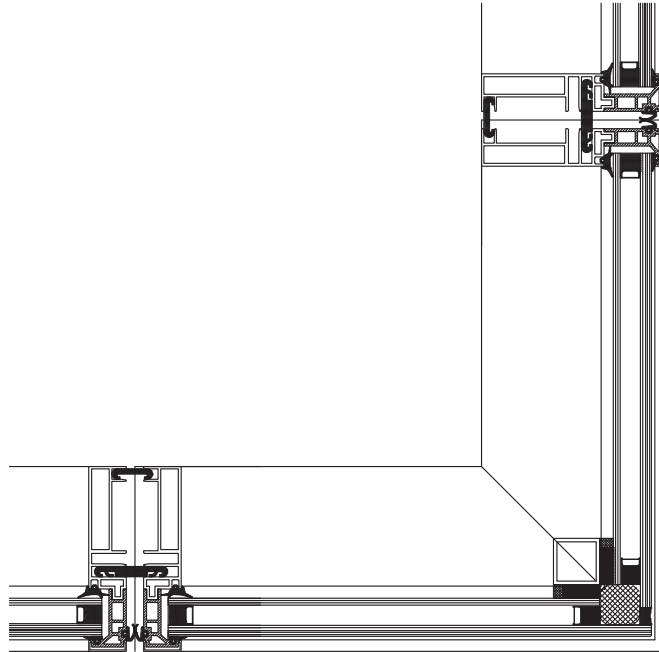
Vertical section vent opening to the outside



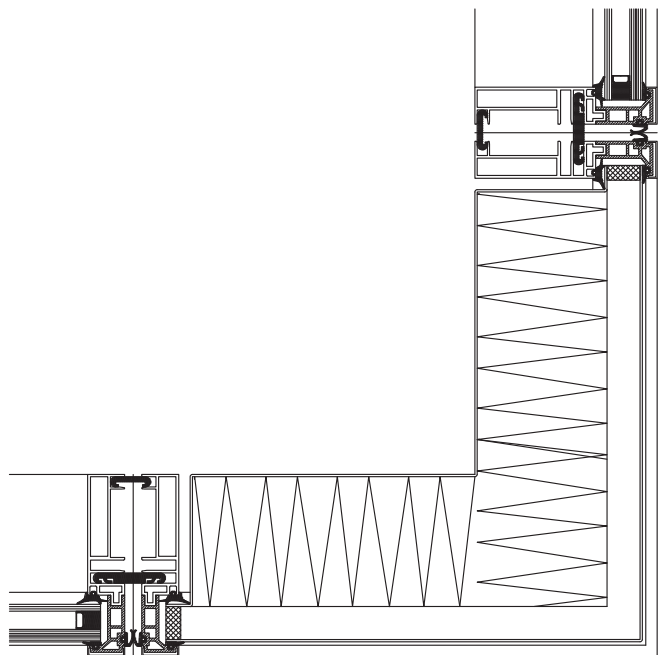


Integrated sunblind-system

# Well-engineered details.



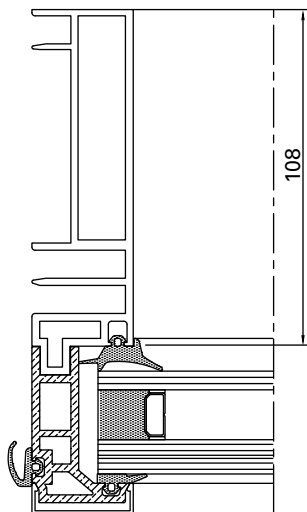
Glazed corner element



Metal sheet cladding for corner element

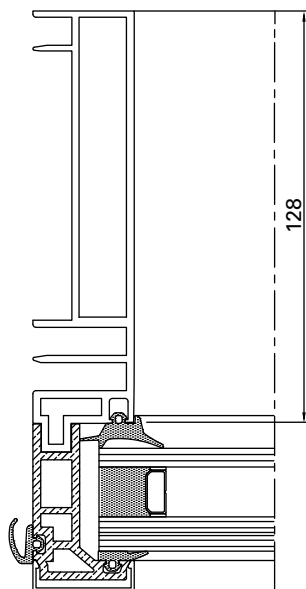
# High structural load capacity.

Different types of profiles



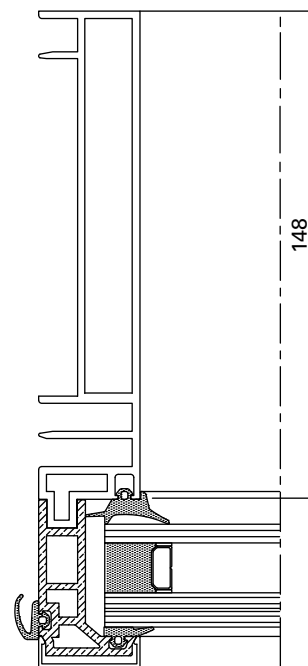
**Profile M 108**

 Profile M 108



**Profile M 128**

 Profile M 128



**Profile M 148**

 Profile M 148

The static load capacity of the profile types shown here is described in detail in subsequent tables.

# High structural load capacity.

Accommodate wind load

Wind load	Element height [m]	Element width, [m]						
		1.2	1.3	1.4	1.5	1.6	1.7	1.8
1.0 kN/m <sup>2</sup>	3.2							
	3.3							
	3.4							
	3.5							
	3.6							
	3.7							
	3.8							
	3.9							
	4.0							
1.2 kN/m <sup>2</sup>	3.2							
	3.3							
	3.4							
	3.5							
	3.6							
	3.7							
	3.8							
	3.9							
	4.0							
1.4 kN/m <sup>2</sup>	3.2							
	3.3							
	3.4							
	3.5							
	3.6							
	3.7							
	3.8							
	3.9							
	4.0							

Descriptions are values based on the standard version; project-related values upon request

Wind load	Element height [m]	Element width, [m]						
		1.2	1.3	1.4	1.5	1.6	1.7	1.8
1.6 kN/m <sup>2</sup>	3.2							
	3.3							
	3.4							
	3.5							
	3.6							
	3.7							
	3.8							
	3.9							
	4.0							
1.8 kN/m <sup>2</sup>	3.2							
	3.3							
	3.4							
	3.5							
	3.6							
	3.7							
	3.8							
	3.9							
	4.0							

Profile M 108

Profile M 128

Profile M 148

Descriptions are values based on the standard version; project-related values upon request

# High structural load capacity.

## Glass weight

Weight per unit area 30 - 40 kg/m<sup>2</sup>

Glass weight	Glazing height, h <sub>1</sub> [m]	Glazing width, B [m]						
		1.2	1.3	1.4	1.5	1.6	1.7	1.8
<b>30 kg/m<sup>2</sup></b>  12 mm thick glazing - single glazed	2.2							
	2.4							
	2.6							
	2.8							
	3.0							
	3.2							
	3.4							
	3.6							
	3.8							
	4.0							
<b>40 kg/m<sup>2</sup></b>  16 mm thick glazing - double glazed	2.2							
	2.4							
	2.6							
	2.8							
	3.0							
	3.2							
	3.4							
	3.6							
	3.8							
	4.0							



Profile M 108



Profile M 128



Profile M 148

Descriptions are values based on the standard version; project-related values upon request

## Weight per unit area 45 - 55 kg/m<sup>2</sup>

Glass weight	Glazing height, h <sub>1</sub> [m]	Glazing width, B [m]						
		1.2	1.3	1.4	1.5	1.6	1.7	1.8
<b>45 kg/m<sup>2</sup></b>  18 mm thick glazing - double glazed - triple glazed	2.2							
	2.4							
	2.6							
	2.8							
	3.0							
	3.2							
	3.4							
	3.6							
	3.8							
	4.0							
<b>50 kg/m<sup>2</sup></b>  20 mm thick glazing - double glazed - triple glazed	2.2							
	2.4							
	2.6							
	2.8							
	3.0							
	3.2							
	3.4							
	3.6							
	3.8							
	4.0							
<b>55 kg/m<sup>2</sup></b>  22 mm thick glazing - triple glazed	2.2							
	2.4							
	2.6							
	2.8							
	3.0							
	3.2							
	3.4							

Descriptions are values based on the standard version; project-related values upon request



# Overview of technical specifications.

The typical static and thermal assessments below were done by the research and development department of the Lindner Group. For project particular

requirements we are able to check quickly and easily the technical feasibility of customer requirements for acoustics and thermal performance.

		Lindner ECO® with 2-pane insulating glass	Lindner ECO® with 3-pane insulating glass
Max. element size (WxH) different dimensions on demand		1350 mm x 3600 mm	1350 mm x 3600 mm
Sight lines		32.5 mm	32.5 mm
Standard system depth		160 mm	174 mm
Glazing unit thickness		33 mm	47 mm
Same frame profiles all around		Yes	Yes
Corner joints		screwed	screwed
Thermal brake		screwed	screwed
Thermal	$U_{cw}$	1.4 W/m <sup>2</sup> K <sub>1)</sub>	1.0 W/m <sup>2</sup> K <sub>1)</sub>
Transmission	$U_f$	2.0 W/m <sup>2</sup> K <sub>2)</sub>	1.7 W/m <sup>2</sup> K <sub>2)</sub>
	$U_g$	1.1 W/m <sup>2</sup> K <sub>3)</sub>	0.7 W/m <sup>2</sup> K <sub>3)</sub>
Gasket system		Shelf gasket	Shelf gasket
Gaskets in EPDM		3 lines of defence	3 lines of defence
Resistance to wind load DIN EN 13116		Design wind load	+/- 1.2 kN/m <sup>2</sup>
		Increased load	+/- 1.8 kN/m <sup>2</sup>
Water-tightness	DIN EN 12154	RE <sub>1050</sub> (1050 Pa)	
Air permeability	DIN EN 12152	AE (750 Pa)	
Sound reduction index	$R_{w,r}$ DIN 4109	36 - 40 dB <sub>3)</sub>	
Sun-protection		optional	
Barrier load glazing		optional	

1) According to DIN EN 13947, depending on dimensions and design, lower values possible, project-related calculation

2) According to DIN EN ISO 10077

3) Depending on quality of glazing

All values based on the standard version, other performance characteristics on demand

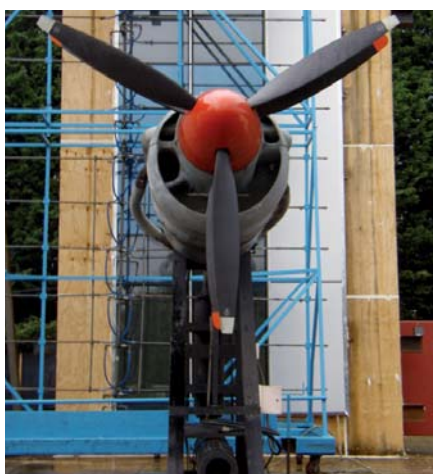
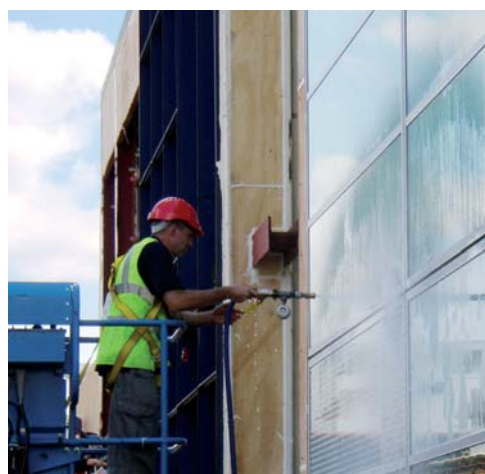
In order to meet highest customer specifications the physical properties of the standard and special elements of Lindner ECO® facade are tested in the company's own test rig. We are able to test for wind and weather performance and fire resistance. In addition, we have our own TÜV-certified laboratories where we are able to test sound protection insulation. Over and above that we use external institutes for further detailed tests. Because our strength is "Building new solutions" we can readily meet all customer requirements.



Lindners in-house facade test facility

Possible tests (according to international standards) at the company's test stand or at external certified institutes:

Kind of test	Test according to	Classification according to
<b>Window</b>		
Resistance to wind load	EN 12211	EN 12210
Air permeability	EN 1026	EN 12207
Water-tightness	EN 1027	EN 12208
<b>Curtain wall</b>		
Resistance to wind load	EN 12179	EN 13116
Air permeability	EN 12153	EN 12152
Water-tightness	EN 12155	EN 12154



Different weathering tests at the Technology Centre VINCI Construction UK

## We can do it all for you.

### Lindner Concepts:

- Insulation Engineering and Industrial Service
- Clean Rooms and Laboratories
- Airports and Airlines
- Railways and Tunnels
- Studios and Concert Halls
- Interior Fit-out and Furnishings
- Cruise Liner and Ship Fit-out
- Hotels and Resorts
- General Contracting

### Lindner Products:

- Facades
- Ceiling Systems
- Lights and Lighting Systems
- Partition Systems
- Doors
- Floor Systems
- Heating and Cooling Technologies
- Dry Lining Systems

### Lindner Service:

- Green Building
- Deconstruction and Gutting
- Clearance of Harmful Substances
- Research and Development
- Delivery
- General Planning
- Installation
- Maintenance
- Public-Private Partnership (PPP)

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