

Exterior Solid Surface Material

HI·MACS

TDS - TECHNICAL DATA SHEET HIMACS EXTERIA FACADE 2022

Design: Woo-jin LIM AEV Architectures, aev-architectures.com © AEV Architectures

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HI·MACS

TDS – TECHNICAL DATA SHEET

HIMACS EXTERIA FACADE 2022 PART 1



Design: Kohler Architekten
Fabrication: Peter Knapp Dach und Fassadentechnik
GmbH Abait Elementos Moldeados, Peter Grube
© Nikolaus Herrmann

■ Foreword

It is essential for HIMACS panels to be used, to be fabricated and to be installed according to its application and Designer needs.

There is a wide range of HIMACS panels up to a thickness of 20mm available products.

In this Technical guide it is assume that all fundamental principles of HIMACS fabrication are well known and handled accordingly to the standard fabrication and installation guidelines as well as assumed a professional understanding of its material technology according to meet customers, architects and Designers expectations.

Select the right product & the right system for the application of Rain Screen Cladding according to its product performance and project requirements.

Ensure that "Quality-Control" on first focus in your façade project planning process. Check incoming goods to there Quality Specifications and keep record on each single sheet- and their unique sequential number.

Be aware sanding of vertical application is very sensitive but also time consuming during installation. Special care and Quality Control of outgoing good essential and also mandatory for any unique look of the facade panels.

Due to the special material performance of HIMACS translucency and other HIMACS sheet products with lucent effects attention needs to be given select the correct product and product thickness in order to avoid shadowing during and after the installation.

Be aware:

The 10 Year Limited Installed Warranty for Exterior Application does not cover any failures due to fabrication or installation mistakes; neither any failure of HIMACS adhesive used on outside application.

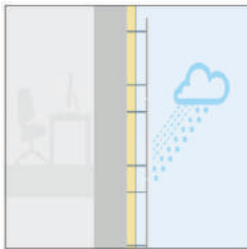
■ Cladding System Solutions

Rain-Screen Cladding: General Requirements

General Façade Building Requirements

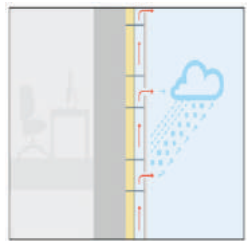
- Design
- Stability
 - Dead load –
 - Wind load (suction and pressure) –
 - Snow and ice loads –
 - Impact loads –
 - Special loads (e.G. Seismic forces, advertising boards)
- Fire protection
- Moisture and heat protection
 - National and technical requirements in terms of moisture and heat protection
- Planning and Design of the cladding and the substructure
- Planning of additional thermal insulation layer & fire brake barriers
- Airtightness:
 - Requirements in terms of airtightness of the building envelope must be met
 - by the load-bearing structure of the building.
 - The RVRF has no sealing function and does not contribute to the airtightness of the building. Airtightness is realized, for example, by
 - the interior plaster and
 - professional installation of doors and windows.
- Sound insulation
 - Requirements conform to national regulations
- Lightning protection
- Deformation
 - Deformations are primarily due to changes in temperature and humidity.
 - Local temperature differences (ΔT) must be taken into consideration
 - generally between - 20°C and +80°C.
- Expansion gaps
 - Dividing joints between buildings must be taken into consideration in the
 - substructure and the cladding and applied to the same extent.
- Tolerances

Rain-Screen Cladding: Physical Features



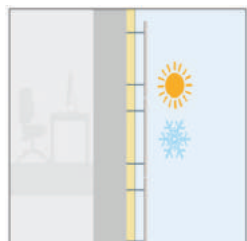
Perfect moisture resistance

HIMACS is highly resistant to moisture like rain, snow or condensation, thus providing excellent protection for the insulation layer behind the façade. Furthermore, any moisture is perfectly removed via a gap between the façade panel and the insulation material.



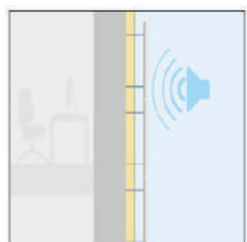
Perfect air circulation

In connection with the ventilated rain screen technology, HIMACS ensures air circulation irrespective of low or high temperatures. This method removes condensation moisture and prevents damage to the insulation layer



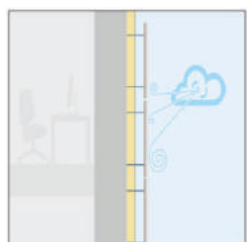
Perfect insulation properties

HIMACS withstands cold and heat equally. These insulation properties result in significant energy savings



Perfect noise insulation

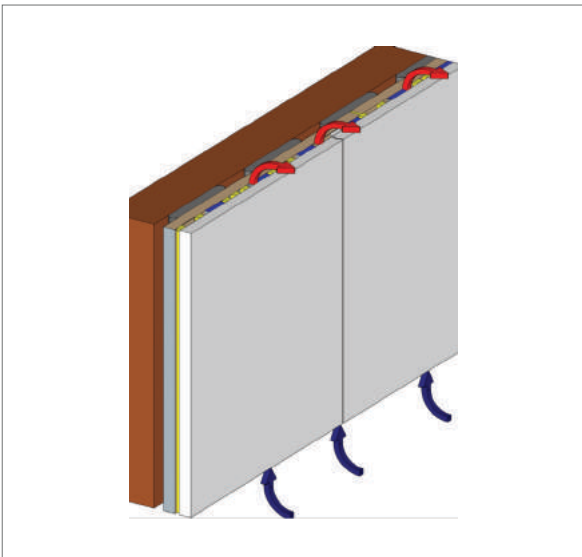
HIMACS façade materials provide optimal noise insulation thus reducing the noise level significantly



Perfect resistance to wind pressure

HIMACS façade materials attest bending strength above average thus offering excellent resistance to wind pressure.

To build HIMACS facades, we recommend using a certified structure to install such panels foreseen for a ventilated façade system made out of aluminum profile structure.



The rain screen cladding air ventilated facade (RSC)

The functions of weather protection and thermal insulation are structurally separated from each other in the case of curtain-ventilated facades. This design is considered to be structurally reliable and sustainable. Additional protection functions characterize this facade system.

In principle, rain screen cladding air ventilated facades can be used for all building heights and uses as well as for all required insulation thicknesses. Its structural components are the substructure, the insulation, the rear ventilation room and the cladding.

Benefits

RSC ensure sustainable dew water and rain protection through the constructive separation of facade cladding and thermal insulation.

RSC are the proven design for achieving a pleasant indoor climate.

RSC significantly reduces energy costs for heating and air conditioning.

RSC are the facade constructions with very low susceptibility to damage.

RSC are durable, maintenance-free and represent an economically extremely interesting solution for increasing the value of the building.

Product

Product Verification



German Sustainable Building Council (DGNB)

HIMACS has achieved quality level 4 of 4 – the best rating – for the local environmental impact of the overall product (2018). The DGNB system is a holistic and unique certification system for sustainable construction.



Building Research Establishment Environmental Assessment Method (BREEAM)

Among other ratings, the material complies with “Hea 02 Indoor Air Quality” for particularly good air quality. BREEAM is one of the world’s most important global rating methods for sustainable Architecture.



Leadership in Energy and Environmental Design (LEED)

Is a standard voluntary system to certify high performance of buildings, from the US Green Building Council (USGBC). LEED certifies buildings using a credit system. Architects and planners using HIMACS for their project can claim EQ Credit for Low-Emitting Materials with the category Indoor Environmental Quality (EQ).



Environmental Building Certificate – Grade “outstanding”

The Korean Air Cleaning Association certifies that HIMACS complies with the Korean regulations for environmental building materials.

Eco-labels & Product Assessments



EQ Credit Low Emitting Materials - Sample on LEEDv4:

The entire product contributes toward satisfying EQ Credit: Low-Emitting Materials:

HIMACS	Yes
--------	-----

The product contributes toward satisfying EQ Credit 4: Low-Emitting Materials:

HIMACS	Yes
--------	-----

Ceilings, walls, thermal, and acoustic insulation

The entire product contributes toward satisfying EQ Credit 4: Low Emitting Materials, Category Ceilings, walls, thermal, and acoustic insulation:

HIMACS	Yes
--------	-----

The product contributes toward satisfying EQ Credit 4: Low Emitting Materials, Category Ceilings, walls, thermal, and acoustic insulation:

HIMACS	Yes
--------	-----

The product is a ceiling, wall, acoustic or thermal insulation material:

HIMACS	Yes
--------	-----

TVOC after 14 days:

HIMACS	□ 0.001 mg/m ³
--------	---------------------------

Formaldehyde after 28 days:

HIMACS	□ 0.012 mg/m ³
--------	---------------------------

Emission testing method according CDPH Standard Method v1.1-2010:

HIMACS	Yes
--------	-----

Emission testing method according AgBB Testing and Evaluation Scheme (2010):

HIMACS	Yes
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Emission testing method according ISO 16000-3: 2010, ISO 16000-6: 2011, ISO 16000-9: 2006, ISO 16000-11:2006 either in conjunction with AgBB, or with French legislation on VOC emission class labeling:

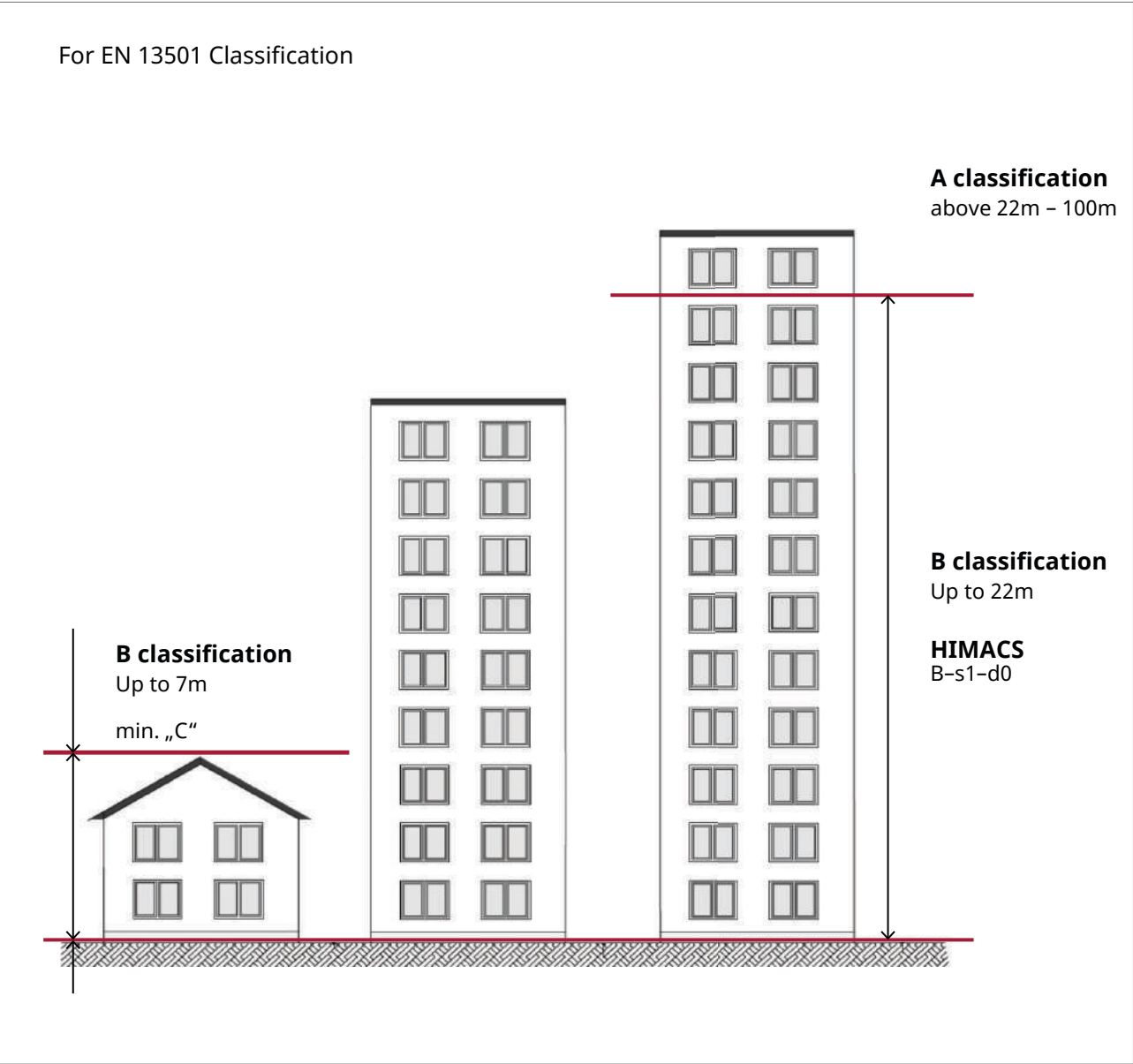
HIMACS	Yes
--------	-----

Emission testing method according DIBt testing method (2010):

HIMACS	Yes
--------	-----

■ Fire Classification

Fire performance application use



The HIMACS -FR-quality passed the fire rating test with far better results than any of the other mineral materials : The achieved SBI test according to EN-13501-1 is the impressive proof of this.



B-s1-d0 Classification

Equivalent to BS class 0 Certification.
The EN 13501 is the European fire classification norm

B = classification level
S1 = low smoke density
D0 = non droplets



B1 Classification

B1 classification proves that HIMACS has a low flammability.
The DIN 4102-2 is the German building fire classification norm

B1 = low flammability



M1 Classification

M1 classification that HIMACS has a low flammability.
The NFP 92-501 is the French fire classification norm

M1 = low flammability

The HIMACS -FR-quality passed the fire rating test with far better results than any of the other mineral materials : The achieved SBI test according to EN-13501-1 is the impressive proof of this.

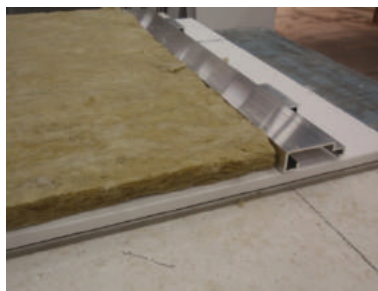
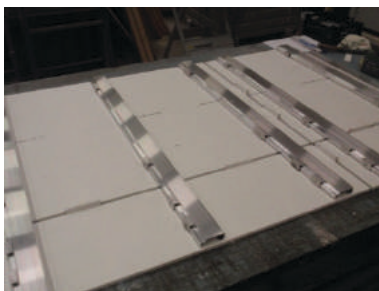


SBI

B-s1-d0 Classification

Equivalent to BS class 0 Certification.
The EN 13501 is the European fire classification norm

- B = classification level
- S1 = low smoke density
- D0 = non droplets



All photos taken by Lothar Moritz – All rights reserved.

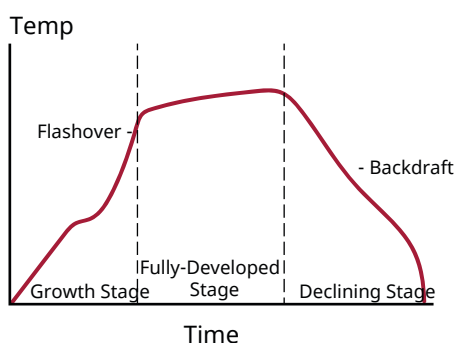
EN-13501-1: maximum time of danger to a Flashover in relation to material calorific value.

Flashover by definition is

“the sudden involvement of a room or an area in flames from floor to ceiling caused by thermal radiation feedback.”

Thermal radiation feedback is the energy of the fire being radiated back to the contents of the room from the walls, floor, and ceiling. This radiation of energy to the contents of the room will raise ALL the contents to their ignition temperature.

When the contents of the room suddenly and simultaneously ignite, this is flashover. This simply means that flashover is a temperature-driven event. It requires that the fire’s energy be radiated back to the contents to produce a rapid rise in temperature and simultaneous ignition. Flashover indicates that the fire has grown to the fully developed stage (Figure 1).



EURO CLASS	TIME TO “FLASH-OVER” OF “ROOM CORNER TEST”
A1	No flash-over / calorific value \leq 2MJ/kg
A2	No flash-over / calorific value \leq 3MJ/kg
B	No flash-over
C	10 - 20 min.
D	2 - 10 min.
E	0 - 2 min.
F	No requirement fixed

Fig.1



BUILDINGS	BUILDING HIGHT	SUB-CONSTRUCTION	INSULATION	RAIN-SCREEN CLADDING
	Up to 7m	Normal flammable	Normal flammable	Normal flammable
	7m up to 22m	Normal flammable	Non flammable	Low flammable
	From 22m and above	Non flammable	Non flammable	Non flammable

Euroclass comparison

Overview of European and most commonly used national performance classes:

European: EN 13501-1:2007 +A1:2009

German: DIN 4102-1,1998 (often referred to as "B1" which is in fact a classification)

French: NF P92-507:2004 (often referred to as "M1" which is in fact a classification)

UK: BS 476-6:1989 +A1:2009 and BS 476-7:1997

EUROCLASS	GERMAN		EUROCLASS	FRENCH	EUROCLASS	UK
EN 13501-1	DIN 4102-1	No Smoke No droplets	EN 13501-1	NF P92-507	EN 13501-1	BS 476/6 BS 476/7
A1	A1	✓ ✓	A1	Non combustible	A1	Non combustible
A2 - s1, d0	A2	✓ ✓	A2 - s1, d0 A2 - s1/s2/s3, d0/d1	M0	A2 - s1/s2/s3, d0/d1	Limited combustible
B/C - s1, d0	B1	✓ ✓	B - s1/s2/s3, d0/d1	M1	B - s1/s2/s3, d0/d1/d2	Class 0
A2/B/C - s2/s3/, d0		✓	C - s1/s2/s3, d0/d1	M2	C - s1/s2/s3, d0/d1/d2	Class 1
A2/B/C - s1, d0/d1						
A2/B/C - s3, d2	B2		D - s1/s2/s3, d0/d1	M2	D - s1/s2/s3, d0/d1/d2	Class 3
D - s1/s2/s3/, d0		✓	D - s1/s2/s3, d0/d1	M4 (No droplets)		
D - s1/s2/s3/, d1/d2			E	E		
E			E - d2	M4		
F	B3		F		F	

EUROCLASS		CLASSIFICATION FOR SMOKE OR DROPLETS					
A1	Not inflammable	D	Well inflammable	S1	No smoke	d0	No droplets allowed
A2	Almost not inflammable	E	Very inflammable	S2	Limited smoke production and smoke increase	d1	No droplets for longer than certain time given
B	Very difficulty inflammable	F	Extremely inflammable	S3	No limitation on smoke production required	d2	No limitation on droplets required
C	Moderately inflammable						

Source: <https://graphics.averydennison.eu/content/dam/averydennison/graphics/eu/en/technical-bulletins/General/TB-1.31-Firecertification-rev-82012-UK.pdf>

Fire Classification

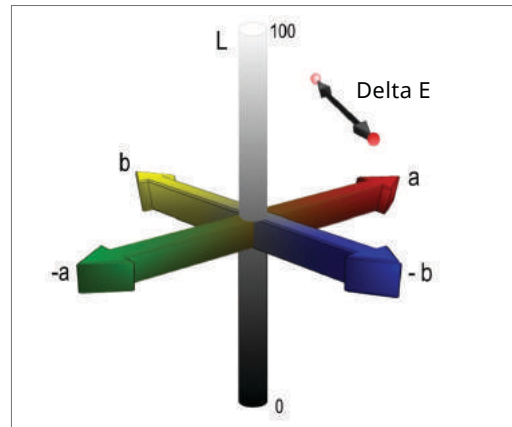
PRODUCT TESTED	TEST METHOD	RESULT
HIMACS FR 12mm S728 Alpine White	EN 13501-1 (SBI)*)	B - s1 - d0
	NF P92-501 (1995)	M1
	DIN 4102-1	B1
	IMO certified Regulation (EU) 2018/773	Modul B Modul D
HIMACS FR 12mm S828 Alpine White	NF P92-501 (1995)	M1
HIMACS 12mm S028 Alpine White	DIN 4102-1	B1
	ABP	B1
HIMACS 12mm S028 Alpine White**)	NF P92-501 (1995)	M1

*) tested with sub-construction and insulation according to EN 13823 & ISO 11925

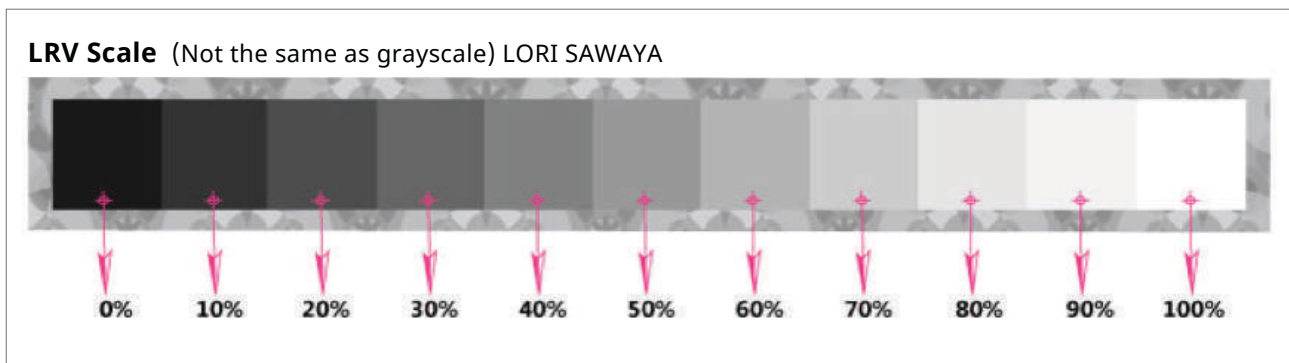
***) wide sheet Korea production

UV Resistance

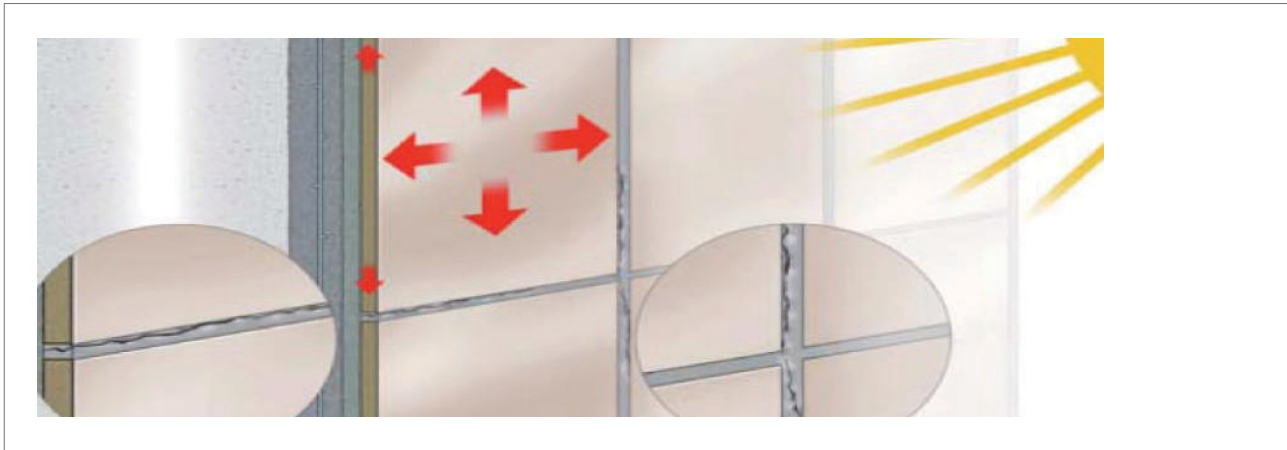
DELTA E VALUES - ID	
E Value	Meaning
0 - 1	A normally invisible difference
1 - 2	Very small difference, only obvious to a trained eye
2 - 3.5	Medium difference, also obvious to an untrained eye
3.5 - 6	An obvious difference
> 6	A very obvious difference



LRV Light Reflectance Value



UV & Weather Ability Aging Resistance Analyses



Zu 3) 3-Punkt-Biegeversuch

Sowohl die nicht bewitterten Proben als auch die Proben, die einer Bewitterung von 500 Stunden, 1000 Stunden bzw. 1500 Stunden ausgesetzt waren, wurden im 3-Punkt-Biegeversuch in Anlehnung an die DIN EN ISO 14125 untersucht. Die Prüfparameter sind in Tabelle 3 zusammengefasst.

Parameter	Bedingungen
Prüfkörperdicke	12,05 mm – 12,19 mm
Prüfkörperbreite	33,99 mm – 40,13 mm
Prüfklima	22 °C, 54 % rel. Feuchte
Vorkraft	1 N
Prüfgeschwindigkeit	1 mm/min
Stützweite	100 mm

Tabelle 3: Prüfparameter für die Bestimmung der mechanischen Kennwerte im Biegeversuch

Die ermittelten Werte sind in Tabelle 4 aufgelistet. Der Biegemodul steigt geringfügig mit zunehmender Bewitterungsdauer an. Dagegen ist eine geringe Reduzierung der Bruchspannung und -dehnung zu beobachten. Dies deutet auf eine marginale Versprödung hin.

Proben	Biegemodul	Bruchspannung	Bruchdehnung
Probe 1 a): Anlieferung	6627 ± 88 MPa	70 ± 2 MPa	1,04 ± 0,04 %
Probe 1 b): nach 500 h Bewitterung	6606 ± 148 MPa	69 ± 1 MPa	1,01 ± 0,03 %
Probe 1 c): nach 1000 h Bewitterung	7194 ± 76 MPa	66 ± 1 MPa	0,93 ± 0,05 %
Probe 1 c): nach 1000 h Bewitterung	7239 ± 62 MPa	65 ± 1 MPa	0,88 ± 0,01 %

Tabelle 4: Ermittelte Kennwerte aus dem Biegeversuch

Flexural Strength

Breaking Elongation

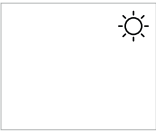
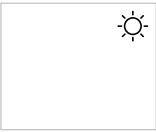

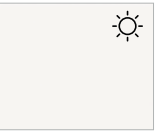
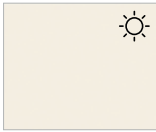
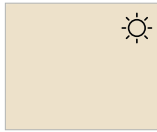

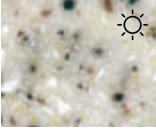



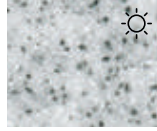
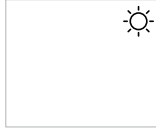




Flexural E-Modulus

3-Point bending investigation analysis before and after weathering according to **DIN EN ISO 14125**

10 Years Warranty On Colours' UV Resistance

The HIMACS resistance to UV radiation surpasses that of any other solid surface. On the following colours, we offer a

- 10 years warranty on colours' UV resistance and a max. loss of gloss of less than 40%, 10 years on colour leaching and
- 20 years on colour peeling, swelling or delaminating.

						
Nordic White S033 [20/12 mm] Δ E5	Alpine White S028 [20/12/9/6/4/ 3mm], Δ E5	Diamond White S034 [20/12 mm] Δ E5	Ivory White S029 [20/12/9/ 6mm], Δ E5	Cream S009 [20/12/6 mm] Δ E5	Almond S002 [20/12 mm] Δ E5	
						
Arctic Granite G034 [20/12/9/6 mm], Δ E5	White Granite G005 [20/12 mm] Δ E5	White Quartz G004 [20/12/9/ 6mm], Δ E5	Sea Oat Quartz G038 [20/12 mm] Δ E5	Beach Sand G048 [20/12/9 mm] Δ E5	Grey Sand G002 [20/12/ 6 mm], Δ E5	Opal S302U [12 mm]
						
Marta Grey S108 [20/12 mm]	Steel Grey S109 [20/12 mm]	Concrete Grey S103 [20/12 mm]	Midnight Grey S117 [20/12 mm]			

COLOUR CODE	COLOUR NAME	Δ E5 FOR 5 YEAR WARRANTY	Δ E5 FOR 10 YEAR WARRANTY	AVAILABLE MATERIAL THICKNESS	COLOUR CODE	COLOUR NAME	Δ E5 FOR 5 YEAR WARRANTY	Δ E5 FOR 10 YEAR WARRANTY	AVAILABLE MATERIAL THICKNESS
S828	Alpine White	Δ E2	Δ E2	12	S103	Concrete Grey	Δ E3	Δ E5	12
S728	Alpine White	Δ E3	Δ E5	20;12	S108	Marta Grey	Δ E3		12
S028	Alpine White	Δ E3		20;12	S109	Steel Grey	Δ E3		12
S033	Alpine White			20;12;9;6;4,5	S117	Midnight Grey	Δ E3		12
S034	Diamant White			20;12					
S029	Ivory			20;12;9;6					
S009	Cream	Δ E3		20;12;6					
S002	Almond	Δ E3		20;12					
G034	Arctic Granite	Δ E3		12;9;6					
G005	White Granite	Δ E4		12					
G004	White Quartz	Δ E4		12;9;6					
G038	Sea Oat Quartz	Δ E4	12						
G048	Beach Sand		12;9						
G002	Grey Sand	Δ E4	12;6						
S302	Opal	Δ E4	12;6						

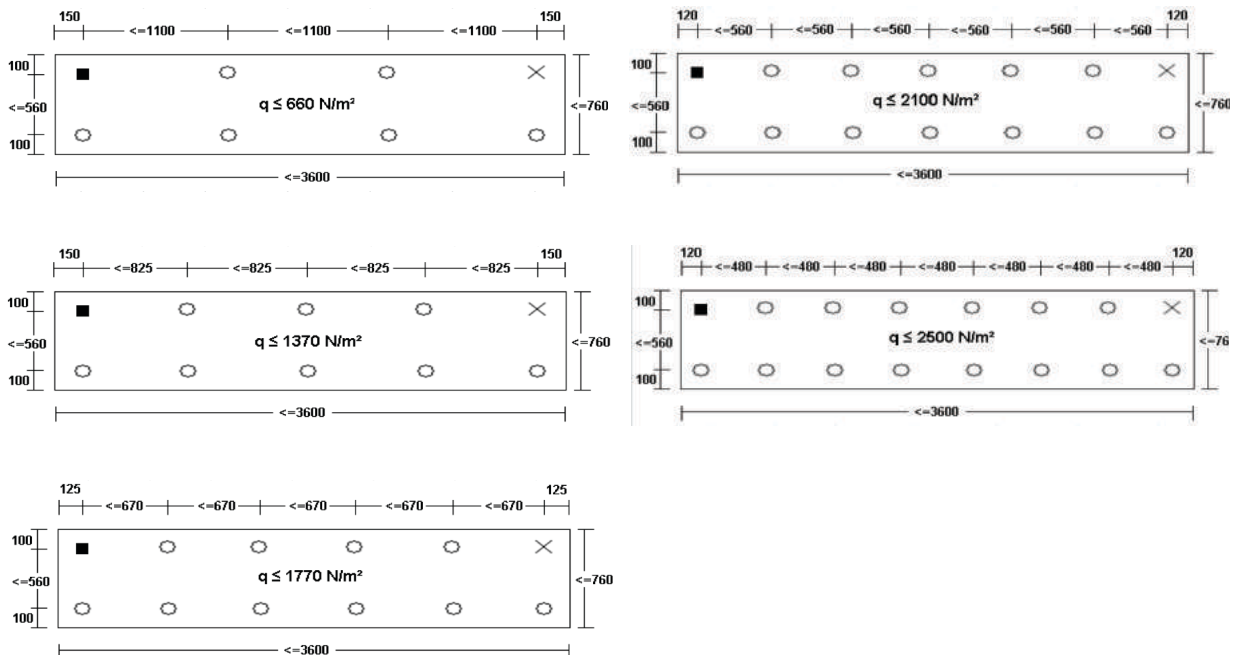
Wind Load on HIMACS Panel Sheets

Summary



SHEET SIZE IN mm	CLASPS DISTANCE IN mm	WIND LOAD N/m ² ≤
3680 x 760	1100	660
	825	1370
	670	1770
	560	2100
	480	2500

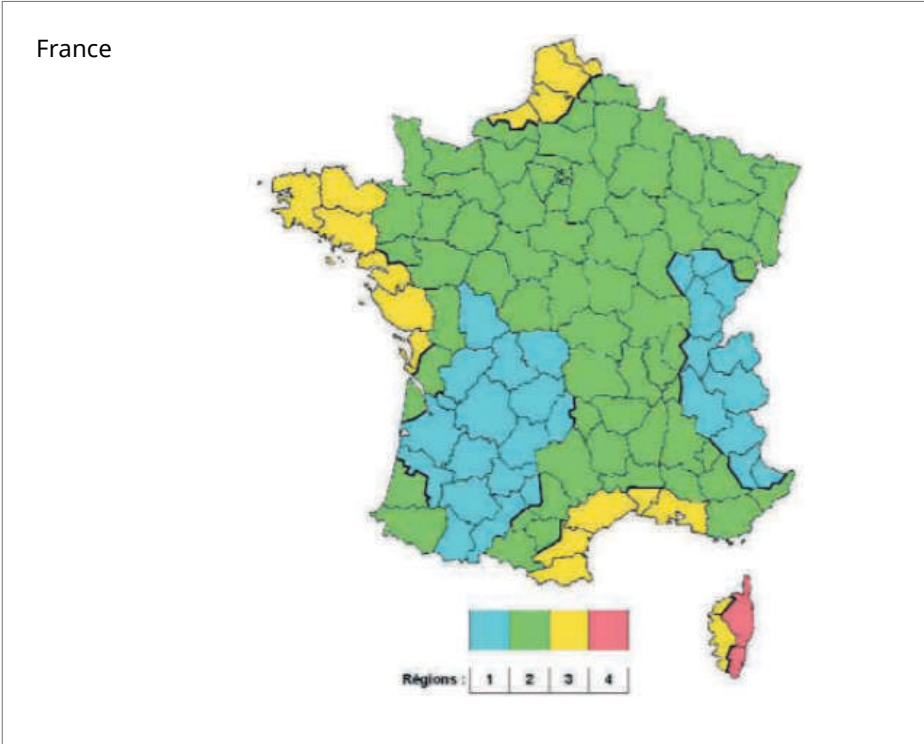
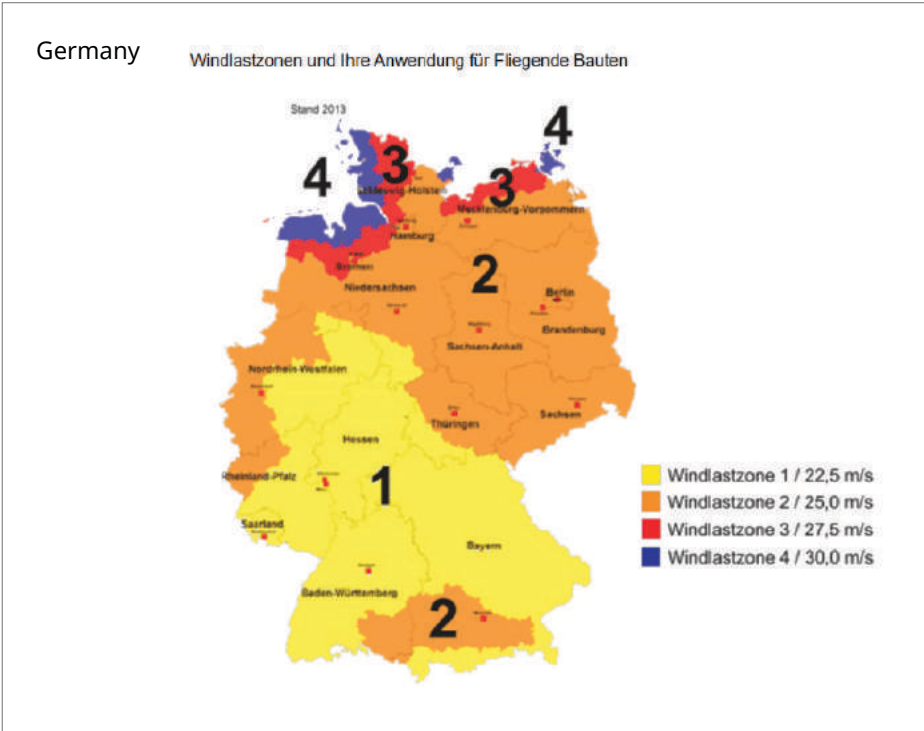
Plate measurement: B x H ≤ 3600 x 760mm



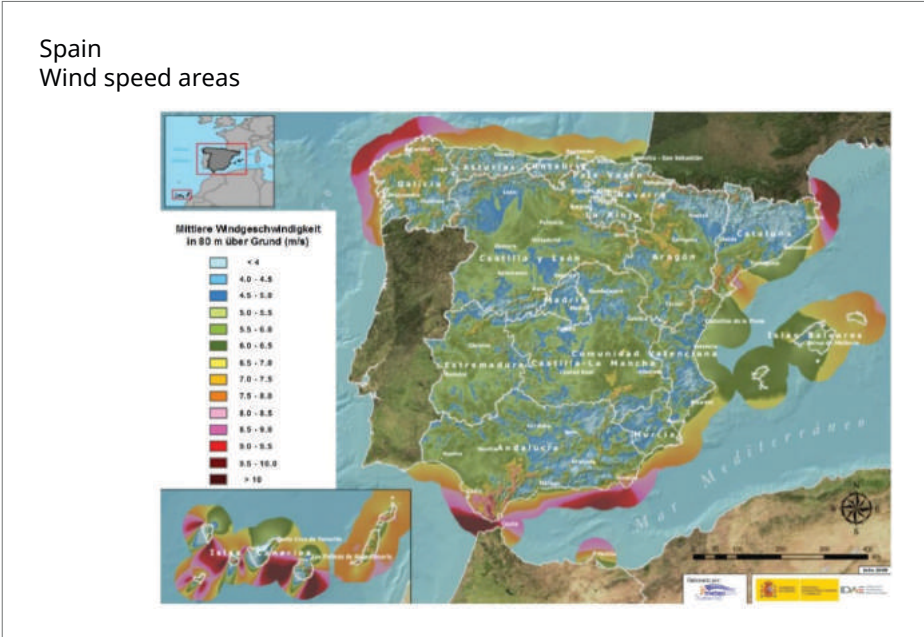
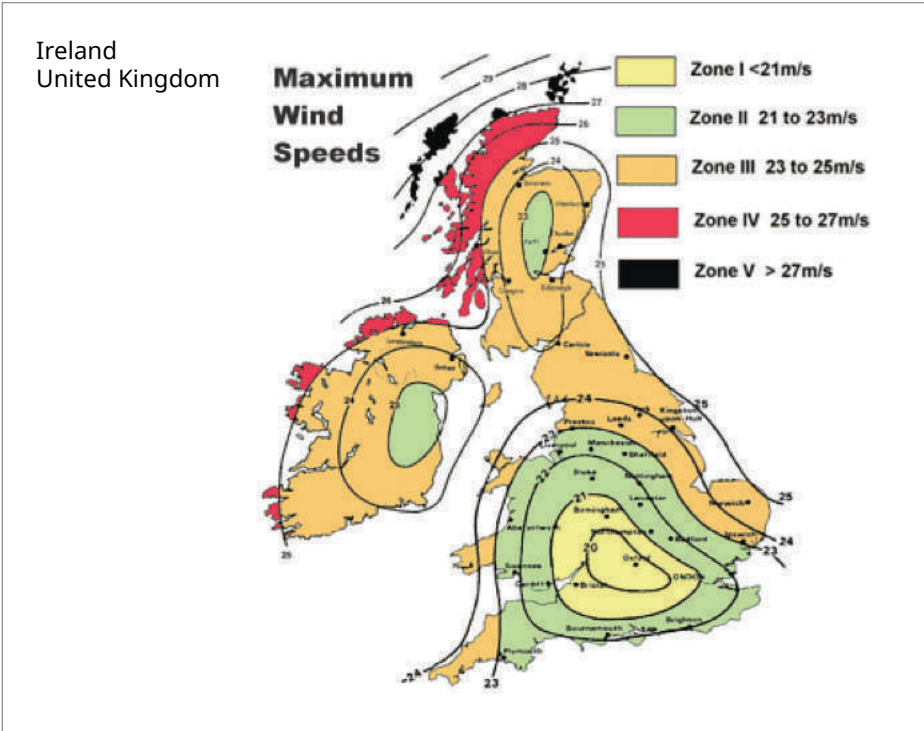
Advantage of small clasps distance

- Withstand higher wind load
- Withstand of warping

Wind Load Zones

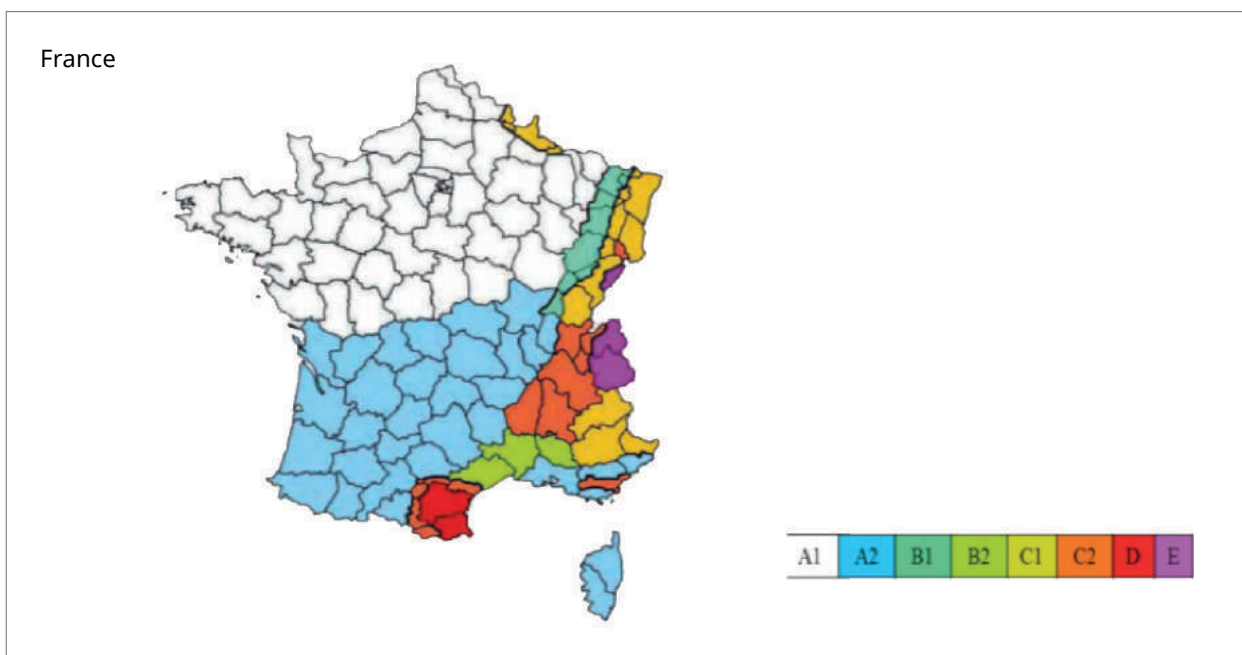
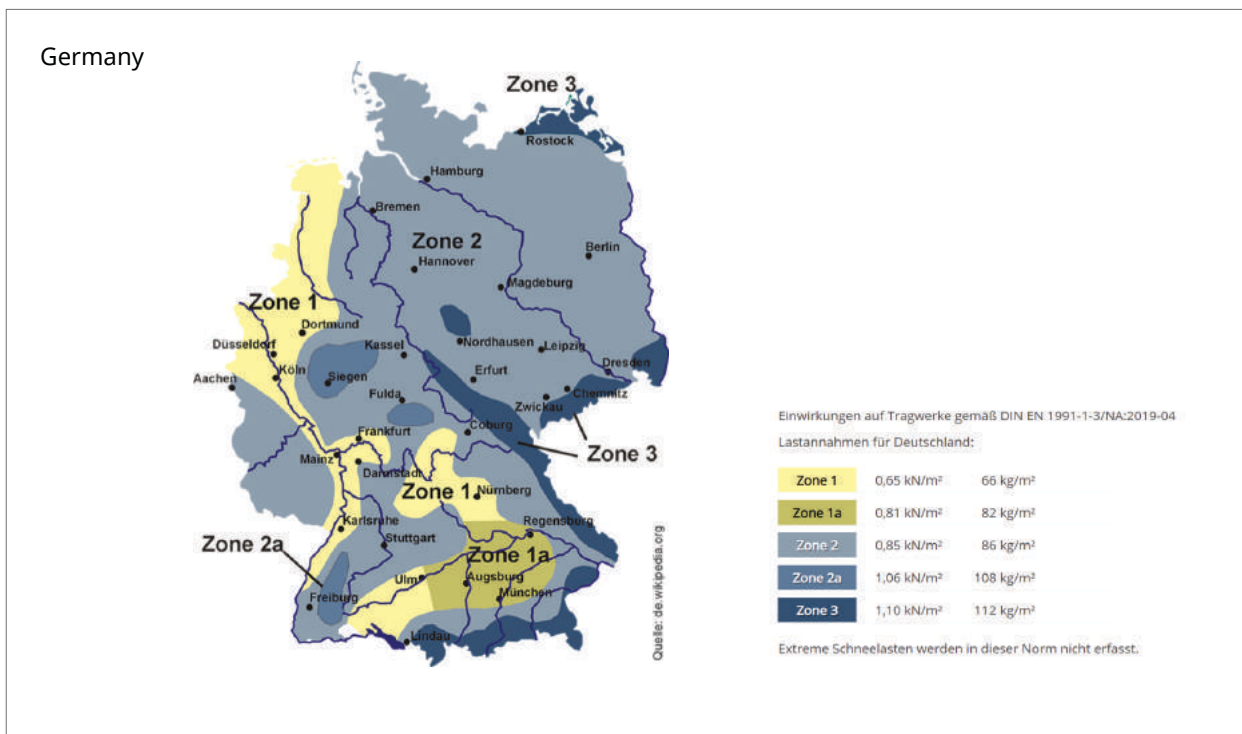


Wind Load Zones




Snow Load on HIMACS Panel Sheets

Snow Load Zones




HIMACS Product Certification

The HIMACS -FR-quality passed the test criteria of European Technical Assessment (ETA)




ETA certified

ETA
European Technical Assessment
HIMACS Exteria Panels fixed with KEIL undercut anchors by using a aluminium frame sub-construction from BMW in **S728 Alpine White**.



Alpine White
S728 - Δ E5
12 mm



European Technical Approval ETA-12/0583

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung Trade name	HI·MACS® Fassadenplatten Typ: S728 CE MED Alpine White mit KEIL-Hinterschnittanker KH
Zulassungsinhaber Holder of approval	IG Haysys Europe GmbH Lyoner Straße 15 60228 Frankfurt/Main DEUTSCHLAND
Zulassungsgegenstand und Verwendungszweck Object, type and use of construction product	Fassadenplatten aus Massivplattenmaterial aus natürlichem Acrylstein mit rückseitiger Befestigung durch Spezialanker Facade panels made of natural acrylic stone with a special anchor for the rear fixing
Geltungsdauer Validity	vom from 18 June 2013 bis to 11 January 2018
Herstellort Manufacturing plant	Herstellwerk 1

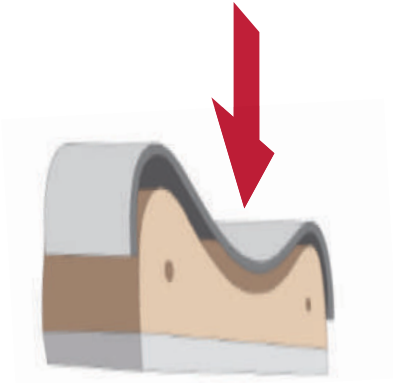
Diese Zulassung umfasst
This Approval covers: 14 Seiten einschließlich 3 Anlagen
14 pages including 3 annexes

Diese Zulassung ersetzt
This Approval replaces: ETA-12/0583 mit Geltungsdauer vom 11.01.2013 bis 11.01.2018
ETA-12/0583 with validity from 11.01.2013 to 11.01.2018

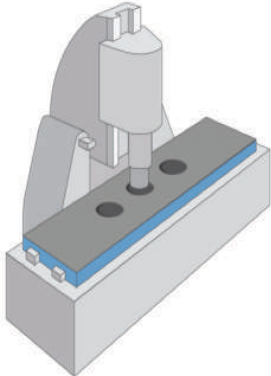
ETA Europäische Organisation für Technische Zulassungen
European Organisation for Technical Approvals

■ Design Range

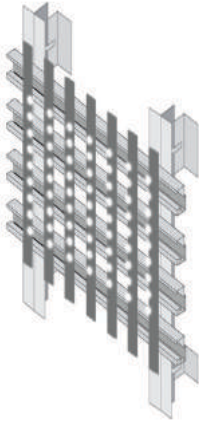
1 Three-Dimensional Design Facade

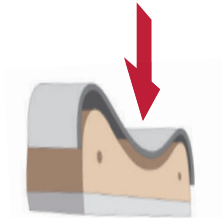


2 Design Skin Facade

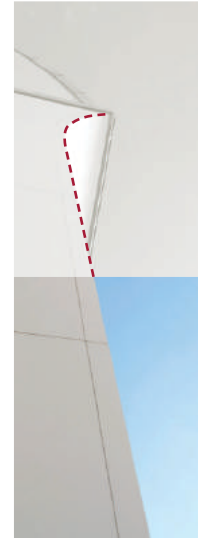
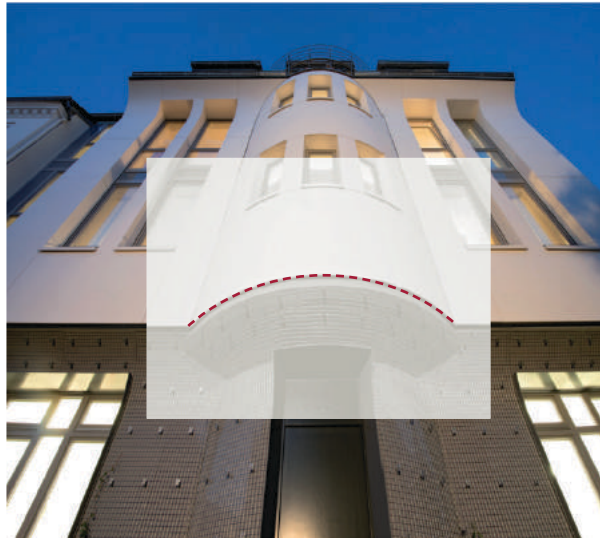


3 Media Facade





Three-Dimensional Design Facade



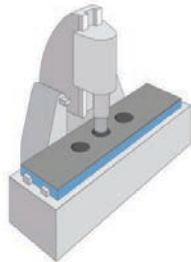
Ice Loft, Hamburg

Design: Köhler Architekten – Façade Construction: Peter Knapp and Fassadentechnik GmbH - Material: HIMACS, Alpine White, S028, Opal S302 Photo credit : © Nikolaus Herrmann



Private House, Pan-gyo, Korea

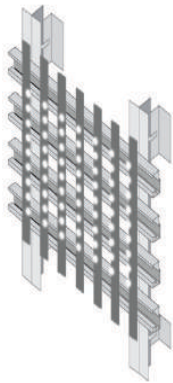
Design: Office 53427 - Fabrication: Daemyung ATM
Material: HIMACS Alpine White
Photo Credit : © Yongkwan Kim



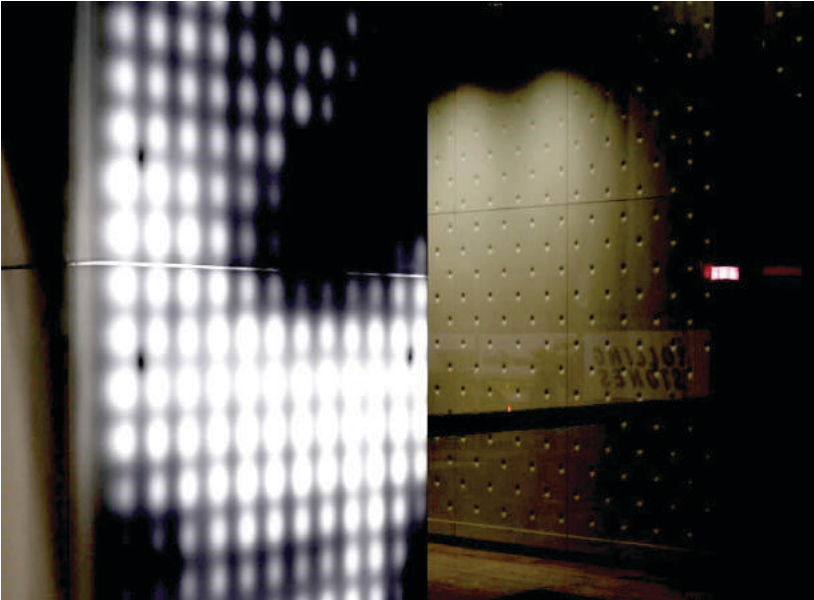
Design Skin Facade



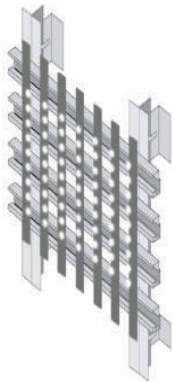
Beneteau's HQ facade, France
Designer: PAD Architectes for BERI21
Fabrication: LCCA
Material: HIMACS Alpine White Photo
credit : © Mathieu Ducros



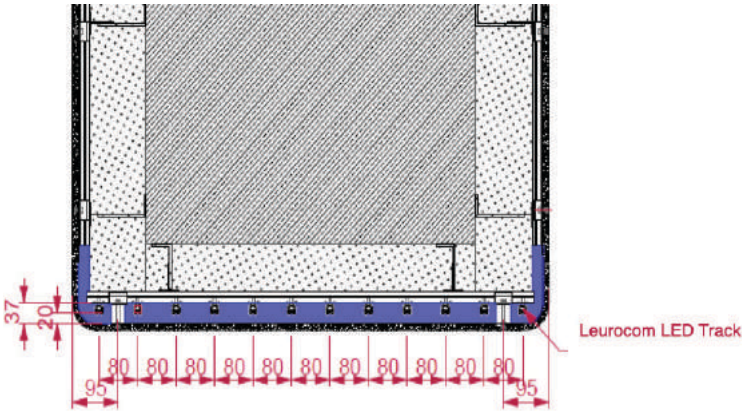
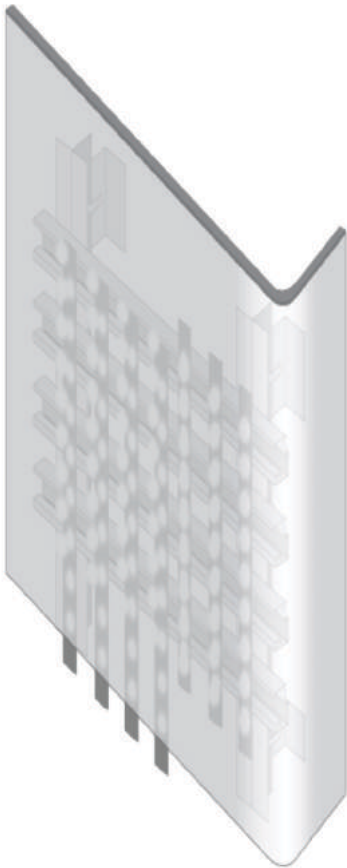
Media Facade



Schönhauser Tor, Berlin - Germany
Design : neo systems architects - Engineering 5D
Engineering Material : HIMACS Opal
Photo Credit © : Volker Mai



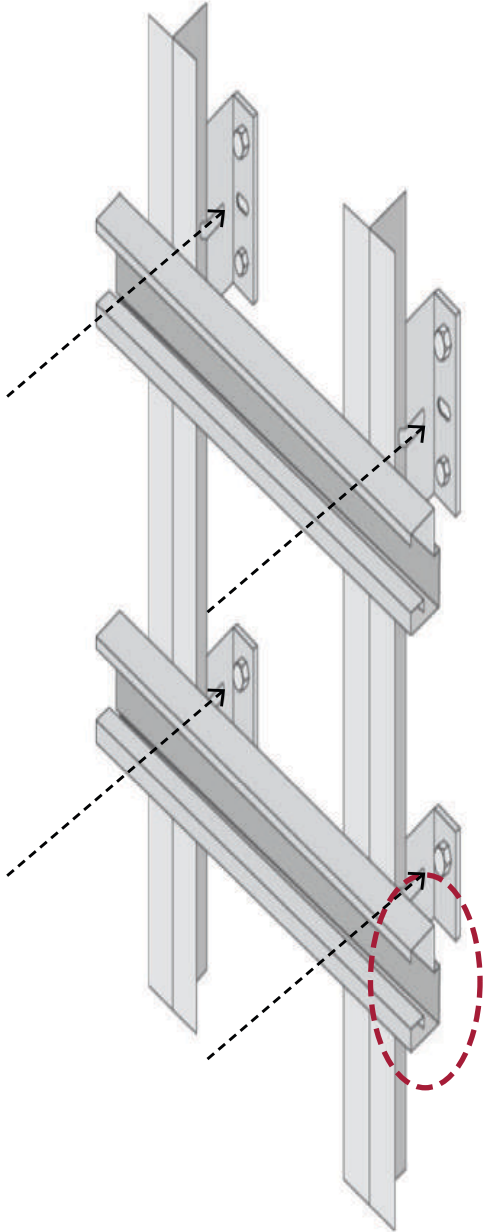
Media Facade



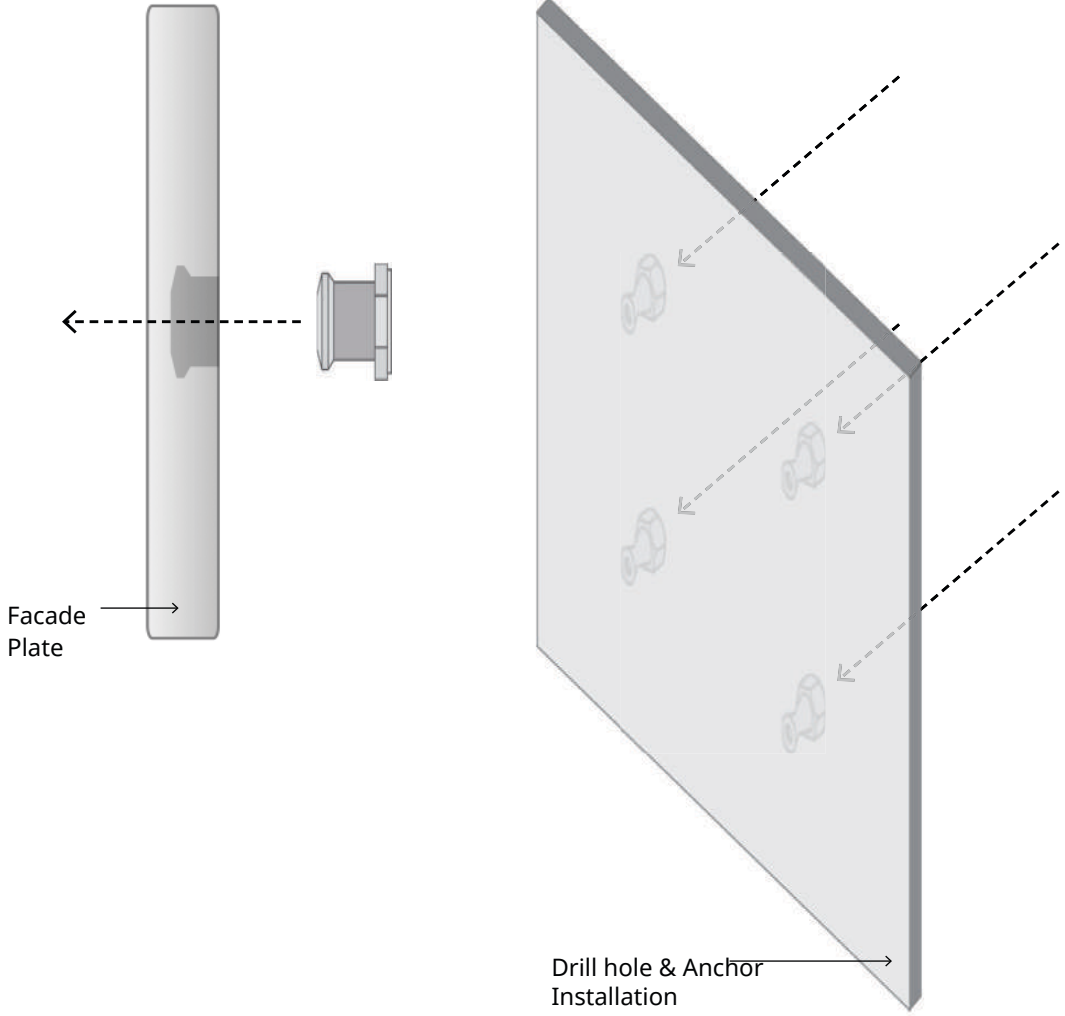
■ Cladding System

To build HIMACS facades, we suggest using a structure made from a ventilated façade system using BWM fixings.

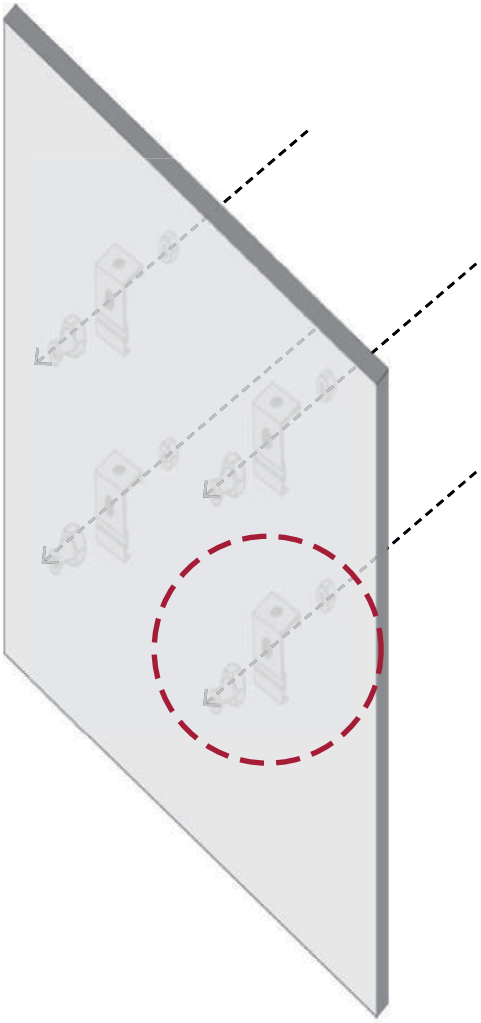
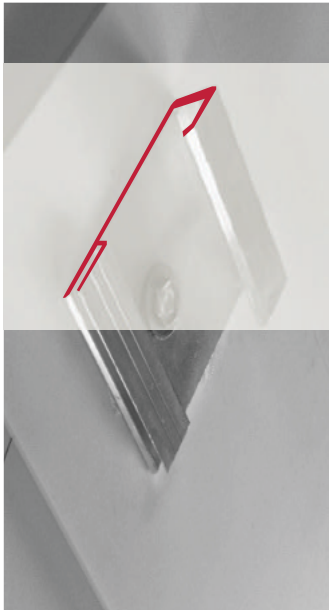
Step **1**

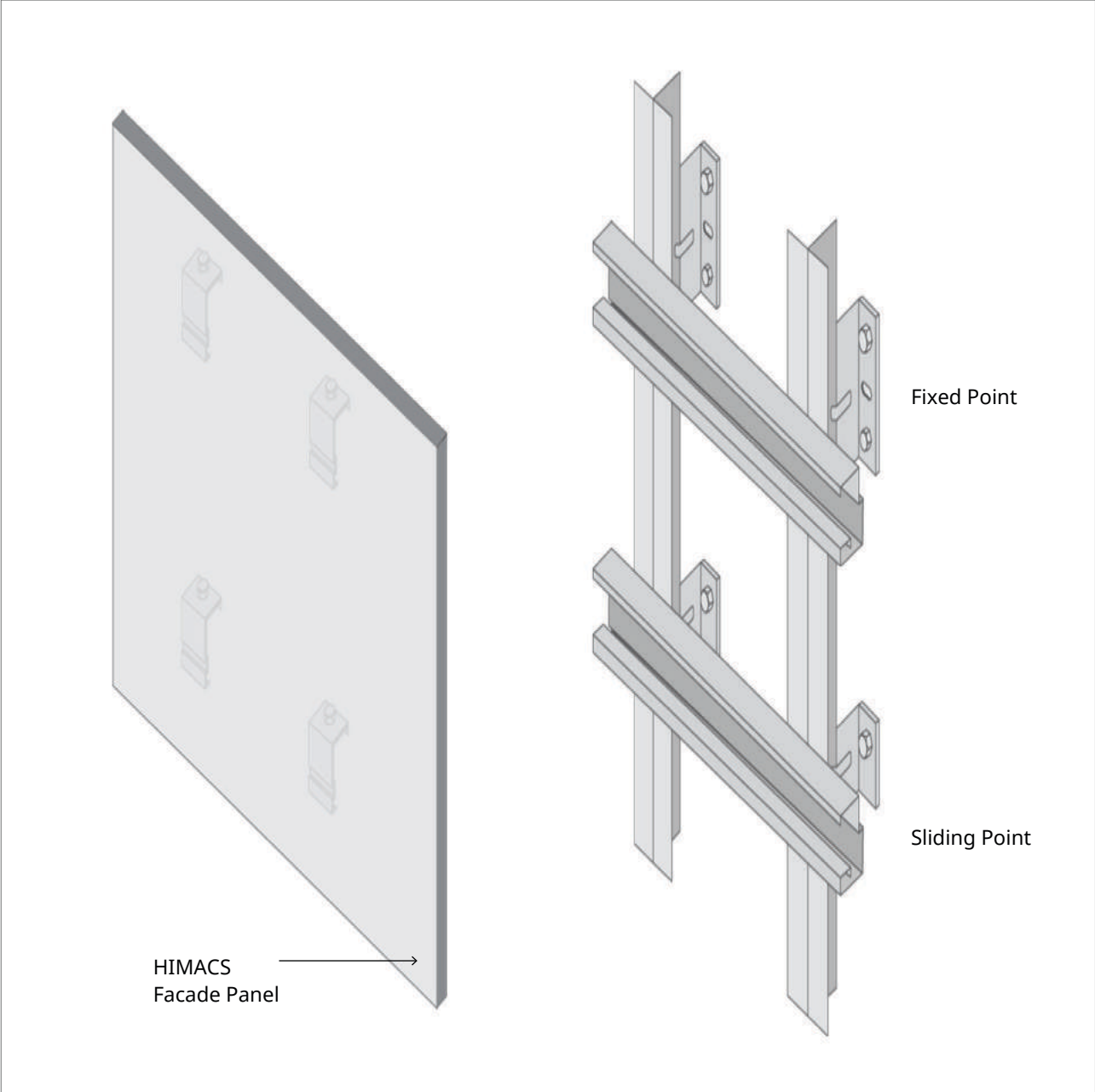


Step 2



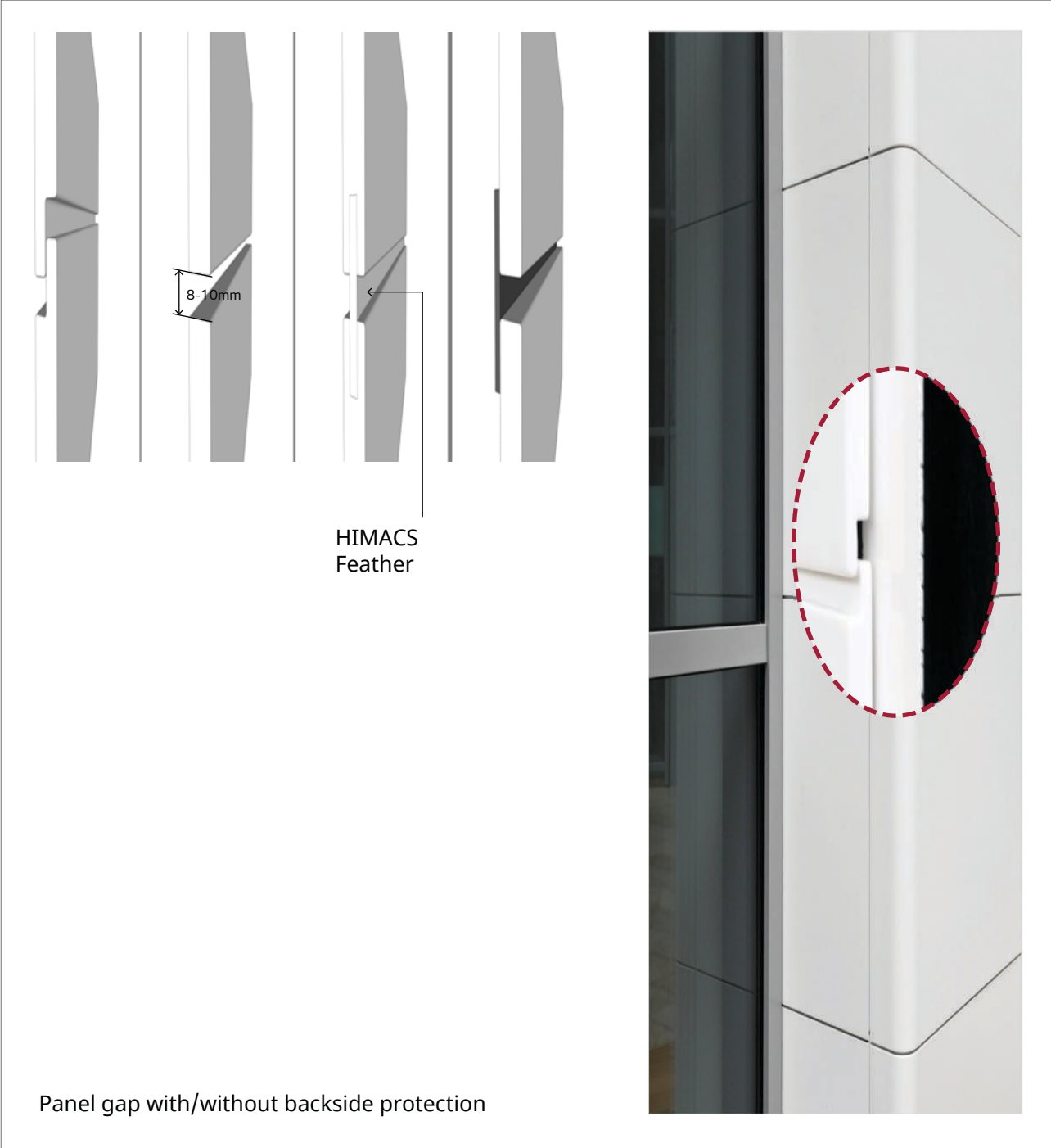
Step 3





Seam Design (Cladding System)

HIMACS has natural contraction and expansion properties related to temperature changes We suggest leaving gaps of 8 to 10mm between each panel.



■ Technical Specification Data (Cladding System)

HIMACS sheet panels S728 & S828

S728

SPECIFICATION		RESULT	UNIT	TEST METHODS
Flexural E-modulus	Ef	8900	MPa	DIN EN ISO 178
Flexural Strength	σ _{fm}	76.9	MPa	DIN EN ISO 178
Breaking Elongation	ε _{fm}	1.01	%	DIN EN ISO 178
Electrostatics Conductivity		> 1 x 10 ¹²	Ω	EN61340-5-1 DIN IEN 61340-4-1
Diffusion Resistance Coefficient	μ	1807		DIN EN ISO 12572
Density		1.71	g/cm ³	ISO 1183
Heat Conductance	λ _{10tr}	0.636	W/mK	DIN EN 12664
Resistance To Thermal Expansion	R	0.048	m ² K/W	DIN EN 12664
Thermal Expansion Coefficient	α	0.048	mm/mK	prEN 14581
Linear Expansion Coefficient		Max. 48 x 10 ⁻⁶	m/°C	
Tensile Resistance	σ _{fm}	32.7	MPa	DIN EN 527
Water Absorption		< 0.1	%	DIN EN 438 - part 12
Sbi Fire Performance		B - s1 - d0		DIN 13501

*applicable to HIMACS FR S728 Alpine White, tested with subconstruction and insulation

S828

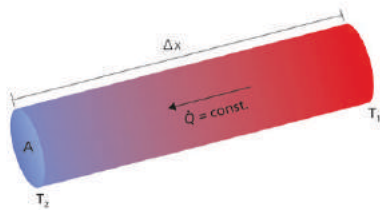
Tables and figures of the Technical Record

CHARACTERISTICS	VALUE	TEST METHODS
Thermal Expansion Coefficient	45x10 ⁻⁶ [1/°C]	EN 14581
Volumetric Mass	1.738 [g/cm ³]	ISO 1183
Elasticity Module	8900 [MPa]	EN ISO 178
Flexural Resistance	65 [MPa]	EN ISO 178
Impact Resistance for a large diameter ball bearing	≥ 1,800mm, no fissure	ISO 19712- 2 §8
	No fissure or visible blister	ISO 19712- 2 §12
Resistance to dry and wet heat	4-5	ISO 19712- 2 §13 (Method A)
	5	ISO 19712- 2 §13 (Method B)
Hardness	289N/mm ²	ISO 19712- 2 §15 (Hardness indention ball)
	120	ISO 19712- 2 §15 (Rockwell hardness)

HIMACS sheet feature / G07

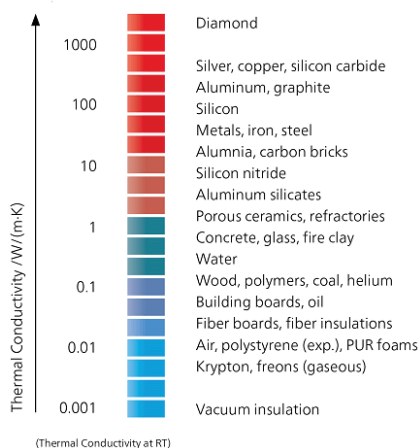
SUBJECT	RESULT / ERGEBNIS	NORM
Thermal conductivity at 10° C medium temperature	$\lambda_{10tr}=0.550W/mK$	EN 12664
Thermal expansion coefficient	$\alpha=0.055mm/mK$	EN 14581
Diffusion resistance number μ	$\mu t=16150$	EN ISO 12572

Subject Definition



Thermal conductivity
In short:

Thermal conductivity
The specific thermal conductivity or thermal conductivity of a material is a quantitative measure of its ability to pass through energy in the form of heat. It is indicated in unit W / (m K) (watts per meter and Kelvin). It is the inverse of the specific thermal resistance.



The thermal conductivity (with unit W/ (m•K)) describes the transport of energy - in the form of heat - by a body due to a temperature gradient (see Fig. 1). According to the 2nd main set of thermodynamics, heat always flows towards the lower temperature.
The relationship between transported heat per unit of time (dQ/dt or heat flux Q) and the temperature gradient (T/X) permissible to the flowing surface A is represented by the heat conduction equation (stationary).

The thermal conductivity is thus a material-dependent material property for the characterization of stationary heat transport. It can be calculated using the following equation:

$$\lambda(T) = \rho(T) \cdot c_p(T) \cdot a(T)$$

a: Temperature
conductivity cp: Specific
heat capacity p: Density

Source: <https://www.netzsch-thermal-analysis.com/de/landing-pages/waermeleitfaehigkeit-und-ihre-definition/>

HIMACS sheet feature / G07

SUBJECT	RESULT / ERGEBNIS	NORM
Thermal conductivity at 10°C medium temperature	$\lambda_{10tr}=0.550W/mK$	EN 12664
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Subject Definition

Längenausdehnungskoeffizienten fester Stoffe

Stoff	α in $10^{-6} \frac{1}{K}$
Aluminium	23,1
Beton	12,0
Blei	29,0
Eisen	11,8
Quarzglas	0,5
Holz	8,0
Kupfer	16,5
Messing	18,0
Silber	18,9
Silicium	2,6
Titan	8,6
Wolfram	4,5
Ziegel	5,0
Zinn	22,0

<https://www.grundwissen.de/-physik/waermelehre/ausdehnung-bei-erwaermung.html>

Thermal expansion

In short:

is generally the change in the length or volume of a body when its temperature increases or decreases. Almost all bodies expand as they warm up and contract when cooled down. an important exception is water between 0 °C and +4 °C (anomaly of the water).

The thermal expansion in solids is smaller than in liquids and there (much) smaller than in gases.

Thermal expansion or thermo expansion is a relative change in the size/length of a solid body due to a change in temperature.

The extent to which atoms in the body are displaced as they vibrate around their original positions is proportional to an increase in temperature. This rising temperature causes the body to expand. If a solid's temperature falls, this results in heat shrinkage or thermal contraction.

The thermal linear expansion ϵT is proportional to the temperature difference ΔT . The coefficient of thermal expansion $\alpha T \Delta T$ is the proportionality factor and depends on the material. The volume expansion also depends on the temperature difference. In the case of bodies with properties that are the same along all axes/in all directions, the following simplification applies: The coefficient of volume expansion γT is three times the coefficient of linear expansion αT .

Based on the principle

of superposition, expansion resulting from the action of forces can be augmented by thermal expansion. This gives the total expansion.

Source: <https://glossar.item24.com/glossarindex/artikel/item/waermeausdehnung.html>

HIMACS sheet feature / G07

SUBJECT	RESULT / ERGEBNIS	NORM
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Subject Definition

Diffusion resistance number μ

Air has the μ value 1 building materials a higher value than 1. μ value indicates how many times the considered layer is more steam-tight than an equally thick air layer.

Quelle: <https://www.recknagel-online.de/mehr/lexikon/diffusionswiderstandszahl-%C2%B5.html>

Diffusion resistance

The water vapor diffusion resistance (also vapor barrier value) expresses how much a building material prevents the diffusion (spread) of water vapor and is measured by means of the water vapor diffusion resistance number.

In building physics, the diffusion resistance is usually measured with the water vapor diffusion equivalent air layer thickness in the form of the S_d value. The S_d value is a comparative indication that indicates the thickness of the dormant air layer that has the same diffusion resistance as the component under consideration.

A 20 cm thick brick wall thus has a diffusion resistance of $5 \times 0.2 \text{ m} = 1 \text{ m}$, i.e. that through a 20 cm thick brick wall as much water vapor flows through as through a 1 m thick, dormant air layer.

This article is based on the article Water Vapor Diffusion Resistance from the free encyclopedia Wikipedia.

Quelle: <https://www.bauemotion.de/baulexikon/diffusionswiderstand/15378038/>

HIMACS sheet feature / G07

Fachgebiet: Bauphysik / Prüftechnik
 Fachgebietsleiter: Prof. Dr.-Ing. K. Kießl
 Betriebsleiter: Dr.-Ing. N. Gajda

MFA Wiener
 Anwaltskanzlei 13
 90423 Wien
 Tel. 0 3643 / 564 322
 Fax. 0 3643 / 564 204

Prüfbericht Nr. B 21/718-04

Auftrag: Bestimmung der Wärmeleitfähigkeit, des thermischen Ausdehnungskoeffizienten und der Diffusionswiderstandszahl von Mineralwerkstoffplatten

Auftraggeber: LGA QualiTest GmbH
 Institut für Warenprüfung und Qualitätsüberwachung
 Tillystraße 2
 90431 Nürnberg

Auftrag vom: 12.05.04

Auftragsnr. des AG: IWQ/7341352

Probeneingang am: 22.06.04

Probe: Mineralwerkstoffplatte G07 (grau-meliert)

Ergebnis der Prüfungen: Wärmeleitfähigkeit bei 10°C Mitteltemperatur $\lambda_{10,10} = 0,550$ W/mK
 Thermischer Ausdehnungskoeffizient $\alpha = 0,055$ mm/mK
 Diffusionswiderstandszahl $\mu = 16150$

Im Auftrag

Weimar, Prof. Dr.-Ing. K. Kießl, Dipl.-L. P. Rieger
 Fachgebietsleiter, Bearbeiter

Dieser Prüfbericht enthält 4 Seiten und 0 Anlagen und wurde in 3 Exemplaren in Deutsch und 3 Exemplaren in Englisch ausfertigt und darf ohne schriftliche Genehmigung der MFA Wiener nicht auszupreisen veröffentlicht werden. Alle Prüfergebnisse beziehen sich ausschließlich auf den im Bericht angegebenen Prüfgegenstand.

Thermal conductivity EN 12664

Bestimmung der Wärmeleitfähigkeit

Probenbezeichnung AG: Nr. 14/500x500/G07
 Anzahl der Proben: 2

Für die Messung wurden die beiden angelieferten Platten übereinandergelegt und als ein Probekörper gemessen. Probennummer 21/A/35/04 1 und 2. Plattenapparat im Einplattenverfahren nach DIN EN 12664:2001-05. Heizplatte 500 mm x 500 mm, Heizung 850 mm x 850 mm.

Prüfgerät:

Angaben zu der Probe

Einbaudicke: 0,0246 m
 Einbaumasse: 9,9604 kg
 Länge: 0,500 m
 Breite: 0,500 m
 flächenbezogene Masse: 39,92 kg/m²
 Rohdichte: 1623 kg/m³

Meßwerte

Nr.	Wärme- strom		Temperatur der Probekörperoberfläche		Temperatur- differenz an der Probe		Mitteltemperatur der Probe		Wärmeleit- fähigkeit
	W	q	°C	°C	K	°C	°C		
1	58,22	18,5	6,1	10,4	13,3	0,5522			
2	58,24	29,2	19,0	10,2	23,1	0,5517			
3	58,01	37,7	27,6	10,0	32,6	0,5689			

Prüfraum 23.06.04 bis 25.06.04

Ergebnis

Wärmeleitfähigkeit des Materials
 $\lambda_{10,10} = 0,550$ W/mK

Wärmedurchlasswiderstand einer Platte
 $R = 0,045$ m²K/W

Prüfbericht Nr. B 21/718-04 Seite 2 von 2

Thermal expansion EN 14581

Bestimmung des thermischen Ausdehnungskoeffizienten

Probenbezeichnung AG: 9
 Anzahl der Proben: 9
 Probenvorbehandlung: Die Proben wurden im Wärmeschrank temperiert
 Prüfung: Die Längenänderung wurde in Anlehnung an
 EN 14581:2002-11 mittels Meßgerät ermittelt

Angaben zu den Proben (mittlere Abmessungen)

Länge: 0,2505 m
 Breite: 0,050 m
 Dicke: 0,012 m
 Masse: 0,2515 kg

Meßwerte

21/A/36/04	Ausgangslänge bei 25 °C			Längenänderung 40°C			Längenänderung 80°C			Längenänderung 80°C		
	L ₀	ΔL	$\Delta L/L_0$	ΔL	$\Delta L/L_0$	α	ΔL	$\Delta L/L_0$	α	ΔL	$\Delta L/L_0$	α
1	0,25059	0,173	0,69	0,048	0,447	1,78	0,051	0,873	2,89	0,349		
2	0,25060	0,155	0,62	0,041	0,473	1,89	0,054	0,712	2,84	0,052		
3	0,25054	0,172	0,69	0,046	0,476	1,90	0,054	0,749	2,99	0,054		
4	0,25058	0,185	0,74	0,044	0,460	1,99	0,059	0,762	3,04	0,055		
5	0,25052	0,173	0,69	0,040	0,503	2,01	0,057	0,778	3,10	0,056		
6	0,24988	0,183	0,73	0,049	0,504	2,02	0,058	0,784	3,14	0,057		
7	0,25058	0,185	0,74	0,040	0,510	2,04	0,059	0,791	3,16	0,057		
8	0,25054	0,192	0,76	0,051	0,508	2,03	0,058	0,785	3,13	0,057		
Mittelwert											0,047	0,055

Dehnung der Proben in Abhängigkeit von der Temperatur

Ergebnis

Mittlerer thermischer Ausdehnungskoeffizient
 $\alpha = 0,055$ mm/mK

Prüfbericht Nr. B 21/718-04 Seite 3 von 4

Diffusion resistance EN ISO 12572

Bestimmung der Wasserdampfdurchlässigkeit

Probenbezeichnung AG: grau, 106 Nr. 15/G07
 Anzahl der Proben: 5
 Vorbehandlung: Lagerung bei 23°C/50% rel. Luftfeuchte

Angaben zu den Proben

Probe Nr.	Durchmesser m	Dicke m	Masse kg	flächenbe- zogene Masse kg/m ²	Rohdichte kg/m ³
21/A/37/04					
1	0,1099	0,0120	0,186	19,61	1634
2	0,1060	0,0119	0,179	19,54	1642
3	0,1059	0,0120	0,173	19,64	1637
4	0,1070	0,0119	0,176	19,57	1645
5	0,1090	0,0119	0,183	19,61	1648

Meßverfahren

Feuchtbereichverfahren (wet cup)
 Prüfbedingung C (Tab. 3) nach
 DIN EN ISO 12572:2001-09
 Sorbens Prüfgefäß (93%): NH₄H₂PO₄
 Sorbens Lagerstrich (53%): Mg(NO₃)₂ · 6 H₂O
 Meßtemperatur: 23°C
 Meßzeit: 08.07.04 bis 26.07.04
 Mittlerer Luftdruck: 990 hPa

Die Probekörper wurden mit der glänzenden Fläche an die höhere relative Luftfeuchte aufgesetzt.

Ergebnis der Messung

Probe Nr.	Wasserdampfaquivalente Luftschichtdicke $s_{e,1}$ in m	Wasserdampf-Diffusionswiderstandszahl μ
21/A/37/04		
1	217,45	18121
2	187,57	15762
3	181,78	15149
4	158,59	13327
5	218,84	18390
Mittelwert		16150


Wasserdampf-Diffusionswiderstandszahl
 $\mu = 16150$

Prüfbericht Nr. B 21/718-04 Seite 4 von 4

HIMACS sheet panels S728 according to ASTM norm

S728

BEYOND ASIAN HUB TOWARD GLOBAL WORLD



TEST REPORT

98, Gyooyukwon-ro, Gwacheon-si, Gyeonggi-do, 13810, Korea

TEL 82-32-5709-700 FAX 82-32-575-5613

Report No : TAK-2018-105518

Receipt Date : 2018.07.05.

Representative : Kyungip Min

Test Completion Date : 2018.07.16.

Company name : LG HAUSYS Co., Ltd

Address : (Yeouido-dong, One IFC)10, Gukjegeumyung-ro, Yeongdeungpo-gu, Seoul, Korea.

Sample name : Artificial Marble (Solid - Resistance to flame prescription)

Test Results

TEST ITEM	UNIT	SAMPLE	RESULT	TEST METHOD
Specific Gravity(23/23) °C)	-	-	1.91	ASTM D792-13(Method A)
Rockwell Hardness(HRM)	-	-	85	ASTM D785-08(2015)(Procedure A)
Barcol Hardness	-	-	64	ASTM D2583-13a
Tensile Strength	MPa	-	42.9	ASTM D638-14(*)
Tensile Modulus of Elasticity	GPa	-	16.3	ASTM D638-14(*)
Flexural Strength	MPa	-	65.9	ASTM D790-17(**)
Flexural Modulus of Elasticity	GPa	-	13.2	ASTM D790-17(**)
Izod Impact Strength	J/m	-	25	ASTM D256-10e1(Method A)
Water Absorption(24 h Immersion)	%	-	0.02	ASTM D570-98(2010)e1
Appearance(Crack) after Heat Resistance((170±2) °C×1 h)	-	-	No Defects	Client Provided Test Method
Appearance(Discoloration) after Hot Water Resistance	-	-	No Defects	Client Provided Test Method(***)
Deflection Temperature Under Load(1.82 MPa)	°C	-	96	ASTM D648-18(Method B)
Thermal Expansion	1/°C	-	4.8×10 ⁻³	KS M 3015 : 2003
Pencil Hardness(Mitsu bishi pencil)	-	-	8H	KS M ISO 15184 : 2013

- Next Page -

Jung yu seok

Prepared by Jung yu seok
Tel : 02-2092-3704


You Seok

Reviewed by You Seok
Tel : 1577-0091(ARS ①-④)

2018.07.16

Korea Testing & Research Institute

President *Byun, Jong-Rip*



QR Code for forgery

KTR KOREA TESTING & RESEARCH INSTITUTE KTR-OP-T6-F01-00107

44(210 X 297)

Sheet Comparison S028 - S728 - 828

The HIMACS Standard product in comparison with HIMACS -FR-quality and improved UV performance results.

Each HIMACS product is to be chosen for the necessary requirements of application needs:

- Private building or
- Public buildings or
- Ship buildings

Price performance ratio is a key element.

CERTIFIED	MATERIAL CODE	COLOUR NAME	SPECIFICATION	NORM / UNIT	RESULT / CLASSIFICATION
ABP	S028	Alpine White	Density		1,738 g/cm ³
			Thermal Expansion Coefficient	EN14581	48x10 ⁻⁶ 1/°C 0.0048 mm/mK
			Tensile Strength	EN ISO 527	51.3 (%1.69) Mpa
			Flexural-E-Modulus	EN ISO 178	8900 Mpa
			Flexural Strength	EN ISO 12372	70.1 Mpa
			Ultimate Elongation	DIN EN ISO 178	1.0 <i>Efm</i>
			Fire Classification	DIN 4102	B1
			Fire Classification	EN 13501	B - s1 - d0
			Calorific Value	EN ISO 1716 MJ/kg	10.0927
			UV Test	UV Sun Light 1500h ΔE	3.251
			UV Test	UV Xenon 3000h ΔE	2.97

3.251
2.97

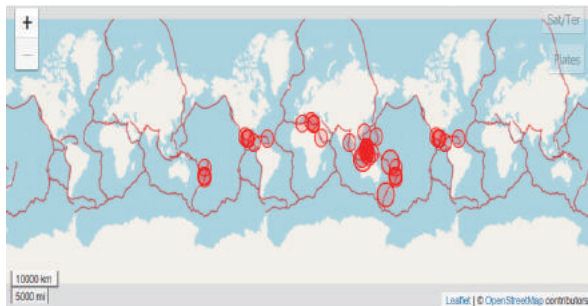
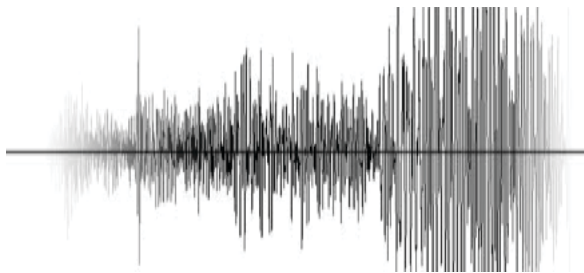
CERTIFIED	MATERIAL CODE	COLOUR NAME	SPECIFICATION	NORM / UNIT	RESULT / CLASSIFICATION	
IMO	ETA	S728M	Alpine White	Density	1,738 g/cm ³	
				Thermal Expansion Coefficient	EN14581	41x10 ⁻⁶ 1/°C 0.0048 mm/mK
				Tensile Strength	EN ISO 527	51.3 (%1.69) Mpa
				Flexural-E-Modulus	EN ISO 178	10000 Mpa
				Flexural Strength	EN ISO 12372	70.4 Mpa
				Ultimate Elongation	DIN EN ISO 178	0.7 <i>Efm</i>
				Fire Classification	DIN 4102	B1
				Fire Classification	EN 13501 (SB1)	B - s1 - d0
				Calorific Value	EN ISO 1716 MJ/kg	5.3834
				Train Application	EN 45545	R1 HL3
				Ship Yacht / Marine Application	IMO	Modul B Modul D

CERTIFIED	MATERIAL CODE	COLOUR NAME	SPECIFICATION	NORM / UNIT	RESULT / CLASSIFICATION	
CSTB	QB	S828	Alpine White	Density	1,738 g/cm ³	
				Thermal Expansion Coefficient	EN14581	45x10 ⁻⁶ 1/°C 0.0048 mm/mK
				Tensile Strength	EN ISO 527	51.3 (%1.69) Mpa
				Flexural-E-Modulus	EN ISO 178	8900 Mpa
				Flexural Strength	EN ISO 12372	65 Mpa
				Ultimate Elongation	DIN EN ISO 178	0.7 <i>Efm</i>
				Fire Classification	DIN 4102	Not tested
				Fire Classification	EN 13501	C - s1 - d0
				Calorific Value	EN ISO 1716 MJ/kg	8.7
				UV Test	UV Sun Light 1500h ΔE	1.223
				UV Test	UV Xenon 3000h ΔE	1.4

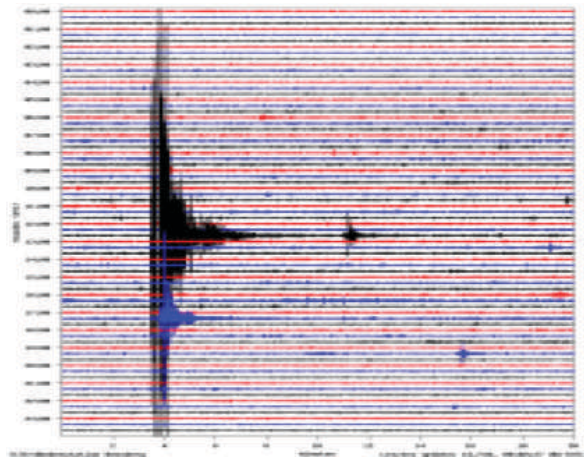
1.223
1.4

Seismic

The HIMACS built-up cladding process may be used in seismic zones and for buildings listed in the table below (as per the Decree of 22 October 2010 and its amendments):



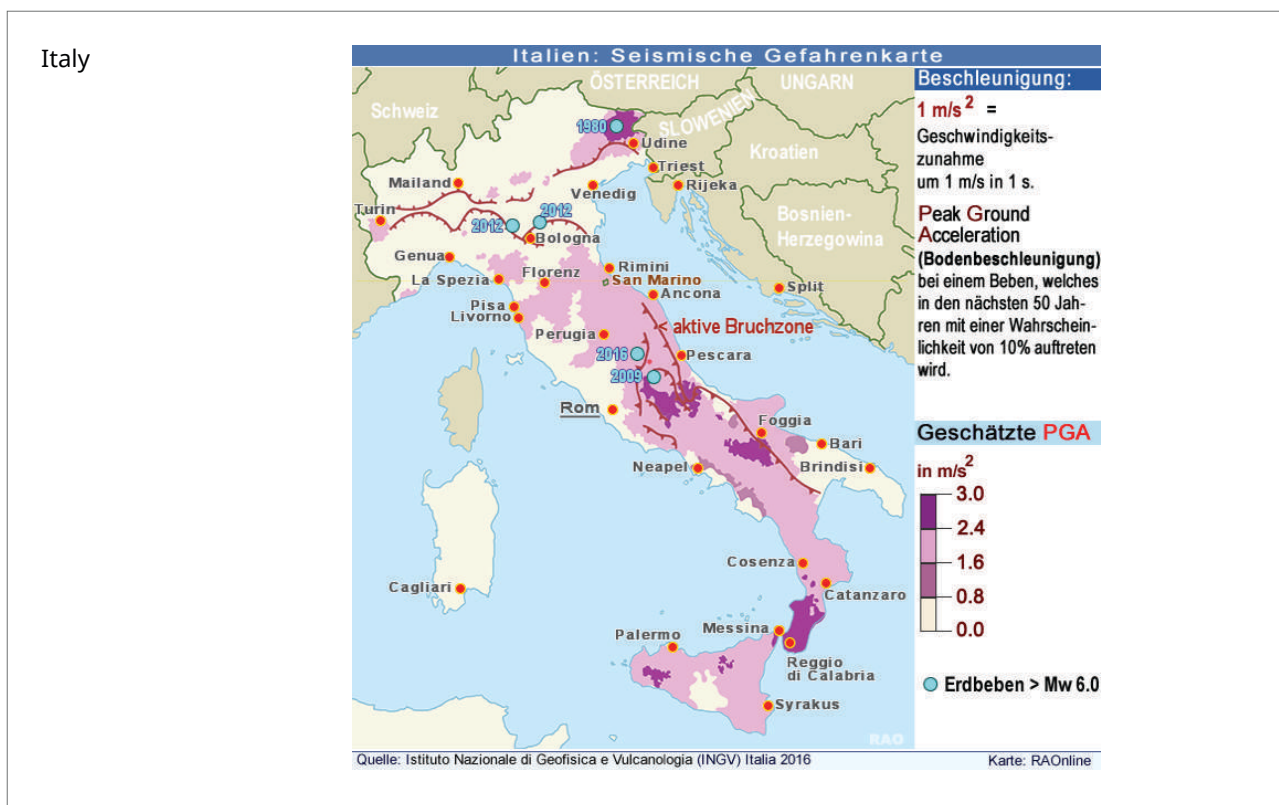
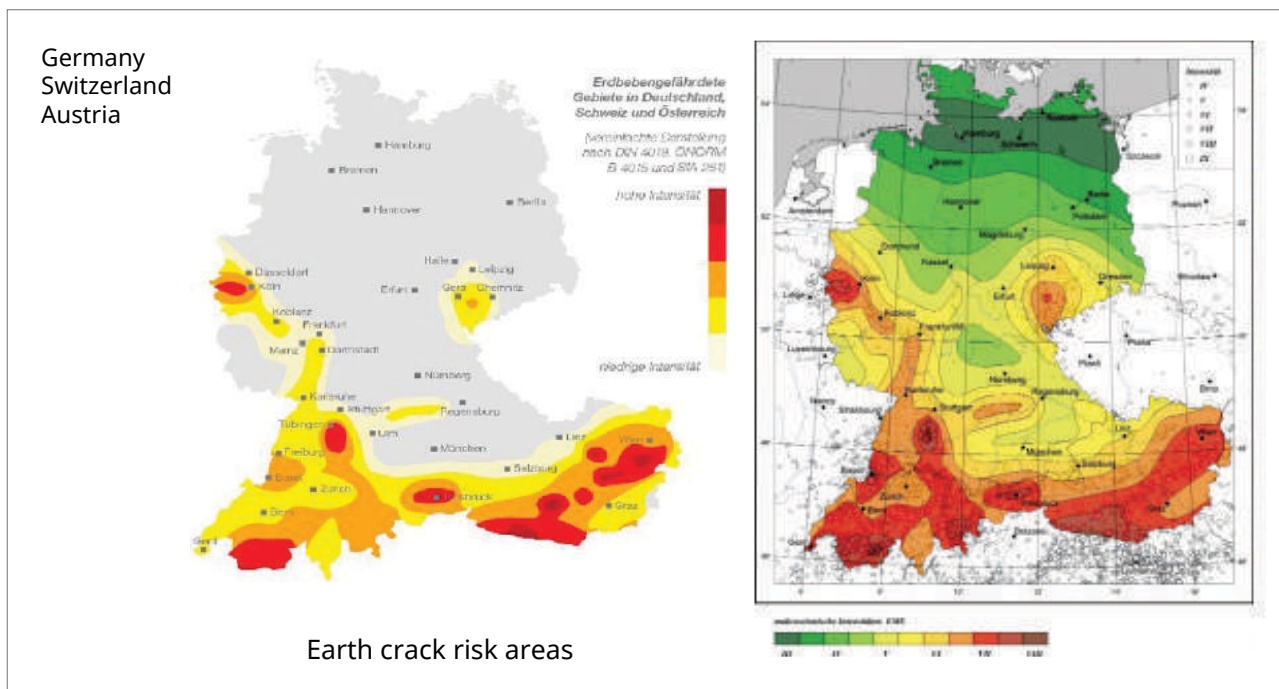
Source: <https://www.volcanodiscovery.com/de/erdbeben-monitor.html>
<https://www.volcanodiscovery.com/de/erdbeben-monitor.html>



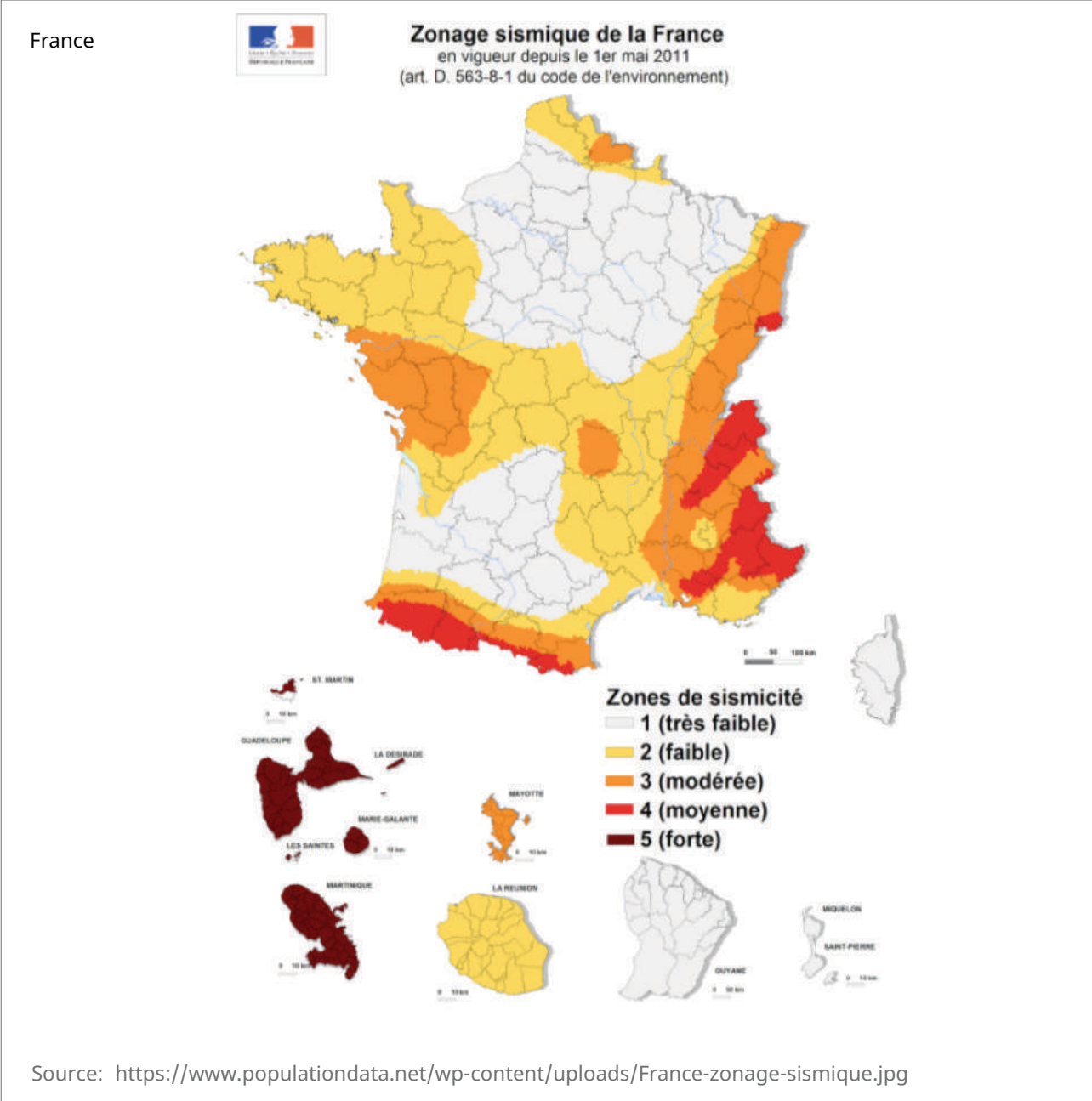
Seismic zones	Classes of the importance categories of buildings			
	I	II	III	IV
1	✘	✘	✘	✘
2	✘	✘	⓪	
3	✘	⓪		
4	✘	⓪		
✘	Installation authorised without specific provisions according to the accepted field of use,			
⓪	Installation authorised without specific provisions according to the accepted field of use for single-level educational institutions (Category III building size) fulfilling the conditions of paragraph 1.1 ¹¹ of the Aseismic Construction Rules PS-MI 89, revised 92 (NF P06-014),			
⓪	Installation authorised without specific provisions according to the accepted field of use for Category II building sizes fulfilling the conditions of paragraph 1.1 ¹ of the Aseismic Construction Rules PS-MI 89, revised 92 (NF P06-014).			
	Installation not authorised			

For structure heights $\leq 3.5\text{m}$, installation of the HIMACS built-up cladding process in seismic zones is authorised without specific provisions, regardless of the building size category or seismic zone (see ENS Guide).

Earth crack risk areas

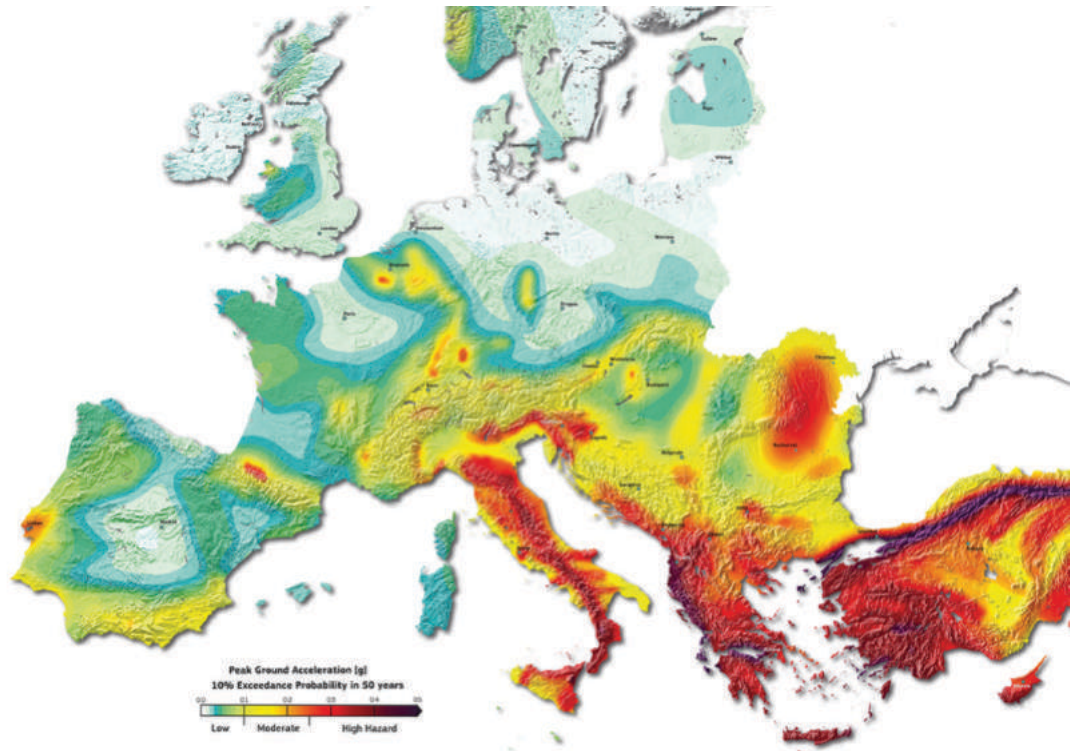


Earth crack risk areas



Earth crack risk areas

Europe

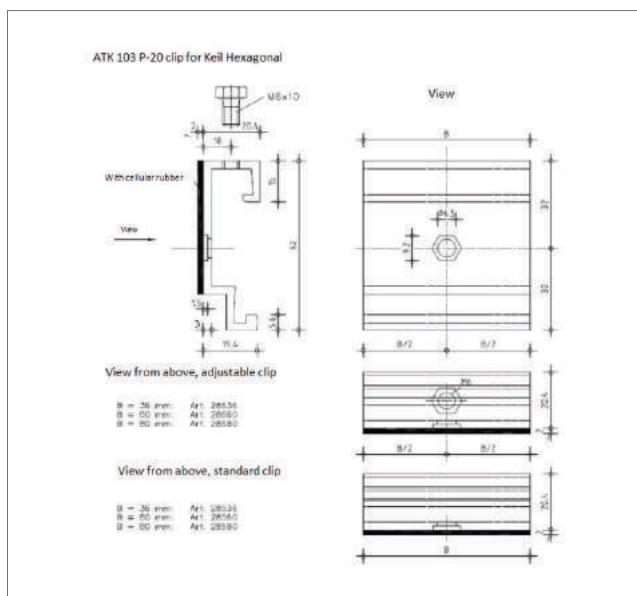


Karte Erdbebengefährdung Europa

Source: <http://www.seismo.ethz.ch/de/knowledge/things-to-know/causes-of-earthquakes/europe/>

Fixing System Solution (Cladding System)

To build HIMACS facades, we suggest using a structure made from a ventilated façade system using BWM fixings and KEIL special undercut anchors to fix HIMACS Façade panel in non visible master technique.



Undercut anchor KH AA

Ø	L	S	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
6.0	4.0	1.0	M6x6	14	555	020	620								
6.0	4.0	3.0	M6x10	14	555	020	742								
6.0	5.0	0.0	M6x6	14	555	020	565								
6.0	5.0	1.0	M6x10	14	555	020	776								
6.0	5.0	0.0	M6x11.5	14	555	020	712								
6.0	5.0	0.0	M6x17.5	14	555	020	840								
6.0	7.0	0.0	M6x10	14	555	020	654								
6.0	7.0	1.0	M6x15	14	555	020	790								
6.0	7.0	3.0	M6x19	14	555	020	890								
11.0	6.0	0.0	M6x11.5	14	555	020	620								
11.0	6.0	1.0	M6x15	14	555	020	762								
11.0	6.0	3.0	M6x19	14	555	020	877								
13.0	10.0	0.0	M6x19	14	555	020	880								
13.0	10.0	1.0	M6x24.5	14	555	020	974								
13.0	10.0	3.0	M6x28	14	555	020	1116								
14.0	11.0	0.0	M6x18	14	555	020	780								
14.0	13.0	1.0	M6x17.5	14	555	020	882								
14.0	15.0	0.0	M6x17.5	14	555	020	815								
14.0	15.0	1.0	M6x19	14	555	020	910								
14.0	15.0	0.0	M6x25.5	14	555	020	920								

For charges:

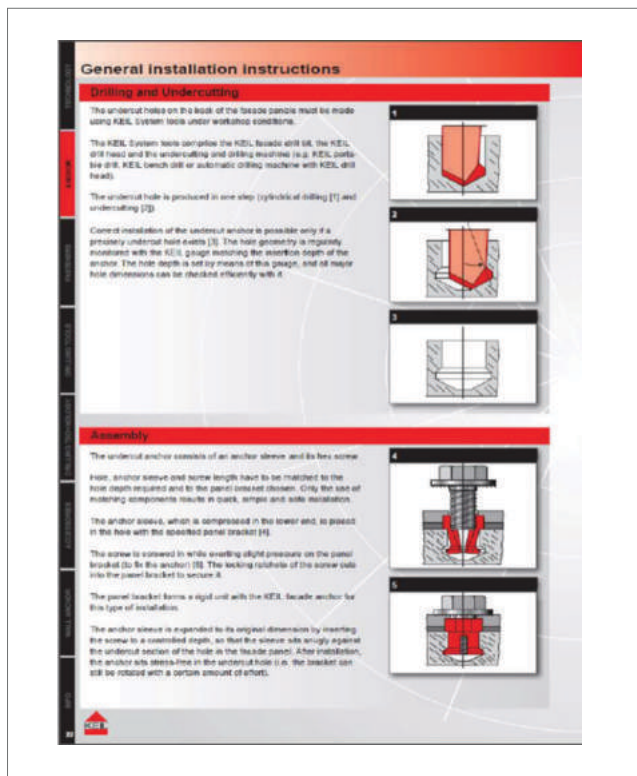
- Ø14 quantities lower than the packing unit are not allowed, the following surcharges apply:
- 450 - 100 pieces + 10%
- 450 - 50 pieces + 20%
- 450 - 1 pieces + 40%

Comments:

- * See appropriate approval table
- ** KEIL undercut anchors are recognized by approved bodies
- Other dimensions on request

Storage:

- * Application only as per approval and KEIL installation instructions

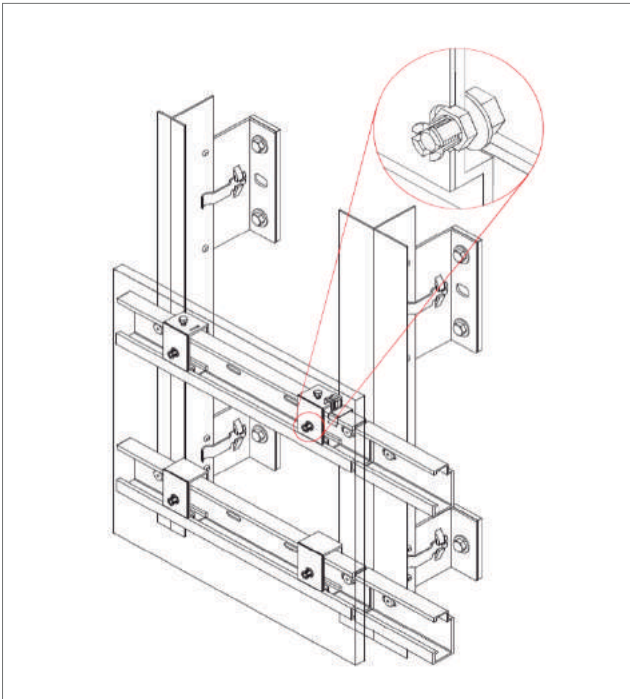


KEIL drilling bit for undercut anchor



KEIL drilling machine for undercut anchor

To build HIMACS facades, we suggest using a structure made from a ventilated façade system using BWM fixings and KEIL special undercut anchors to fix HIMACS Façade panel in non visible master technique.






Declaration of Conformity

The producer:
KEIL Befestigungstechnik GmbH
Im Aust 42, 51766 Engelskirchen, Germany

Confirms according to § 9 of the Bauproduktengesetz as implementation of the CPD (69/109/EEWG), that the product:

KEIL undercut anchor KH
for facade panels
HI·MACS® type: Alpine White

Produced at the manufacturing plant:
KEIL Befestigungstechnik GmbH
Im Aust 42, 51766 Engelskirchen, Germany

Complies with the European Technical Approval ETA – 12/0583 and fulfils the requirements for the CE - marking referred to section 3 of ETA-12/0583.

For the Certification of the factory production control the following notified body was assigned:

Koeln Institut fuer Baustoffpruefung und -technologie
Betzdorfer Strasse 2, 50679 Koeln, Germany, (1649)

The certificate of the factory production control was issued with the following number

1649-CPD-0013

on the 11.01.2013 (valid until the 24.04.2016)



Logo: 17.09.2013
KEIL Befestigungstechnik GmbH
Im Aust 42, 51766 Engelskirchen, Germany
Jürgen Bergfelder
Managing Director
KEIL Befestigungstechnik GmbH

DECLARATION OF PERFORMANCE

DoP No. 1649-CPD-0013 E



Unique identification code of the product-type: **KEIL undercut anchor KH for facade panels HI·MACS®**
Type: **Alpine White**

- Type, batch or serial number or any other element allowing identification of the construction product as required pursuant to Article 11(6) of the CPD (69/109/EEWG), Annex 2. Batch number: see packaging of the product.
- Intended use or uses of the construction product, in accordance with the applicable harmonised technical specification, as foreseen by the manufacturer:

generic type	Undercut anchor KH
for use in	Special anchor for the rear fixing of facade panels made of natural acrylic stone and to the specifications given in ETA-12/0583
material	stainless steel
	internal and external use (including industrial and marine environment) without particular aggressive conditions.
- Name, registered trade name or registered trade mark and contact address of the manufacturer as required pursuant to Article 11(6):
KEIL Befestigungstechnik GmbH, Im Aust 42, 51766 Engelskirchen, Germany, www.keil.eu
- Where applicable, name and contact address of the authorised representative whose mandate covers the tasks specified in Article 12(3). Not relevant.
- System or systems of assessment and verification of consistency of performance of the construction product as set out in Annex V: **System 2+**
- In case of the declaration of performance concerning a construction product covered by a harmonised standard: Not relevant.
- In case of the declaration of performance concerning a construction product for which a European Technical Assessment has been issued: **Deutsches Institut für Bautechnik**, 10829 Berlin, Germany, www.dibt.de (issued: ETA-12/0583) on the basis of: **CUAP 06/01/16**
The notified body **KIBT**, 50679 Koeln, (1649-CPD) performed according to System 2+ the Certification of factory production control 1649-CPD-0013 on the basis of:
- Initial inspection of factory and of factory production control;
- Ongoing surveillance, assessment and approval of factory production control

8. Declared performance:

Essential Characteristics	Performance	Harmonized Technical Specification
Characteristic values for the design of the anchor and facade panel	ETA-12/0583, Annex 4	CUAP 06/01/16
Reaction to fire	Class A1	EC decision 86/603/EEC (as amended)

When pursuant to Article 37 or 38 in the Specific Technical Description has been used, the requirements with which the product complies: Not relevant.

10. The performance of the product identified in points 1 and 2 is in conformity with the declared performance in point 9.

This declaration of performance is issued under the sole responsibility of the manufacturer identified in point 4.

Signed for and on behalf of the manufacturer by:



Jürgen Bergfelder
Managing Director



Dipl.-Ing. Georg Mißbach
Product Manager



Engelskirchen, 28.08.2013

DoP 12-0583 2013 E.doc

Deutsches Institut für Bautechnik

Anstalt des öffentlichen Rechts
Kolonnenstr. 30 L
10529 Berlin
Deutschland
Tel.: +49(0)30 787 30 0
Fax: +49(0)30 787 30 320
E-mail: dibt@dibt.de
Internet: www.dibt.de



Mitglied der EOTA
Member of EOTA



Erklärung
und
Motivierung
gemäß Artikel 12 der
Richtlinie des Rates vom
21. Dezember 1988 zur
Angleichung der Rechts- und
Verwaltungsverfahren
der Mitgliedstaaten
über Bauprodukte
(89/109/EEWG)

Europäische Technische Zulassung ETA-06/0220

Handelsbezeichnung <i>Trade name</i>	KEIL Hinterschnittanker KH für Glasfaserbeton-Tafel "concrete skin" <i>KEIL undercut anchor KH for Glass fibre concrete panels "concrete skin"</i>
Zulassungsinhaber <i>Holder of approval</i>	Rieder Faserbeton-Elemente GmbH Glasberg 1 83059 Kolbermoor DEUTSCHLAND
Zulassungsgegenstand und Verwendungszweck <i>Generic type and use of construction product</i>	Spezialanker zur rückseitigen Befestigung von Fassadenplatten aus Faserzement-Tafeln nach EN 12467 <i>Special anchor for the rear fixing of facade panels made of Fibre-cement flat sheets according to EN 12467</i>
Geltungsdauer: <i>Validity:</i>	vom 11. Oktober 2006 bis 11. Oktober 2011
Herstellwerke <i>Manufacturing plants</i>	Keil Hinterschnittanker KH: Keil Werkzeugfabrik Fassadenplatte: Rieder Faserbeton-Elemente GmbH

Diese Zulassung umfasst
This Approval contains:



14 Seiten einschließlich 6 Anhänge
14 pages including 6 annexes

Europäische Organisation für Technische Zulassungen
European Organisation for Technical Approvals

Sub-Construction System Solution (Cladding System)

To build HIMACS facades, we suggest using a structure made from a ventilated façade system using BWM fixings.



BWM
KONSTRUKTIONSSYSTEME FÜR DEN FASSADENBAU

Lieferprogramm ATK 103 T für Keil-Dübelssystem

Tragprofile

Horizontal-Tragprofil ungleicht t=3mm
s=Nennmaß 34mm
Material: EN AW 6063 T96

L [mm]	Artikel-Nr.
6000	669430

Horizontal-Tragprofil geleicht t=3mm
s=Nennmaß 34mm
Material: EN AW 6063 T96

L [mm]	Artikel-Nr.
6000	669430

Agraffen

Agraffen justierbar t=3mm
Material: EN AW 6063 T96

B [mm]	Artikel-Nr.
30	66031
60	66032
80	66033

MIT Stellschraube und Teiler zur Plattenfixierung

Agraffen star t=3mm
Material: EN AW 6063 T96

B [mm]	Artikel-Nr.
30	66034
60	66035
80	66036

Technische Änderungen vorbehalten
Seite 51

04/2007

BWM
KONSTRUKTIONSSYSTEME FÜR DEN FASSADENBAU

Project-Checklist

Date

Project

Name of project
Address (zip code, town, street)
Total facade area A = m²

Measurements of building

Height [m]	Length [m]	Width [m]
<input type="text"/>	<input type="text"/>	<input type="text"/>

Wind loads

Pressure [N/m ²]	Suction [N/m ²]
<input type="text"/>	<input type="text"/>

Cladding elements
(type, quality and form)

Measurements of panel

Width [mm]	Height [mm]	Thickness [mm]
<input type="text"/>	<input type="text"/>	<input type="text"/>

Panel fixing
(Visible, hidden, other)

Anchoring ground
(type, quality, thickness, etc.)

Distance from anchoring ground

Insulation [mm]	Ventilation space [mm]
<input type="text"/>	<input type="text"/>

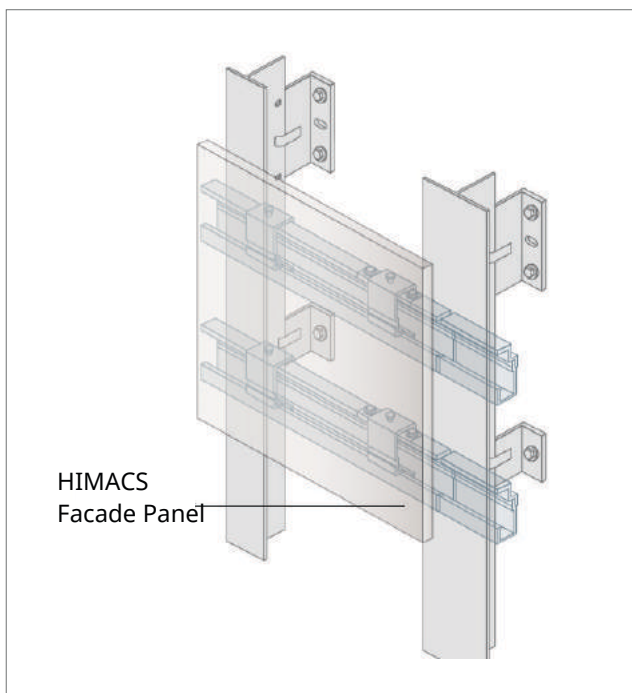
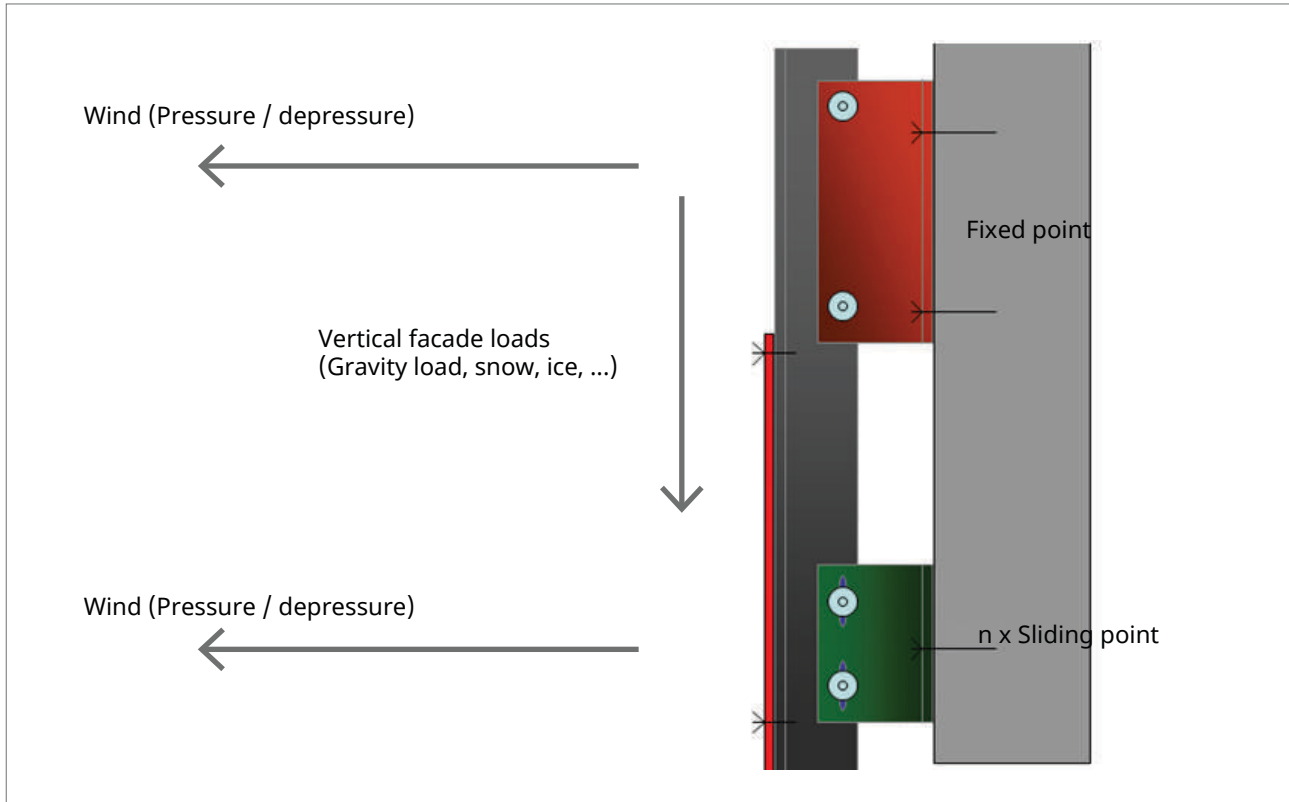
BWM subconstruction type

Notes/Special requirements
(seismic actions, fire barriers, ...)

Attachments
(panel layout, horizontal section, vertical section, etc.)

Additional information

To build HIMACS facades, we suggest using a structure made from a ventilated façade system using BWM fixings.



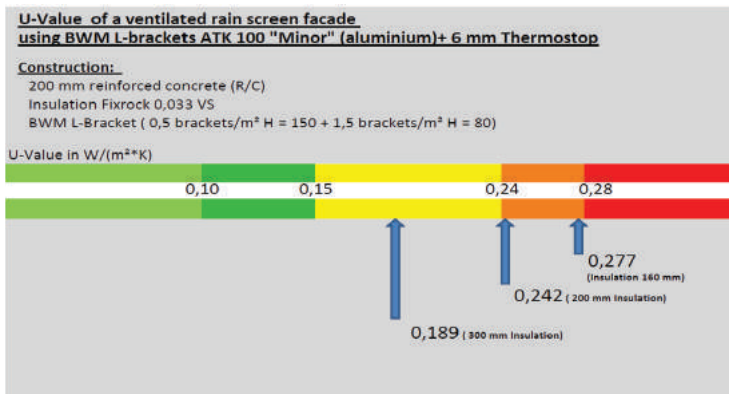
In order to enable stress-free changes in length of the sections due to temperature variations, the sections are usually fixed using

- 1 x fixed point
- n x sliding point
(n = statically required number of brackets)

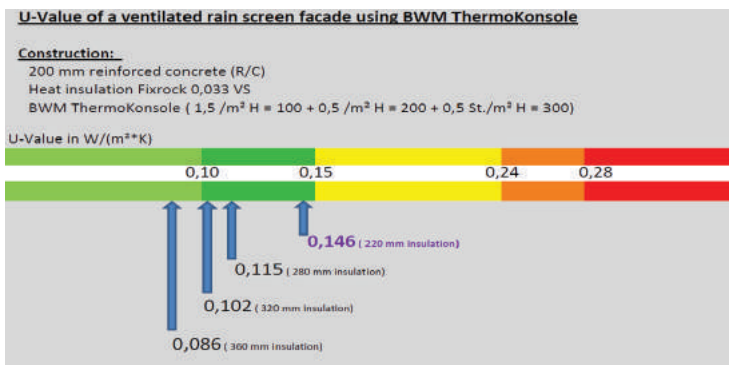
Sub-construction



BWM L-brackets
 • Made of aluminum



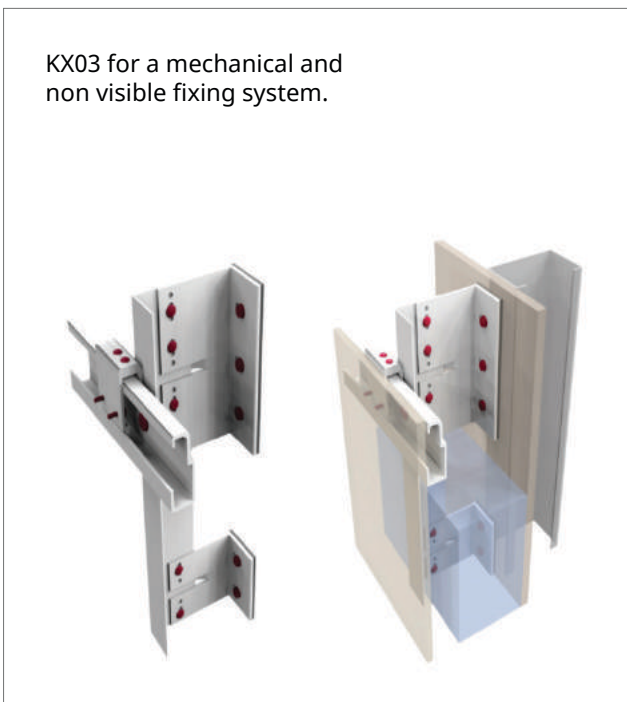
BWM Thermo-brackets
 • Made of fiber glass
 • Reinforced polyamide



To build HIMACS facades, we suggest using a structure made from a ventilated façade system using SFS Façade Fixing Systems made in Aluminum.



KX03 for a mechanical and non visible fixing system.



Einstellbereiche – 50 x 50 mm L oder 100 x 50 mm T				
Größe (mm)	Min (mm)	Max (mm)	Aluminium	Edelstahl
42	76	105	•	•
60	102	135	•	•
90	118	148	•	•
120	148	179	•	•
150	178	209	•	•
180	208	239	•	•
210	238	269	•	•
240	268	299	•	•
270	298	329	•	•
300	328	359	•	•
330	358	389	•	•
360	388	419	•	•
390	418	449	•	•

Einstellbereiche – 60 x 40 mm L oder 100 x 40 mm T				
Größe (mm)	Min (mm)	Max (mm)	Aluminium	Edelstahl
42	66	85	•	•
60	68	105	•	•

Einstellbereiche – 60 x 40 mm L oder 100 x 60 mm T				
Größe (mm)	Min (mm)	Max (mm)	Aluminium	Edelstahl
60	112	125	•	•
90	118	159	•	•
120	148	188	•	•
150	178	218	•	•
180	208	248	•	•
210	238	279	•	•
240	268	309	•	•
270	298	338	•	•
300	328	368	•	•
330	358	399	•	•
360	388	429	•	•
390	418	459	•	•

Referenzbezeichnung	Detailangaben	Artikelnr.
NV-CP-NV3-3000	Tagprofil NV3 System x 3000	1821331
NV-CP-NV3-6000	Tagprofil NV3 System x 6000	1821334
NV3-TUF-S-ADUF-3.5mm	NV3 justierbare Agraffe für TUF-S	1848012
NV3-TUF-S-STAT-3.5mm	NV3 statische Agraffe für TUF-S	1848015
NV-NV3-KEIL-STAT	NV3 statische Agraffe für 1x Keil	1821456
NV-NV3-KEIL-ADUF	NV3 justierbare Agraffe für Keil	1821454

Befestigungen	Referenzbezeichnung	Detailangaben	Artikelnr.
SD4S	SD4S/3,5x13,54 (5x2)	Profil an Wandkonsole, Tagprofil an vertikales Profil, Sicherung Agraffe (Festpunkt)	1807972
ASO-D14	ASO-D14-Ø14xL	Profil an Wandkonsole, Tagprofil an vertikales Profil	1816426

Unser Service

Angebot

Beratung) Referenzfläche) Vorstatik) Systemkizze) Angebot

Auftrag

Statik) Planung Unterkonstruktion) Auftragsbestätigung) Lieferung) Aufmaß (Kunde)) Paneelplanung



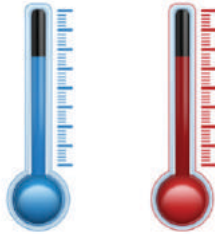
Thermal Expansion (Cladding System)

Expansion

The thermal expansion coefficient to take into account is:

$$45 \times 10^{-6} \text{ mm/mm/}^{\circ}\text{C}$$

for a Delta T of 80°C
(min: -20°C/max: +80°C).



The determined expansion X in mm of the panels is given in the tables below, taking into consideration the manufacturing tolerances and Delta T of 100°C, according to the following equations:

$$X = (45 \times 10^{-6}) \times (W \text{ or } H) \times 100$$

X = expansion (mm)
W = panel width (mm)
H = panel height (mm)

Sample Calculation of expansion max.

Expansion

Example $\Delta t = + 100^{\circ}\text{C}$
 $\alpha t = + 100^{\circ}\text{C}$
L = 100cm

$$\Delta = 0.000045 \text{K} \times 100^{\circ}\text{C} \times 100\text{cm}$$

$$\Delta = 0.0045 \times 100$$

$$\Delta = 0.45\text{cm}$$

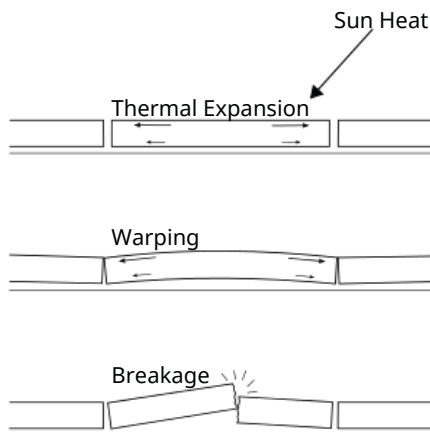
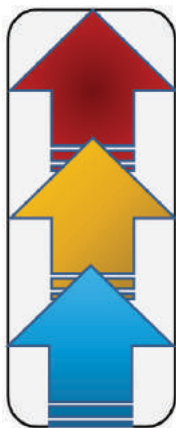
$$\Delta = 4.5\text{mm}$$

Note:

At a temperature difference of 100°C HIMACS shrinks or expands of approximate +/- 4.50mm / linear Meter

WIDTH : W (mm)	X (mm)	JOINT TYPE
0 ≤ L ≤ 1200	5	Open, closed, or lap joints
1200 ≤ L ≤ 1400	6	
1400 ≤ L ≤ 1700	7	
1700 ≤ L ≤ 2000	8	
2000 ≤ L ≤ 2300	9	Closed, or lap joints
2300 ≤ L ≤ 2600	10	
2600 ≤ L ≤ 2800	11	
2800 ≤ L ≤ 3100	12	
3100 ≤ L ≤ 3400	13	
3400 ≤ L ≤ 3670	14	

Source: CSTB: HIMACS Avis Technique



Expansion

Sample Calculation of expansion max.

Expansion

Expansion coefficient of HIMACS according to norm EN 14851:

$$\alpha_t = 45 \times 10^{-6} / K$$

Formula without adding limitations:

$$\Delta = \alpha_t \times \Delta t \times l$$

Δ = Expansion
 α_t = Expansion coefficient
 Δt = Temperature difference
 l = Length

$\Delta t = 80^\circ C$ Material length: 1m

Expansion

Example $\Delta t = 80^\circ C$
 $\alpha_t = 0.000045K$
 $L = 100cm$

$$\Delta = 0.000045K \times 80^\circ C \times 100cm$$

$$\Delta = 0.0036 \times 100$$

$$\Delta = 0.36cm$$

$$\Delta = 3.6mm$$

Note:

At a temperature difference of $80^\circ C$ HIMACS shrinks or expands of approximate +/- 3.6mm / linear Meter

$\Delta t = 1^\circ C$ Material length: 1m

Expansion

Example $\Delta t = 1^\circ C$
 $\alpha_t = 0.000045K$
 $L = 100cm$

$$\Delta = 0.000045K \times 1^\circ C \times 100cm$$

$$\Delta = 0.00004 \times 100$$

$$\Delta = 0.0045cm$$

$$\Delta = 0.045mm$$

Note:

At a temperature difference of $1^\circ C$ HIMACS shrinks or expands of approximate +/- 0.045mm / linear Meter

$\Delta t = 100^\circ C$ Material length: 1m

Expansion

Example $\Delta t = + 100^\circ C$
 $\alpha_t = 0.000045K$
 $L = 100cm$

$$\Delta = 0.000045K \times 100^\circ C \times 100cm$$

$$\Delta = 0.0045 \times 100$$

$$\Delta = 0.45cm$$

$$\Delta = 4.5mm$$

Note:

At a temperature difference of $100^\circ C$ HIMACS shrinks or expands of approximate +/- 4.50mm / linear Meter

$\Delta t = 30^\circ C$ Material length: 1m

Expansion

Example $\Delta t = 30^\circ C$
 $\alpha_t = 0.000045K$
 $L = 100cm$

$$\Delta = 0.000045K \times 30^\circ C \times 100cm$$

$$\Delta = 0.00135 \times 100$$

$$\Delta = 0.135cm$$

$$\Delta = 1.35mm$$

Note:

At a temperature difference of $30^\circ C$ HIMACS shrinks or expands of approximate +/- 1.5mm / linear Meter

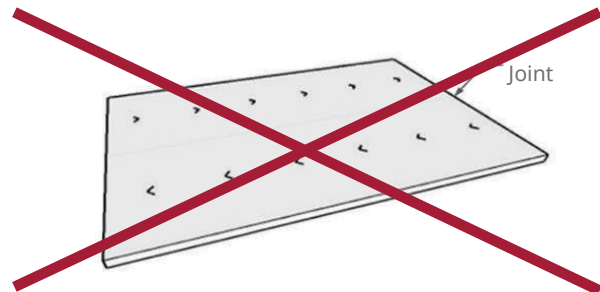
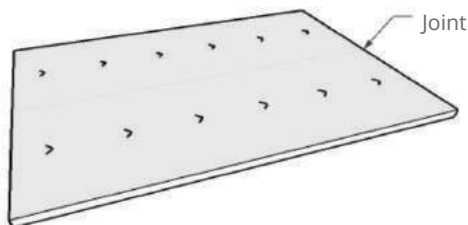
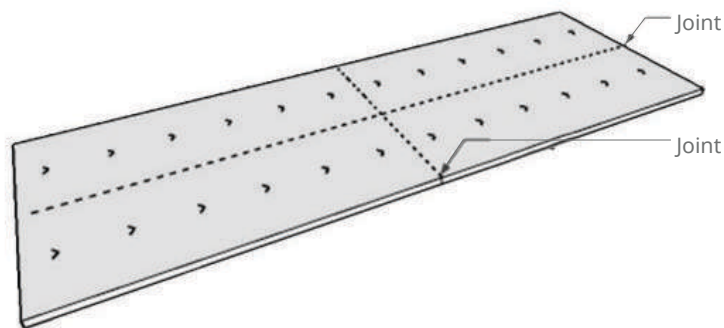
Source

TTT: HIMACS Basic Fabrication

■ Summery of Hints

When using several sheets for doing one job ensure a continuous flow of sequential numbers as well as the same production flow.

Do not turn one sheet into a different direction from the next or opposite side (no turn of any sheet by 90°, 180° or 270°).



When preparing for a big project and you have to use more then one batch of material ensure the surface is sand equal to any other using surface sanding level. If not it is fabricators responsibility to adjust the right sanding level in his workshop.

Therefore a proper project planning with following batch and sequential numbering is mandatory. Check always on colour matching before fabricating.

Be aware:

The 10 Year Limited Installed Warranty for Exterior Application does not cover any failures due to fabrication or installation mistakes; neither any failure of HIMACS adhesive used on outside application.

Sanding / finishing

The reference is as recommended with our standard products: For further details: See Technical Guidelines: "Sanding".

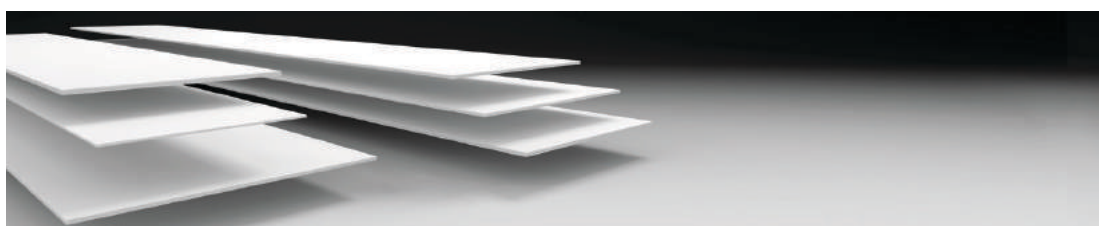


Festool RO150 & Festool Langhalsschleifer

		Standard recommendation				
FINISH-LEVEL	MATT-FINISH		SEMI-GLOSS-FINISH		HIGH-GLOSS-FINISH	
HIMACS colour family	for all colours		for all colours		for all colours	
Sanding steps	micron-sandpaper	grid-sandpaper	micron-sandpaper	grid-sandpaper	micron-sandpaper	grid-sandpaper
Step 1	100/80 µ	150/180	100/80 µ	150/180	100/80 µ	150/180
	take dust away		take dust away		take dust away	
Step 2	60 µ	220	60 µ	220	60 µ	220
	take dust away		take dust away		take dust away	
Step 3	"useit®" Superpad S/G Scotch Brite™ Maroon 7447	280	40/30 µ	280/320	30 µ	280/320
	take dust away		take dust away		take dust away	
Step 4	industrial paper towel	"useit®" Superpad S/G Scotch Brite™ Maroon 7447	"useit®" Superpad S/G Scotch Brite™ Maroon 7447	380/400	15 µ	380/400
	take dust away		take dust away		take dust away	
Step 5		industrial paper towel	industrial paper towel	"useit®" Superpad S/G Scotch Brite™ Maroon 7447 take dust away	9 µ	600/800
					take dust away	
Step 6				industrial paper towel	Finesse-it™ Finish- component	1200
					take dust away	
Step 7						1500
						1800
						2500

Product Availability on HIMACS Panel Sheets

The material can be chosen according to its requirements of application



COLORS		THICKNESS	STANDARD WIDTH	STANDARD LENGTH	AVAILABLE WIDTH	FLEXIBLE LENGTH	
Solid	Solid S028	20mm	760mm	3,680mm	N/A	2,200mm ~3,680mm	
			910mm	3,680mm			
			1,350mm	3,680mm			
			1,520mm	3,680mm			
	Solid (Except S028)	6mm	760mm	2,490mm	910mm, 1350mm, 1520mm	2,200mm ~3,680mm	
		9mm	760mm	3,680mm	910mm, 1350mm, 1520mm	2,200mm ~3,680mm	
		12mm	760mm	3,680mm	910mm, 1350mm, 1520mm	2,200mm ~3,680mm	
		20mm	760mm	3,000mm	N/A	2,200mm ~3,680mm	
		Ultra Thermoforming Intense Standard	12mm	760mm	3,680mm	910mm, 1350mm, 1520mm	2,200mm ~3,680mm
				930mm	3,680mm	N/A	2,200mm ~3,680mm
		Intense ULTRA	12mm	760mm	3,680mm	910mm, 1350mm, 1520mm	2,200mm ~3,680mm
		S828	12mm	760mm	3,680mm	N/A	2,200mm ~3,680mm
	FR S728 + S728M	12mm	760mm	3,680mm	N/A	2,200mm ~3,680mm	
	Lucent	OPAL	6mm	760mm	2,490mm	910mm, 1520mm	2,200mm ~3,680mm
1350mm				3,680mm			
9mm			760mm	3,680mm			
			1350mm	3,680mm			
12mm		760mm	3,680mm				
		1350mm	3,680mm				
"Except OPAL (Sapphire, Ruby Emerald)"	12mm	760mm	3,680mm	910mm, 1350mm, 1520mm	2,200mm ~3,680mm		
Lucia	Standard	12mm	760mm	3,680mm	N/A	2,200mm ~3,680mm	
		20mm	760mm	3,000mm	N/A	2,200mm ~3,680mm	
Volcanics	Standard	12mm	760mm	3,680mm	N/A	2,200mm ~3,680mm	
Aster	Standard	12mm	760mm	3,680mm	N/A	2,200mm ~3,680mm	
Marmo	Standard	12mm	760mm	3,680mm	N/A	2,200mm ~3,680mm	
Eden	Standard	12mm	760mm	3,680mm	N/A	N/A	
Strato	Standard	12mm	760mm	3,680mm	N/A	3,680mm	
Terrazzo	Standard	12mm	760mm	3,680mm	N/A	3,680mm	

■ Product

Transportation and storage

During transportation and in storage, all facade-cladding materials must be protected from moisture, the formation of condensate, rapid temperature changes, and direct sunlight. Instructions by the manufacturers must be followed.

For standard panels follow the general instructions. For special HIMACS Façade Panels ensure to avoid any pressure from top and store the items stress free and under normal weather conditions.

Quality Check

- Check any fabricated item on quality aspects before leaving the workshop.
- In case of any mistakes it easily can be repaired in the workshop and keeps the time of re-work very low.
- Any damage or any mistakes which will be recognized at a later time will make the fixing much more expensive.

Tolerances

Tolerances of the finished product

Principles/General Tolerances are permissible deviations of a (partial) service/work from the planned target.

- 1) Tolerances are unavoidable in construction works, and result from the sum of substrate-, product- and installation tolerances. In most cases, they relate to dimensions and position, but they may also relate to surface characteristics, the degree of gloss, colour and other properties of components.
- 2) Tolerances must be distinguished from dimensional changes or deformations resulting from temperature changes, load change or moisture absorption. These are determined by the physical and chemical properties of the building materials. They cannot be prevented and must therefore be taken into account in addition to the tolerances.
- 3) In order to avoid arguments between client and contractor relating to deviations of the finished services/works from the agreed or planned specifications, the permissible tolerances and the methods of measurement must be clearly agreed upon beforehand. This applies particularly to cases in which smaller tolerances than those specified in the pertinent regulations are to be achieved.
- 4) The product-, substrate- and installation tolerances must be taken into account when specifying the permissible tolerances for the finished wall and roof surfaces.
- 5) Unless otherwise specified, a standard viewing method is to be used when assessing the visual appearance of visible surfaces. This means that lighting and viewing distance and angle must match the conditions under which the building is normally used.
- 6) The visual appearance of surfaces and colours depends on the type and thickness of the coating as well as the direction in which the cladding elements were installed.
- 7) Assessments must be carried out in diffuse light and under no circumstances in side light or in direct sunlight.
- 8) To avoid differences in surface and colour, client and contractor must agree that the material for particular sections or for the complete work should come from the same production batch.
- 9) With certain colours (particularly glazed or metallic colours), colour differences may occur even within one production batch. Guidelines by the manufacturer are to be followed in.

Tolerances

Tolerances of the finished product

Recommendations on agreed tolerances

- 1) Tolerances must already be considered and agreed upon in the planning stage.
- 2) When deciding on the permissible tolerances of the finished surfaces, the sum total of substrate-, product-, cutting-, and installation tolerances must be taken into account. Compensatory allowances must be considered in the construction...
- 3) For the following points, the permissible tolerances and their methods of measurement in the finished works must be agreed upon:
 - **Lengths and widths** of the cladding elements
 - **Deviations from specified alignments and heights**
 - **Joint width, misaligned joints:** The tolerances of the finished joint widths comprise the sum of temperature- and material-induced dimensional changes and the permissible production and installation tolerances, and should amount to at least $\pm 20\%$ of the joint width. Example: 10 mm joint $\pm 20\%$ results in 8 to 12 mm **joint width**. The impression of a regular joint pattern is to be achieved.
 - **Evenness of the facade:** The surface of the facade should be even. Any unevenness in the supporting substrate frame must be considered in the planning phase and compensated for by the substructure. The tolerances to be agreed upon depend on the cladding material used. Waviness is generally unavoidable in thin metal sheets and therefore not to be regarded as a defect (see IFBS-guidelines for light-weight metal construction (Planning and Installation)).
 - **Colour, gloss, surface:** Samples are useful in this context. Ideally, boundary samples should be agreed upon, within the limits of which the colour and gloss may vary (IFBS guidelines for light-weight metal construction | Basic principles).

Services & Maintenance

Service and maintenance

Like buildings and their elements, RVRFs must be inspected at specific intervals.

- 1) It is recommended that clients sign a maintenance agreement with a specialised company. Care and maintenance measures are necessary to allow timely detection of any changes, damage or consequential damage to the RVRF.
- 2) The sooner any damage is detected, the lower the costs for repairs and maintenance and the effort for eliminating consequential damage.
- 3) The following measures are particularly important: - visual inspection of the exhaust air and air supply openings (removal of dirt, encrustation, etc. to clear the openings) - visual inspection of the fastening/fixing elements (refastening or replacement if necessary)

Material Disposal

HIMACS behaves in an environmentally neutral manner. Waste key number in accordance with the European Waste Key Directory Regulation (AVV *) **):

HIMACS sheet material

12 01 05 Plastic shavings and rotary shavings
17 02 03 Plastics (= HIMACS and cured HIMACS adhesive)

When processed with other building materials:

17 09 04 mixed construction and demolition waste, with the exception of those covered by 17 09 01, 17 09 02 and 17 09 03

HIMACS adhesive (unmixed)

07 02 14 Waste of additives containing hazardous substances

14 06 05 Sludge or solid waste containing other solvents

If adhesive is mixed, this is to be treated like sheet material:

17 02 03 Plastics

Packaging:

15 01 01 Paper and cardboard
15 01 02 packaging Plastic packaging
15 01 03 Wooden packaging

Packaging adhesive cartridges:

15 01 10* Packaging containing residues of dangerous substances or contaminated by hazardous substances

Footnote / source:

*) https://www.umweltbundesamt.de/sites/default/files/medien/2503/dokumente/abfallverzeichnis-verordnung_2016.pdf

***) <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1434551761079&uri=CELEX:32001D0118>

For any general Product Information or general fabrication Guideline please check out always the latest Technical documents of

- MSDS
- Price list
- Fabrication Manual
- Technical Data Sheets
- Quality Club Manual or
- latest documentations and brochures under www.himacs.eu

Disclaimer

The information provided in this specific technical bulletin corresponds to our best knowledge on the subject at the date of its publication. This information may be subject to revision as new knowledge and experience becomes available. The data provided fall within the normal range of product properties and relates only to specific material designated. These data may not be valid for such material in combination with other materials or in any process, unless expressly indicated otherwise. It is offered exclusively to provide possible suggestions for your own experiments and needs our approval for Warranty.

This Technical Document is not intended to replace for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purpose. Since we cannot anticipate all variations in actual end-use conditions,

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Exterior Solid Surface Material

HI·MACS

TDS – TECHNICAL DATA SHEET

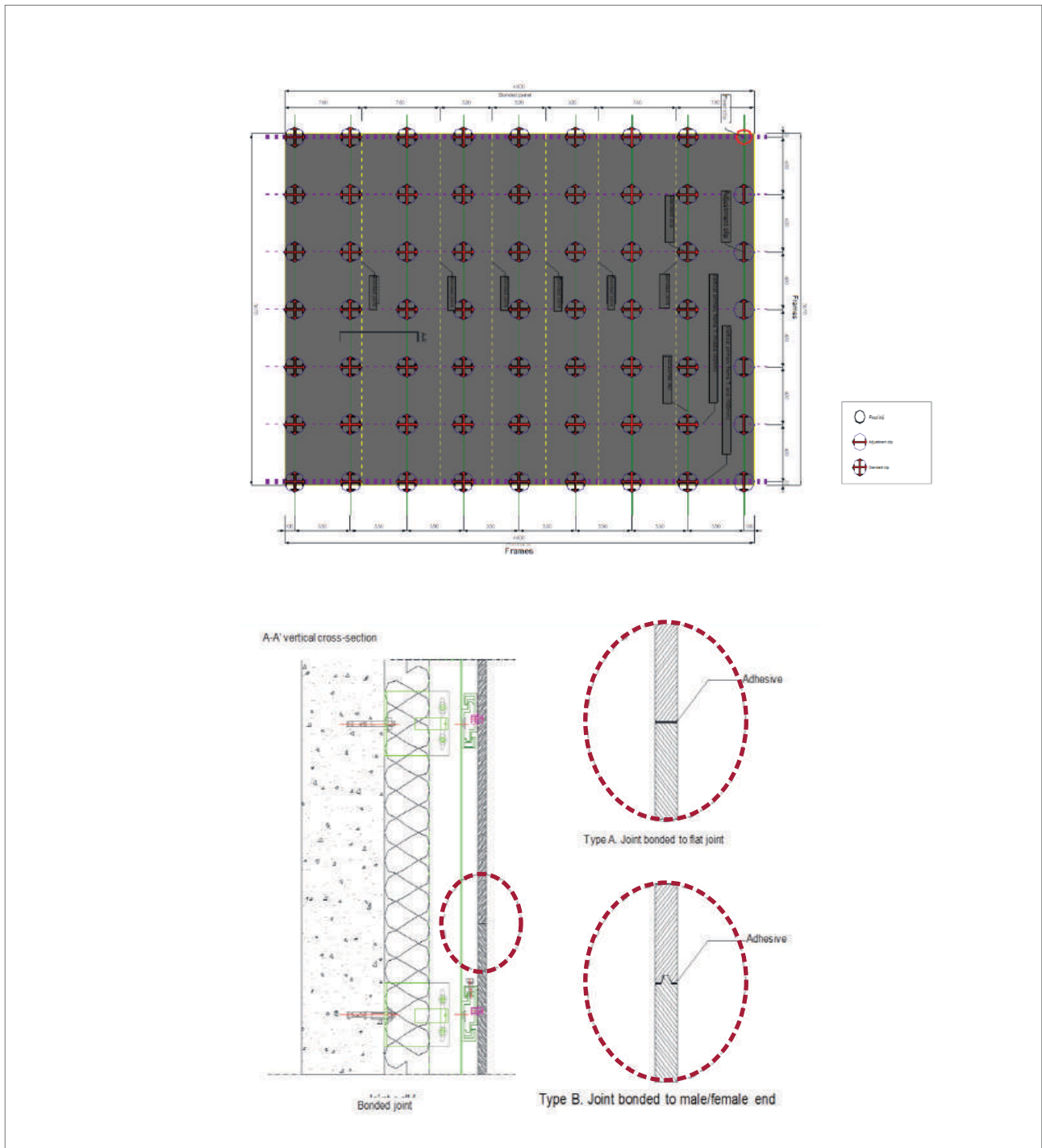
HIMACS EXTERIA FACADE 2022 PART 2

- Drawings

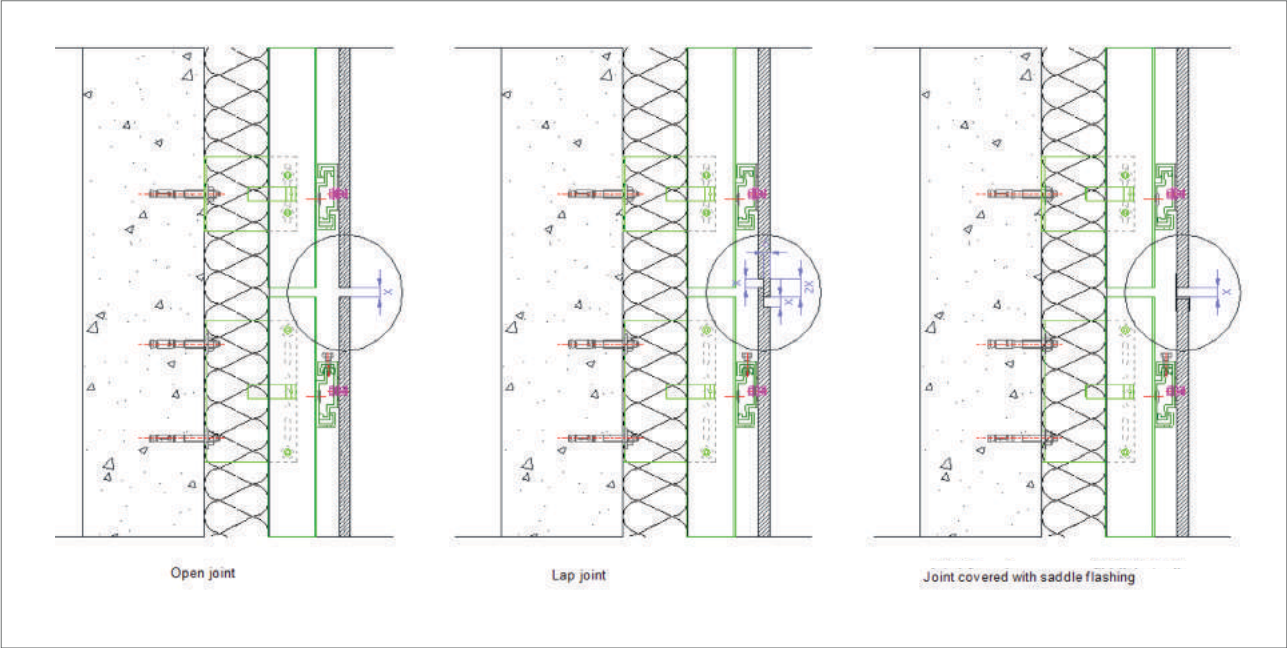
Design: Woo-jin, LIM AEV
Architectures © AEV Architectures

■ Cladding System Solutions (Drawings)

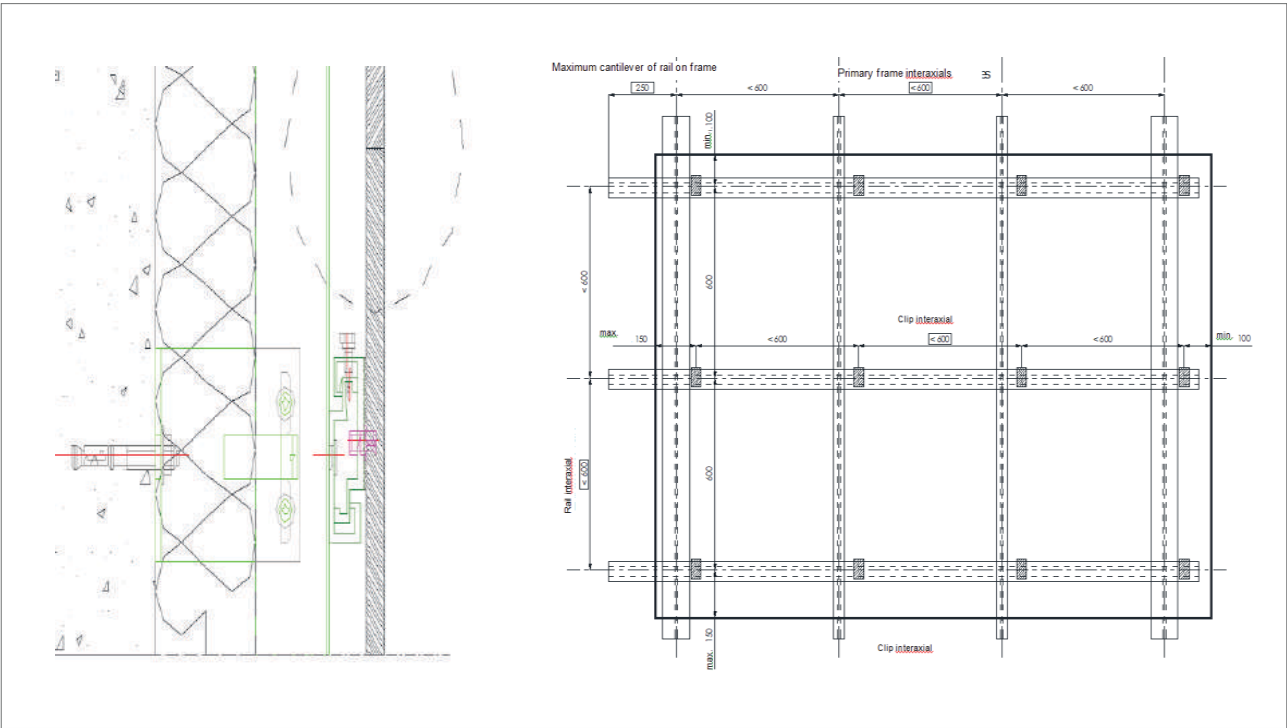
Façade panel sample



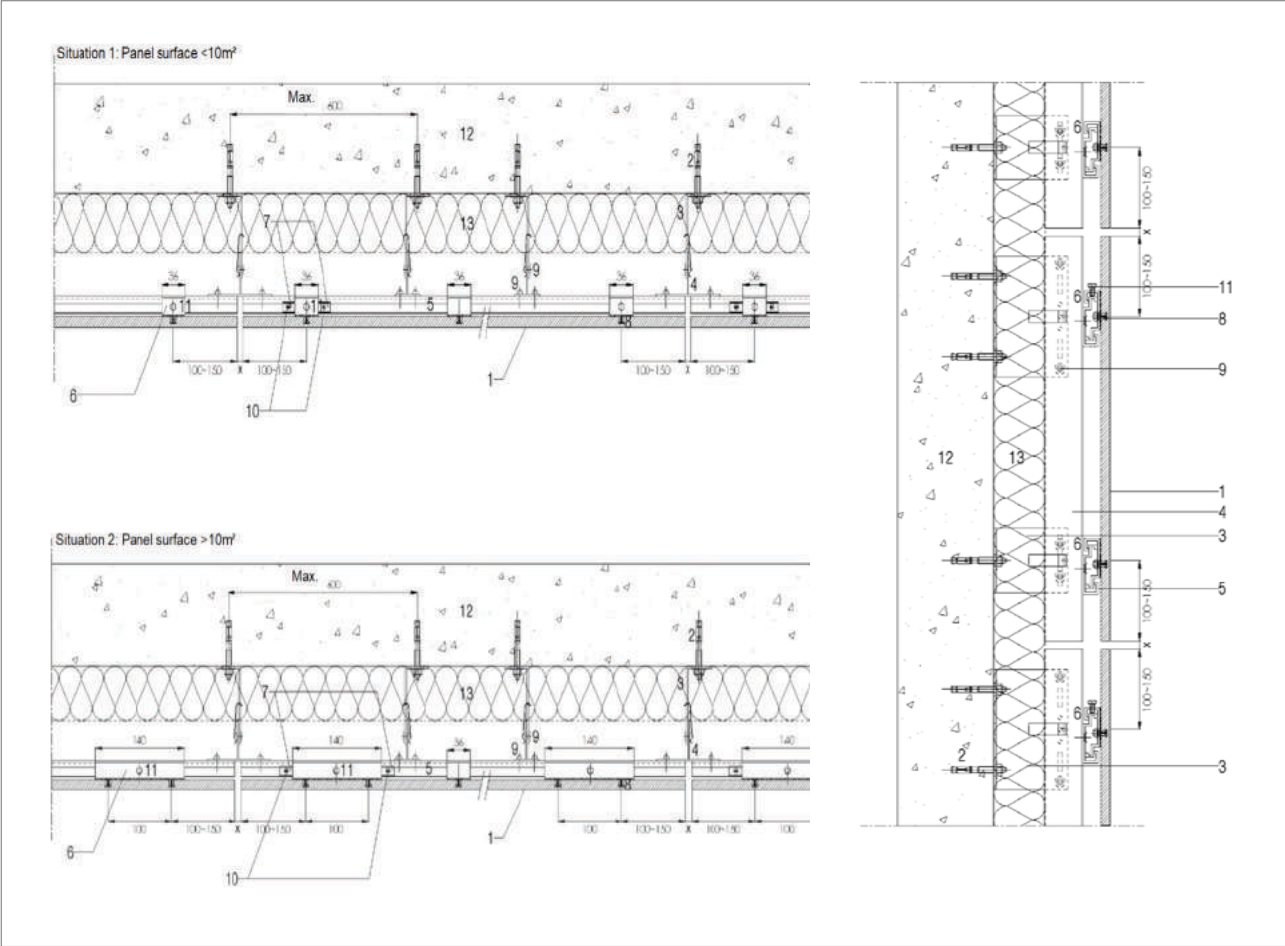
Seams



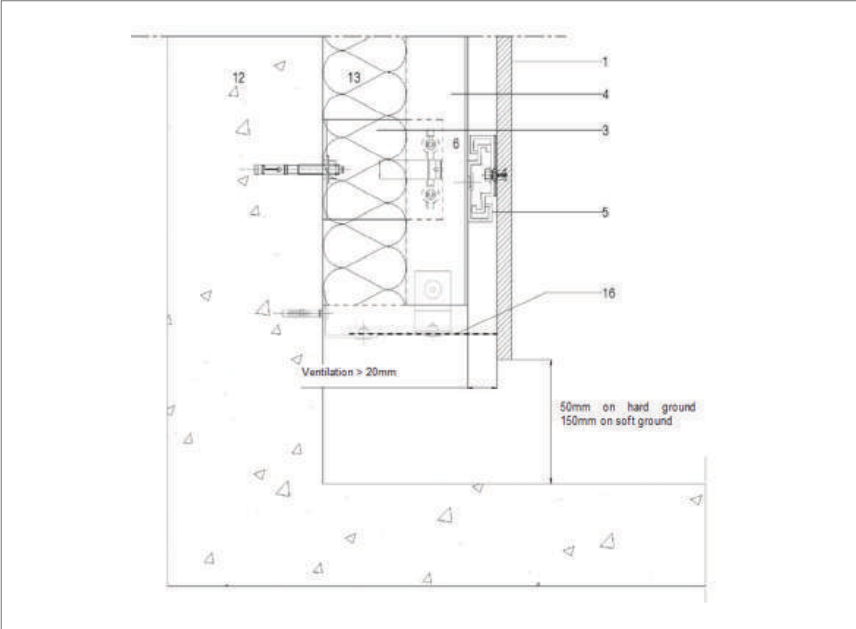
Clasps with adjusting screw



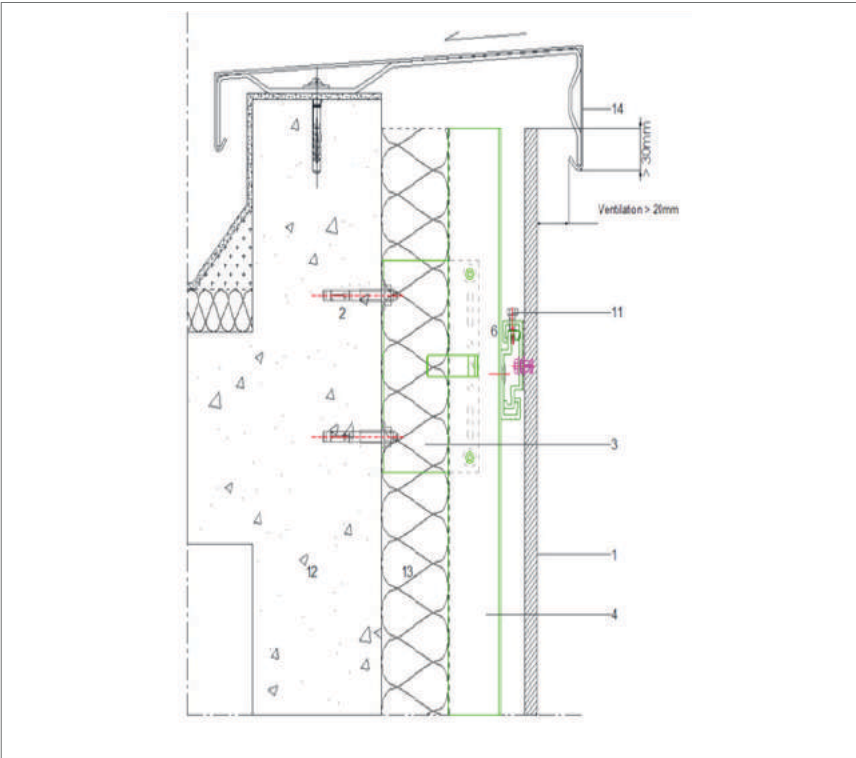
Panel section



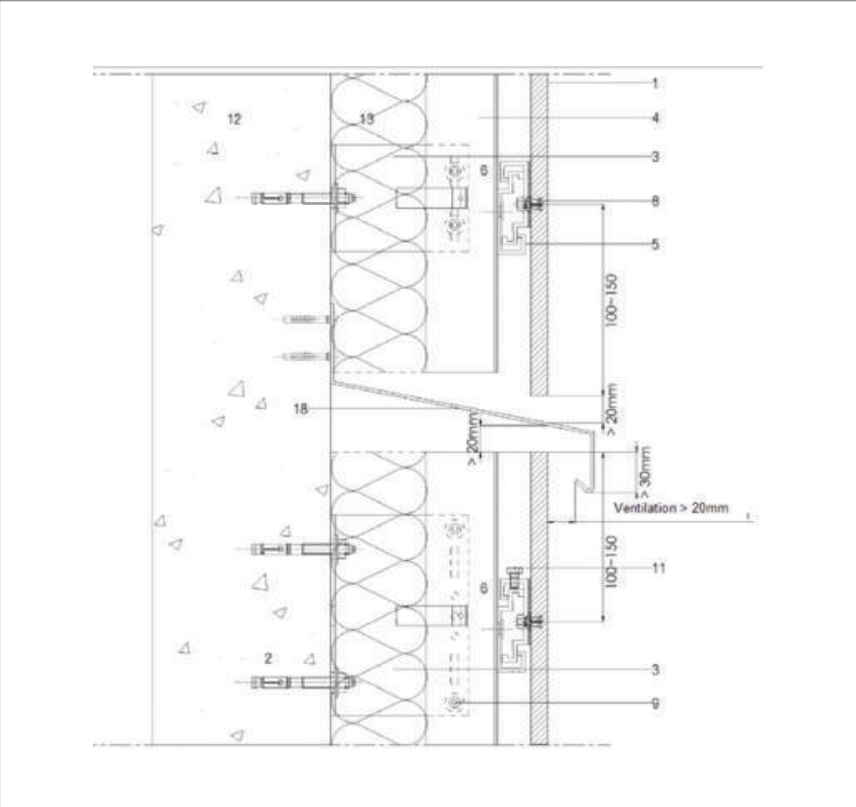
Ground / bottom



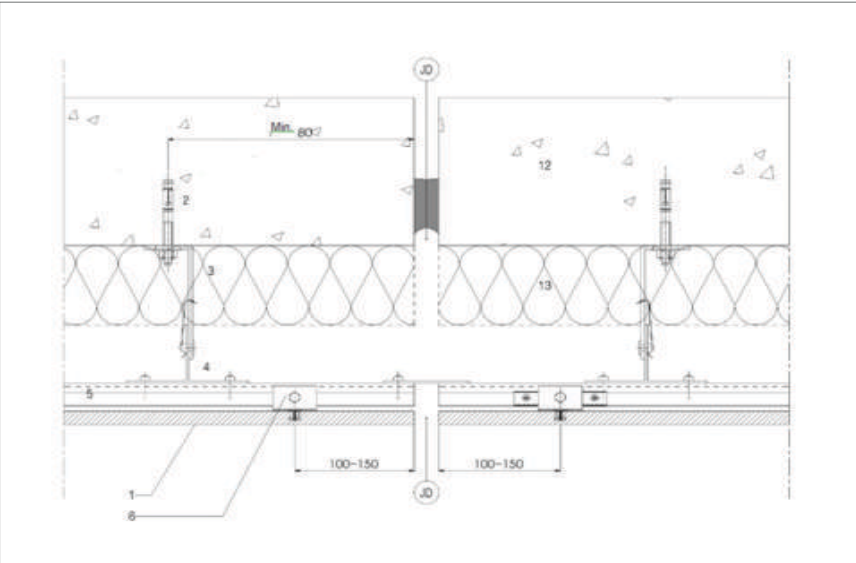
Roof



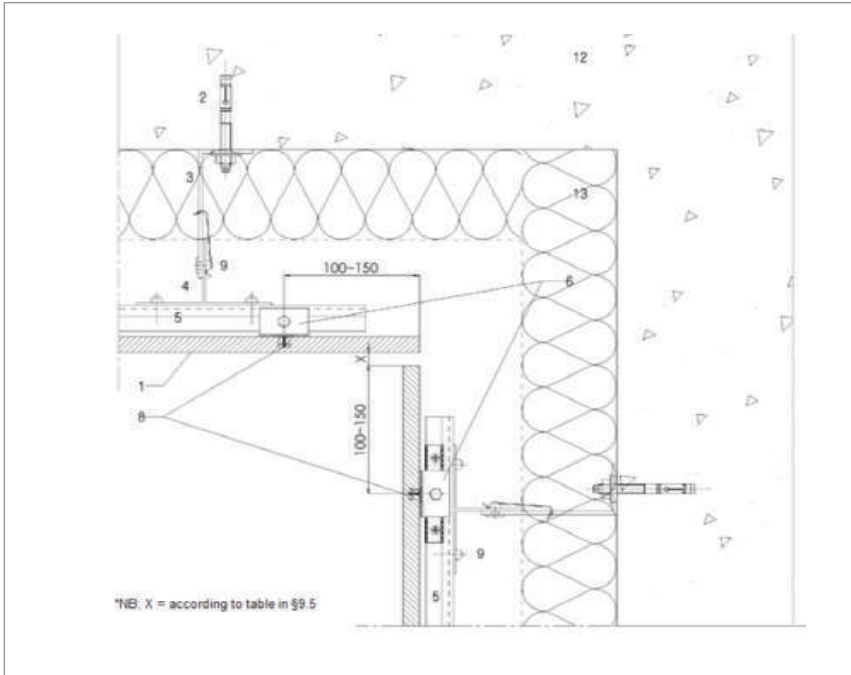
Vertical compartment aviation of air gap



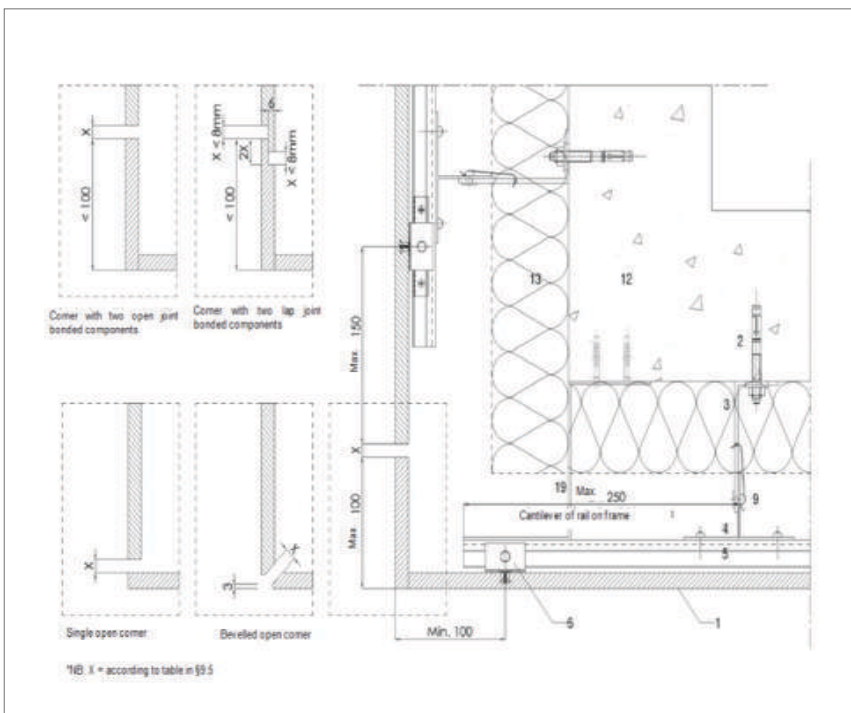
Horizontal compartment aviation of air gap



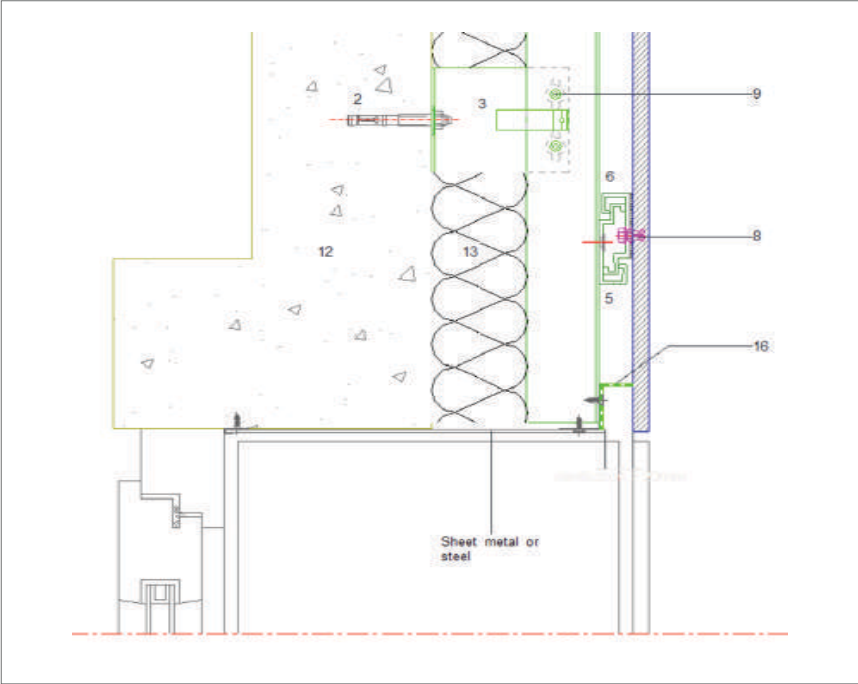
Inside corner



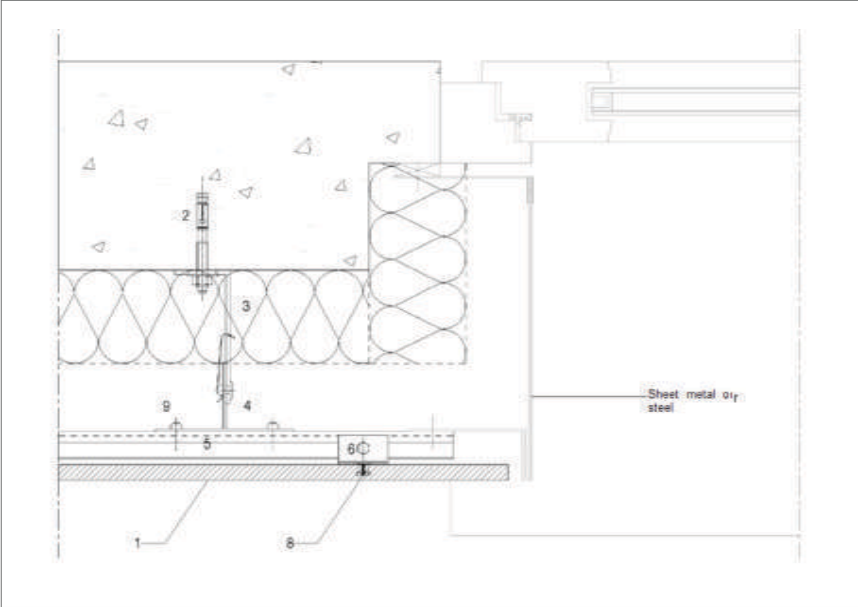
Outside corner



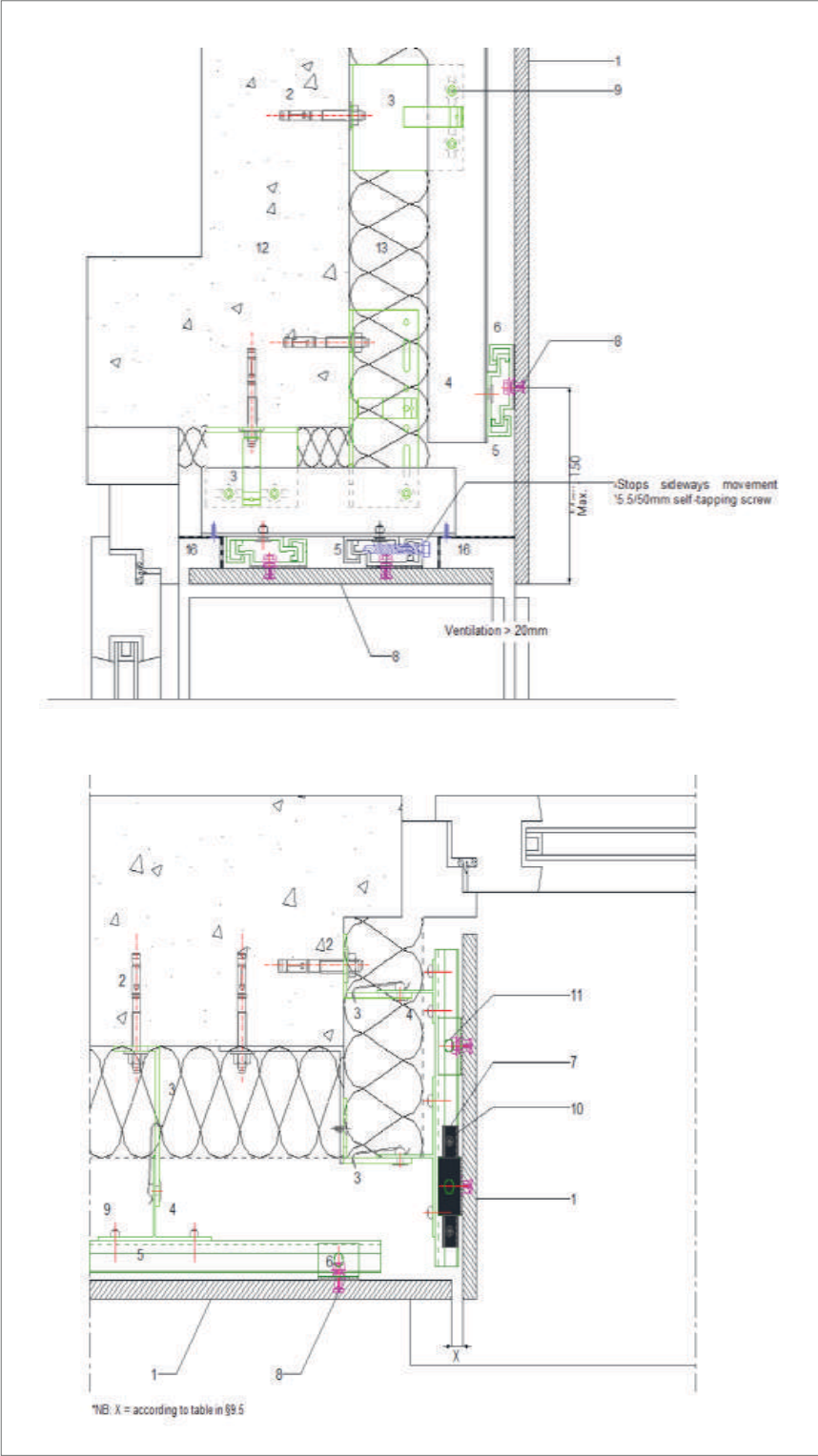
Window lintel with metal sheet (Vertical cut)



Window lintel with metal sheet (Horizontal cut)



Window lintel with HIMACS sheet



Disclaimer

The information provided in this specific technical bulletin corresponds to our best knowledge on the subject at the date of its publication. This information may be subject to revision as new knowledge and experience becomes available. The data provided fall within the normal range of product properties and relates only to specific material designated. These data may not be valid for such material in combination with other materials or in any process, unless expressly indicated otherwise. It is offered exclusively to provide possible suggestions for your own experiments and needs our approval for Warranty.

This Technical Document is not intended to replace for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purpose. Since we cannot anticipate all variations in actual end-use conditions,

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HIMACS EXTERIA FACADE 2022 PART 3

- References



NAM

Bus Station Weilheim / Germany



Project: Weilheim Central Bus Station (Bavaria), Germany
Design: Atelier PK Architects, <https://atelier-pk.com/>
Planning, manufacture & assembly: Glasbau Gipser GmbH <https://www.glasbaugipser.de/>
HIMACS workmanship: ROSSKOPF + PARTNER AG, <https://www.rosskopf-partner.de/>
Material: HIMACS S302 Opal, www.himacs.eu
HIMACS elements: Cladding of the bus platform canopy
Photo credit: Stefan Müller-Naumann, www.mueller-naumann.de

Hanse Merkur Hamburg / Germany.



Location: Siegfried-Wedell-Platz1, Hamburg, Germany
Design: Querkopf Architekten GmbH, Wasfy Taha, Fionn Mögel
Engineering: Buthmann Ingenieur-Stahlbau AG
Fabrication: Likoo / Betriebsgesellschaft GmbH
Material: HIMACS-FR Alpine White S728 (12 mm)
Photo credit: © Dominik Reipka Fotograf
Others MOUNTING SYSTEM: KEIL Befestigungstechnik GmbH, Engelskirchen

Private Penthouse Hamburg / Germany



Location : Hamburg, Germany

Design : Jan Gerdt, Germany, gerdt-picas.de

Fabrication : Kiebitzberg GmbH & Co., Germany,

kiebitzberg.de – Klöpfer Surfaces, Germany, kloepfer-surfaces.de

Material : HIMACS, Ivory White

Stratus Building / Gran Canaria, Spain



Location: Las Palmas de Gran Canaria, Spain
Design: Bello y Monterde Arquitectos, Spain, belloymonterde.com
Fabrication: Acrimobel, Spain
Material: HIMACS, Alpine White

Leonardo Glass Cube / Germany



Location: Bad Driburg, Germany
Design: 3deluxe, Germany
Fabrication: Roskopf + Partner AG, Germany
Material: HIMACS Alpine White
Photo credit :© Emanuel Raab

Private House, Pan-gyo / South Korea



Location: Pan-gyo, Korea
Design: Office 53427
Manufacture: Daemyung ATM
Material: HIMACS S028 Aphine White
Photo credits: © Yonghwan Kim

Privat Haus Dreer / Bavaria, Germany



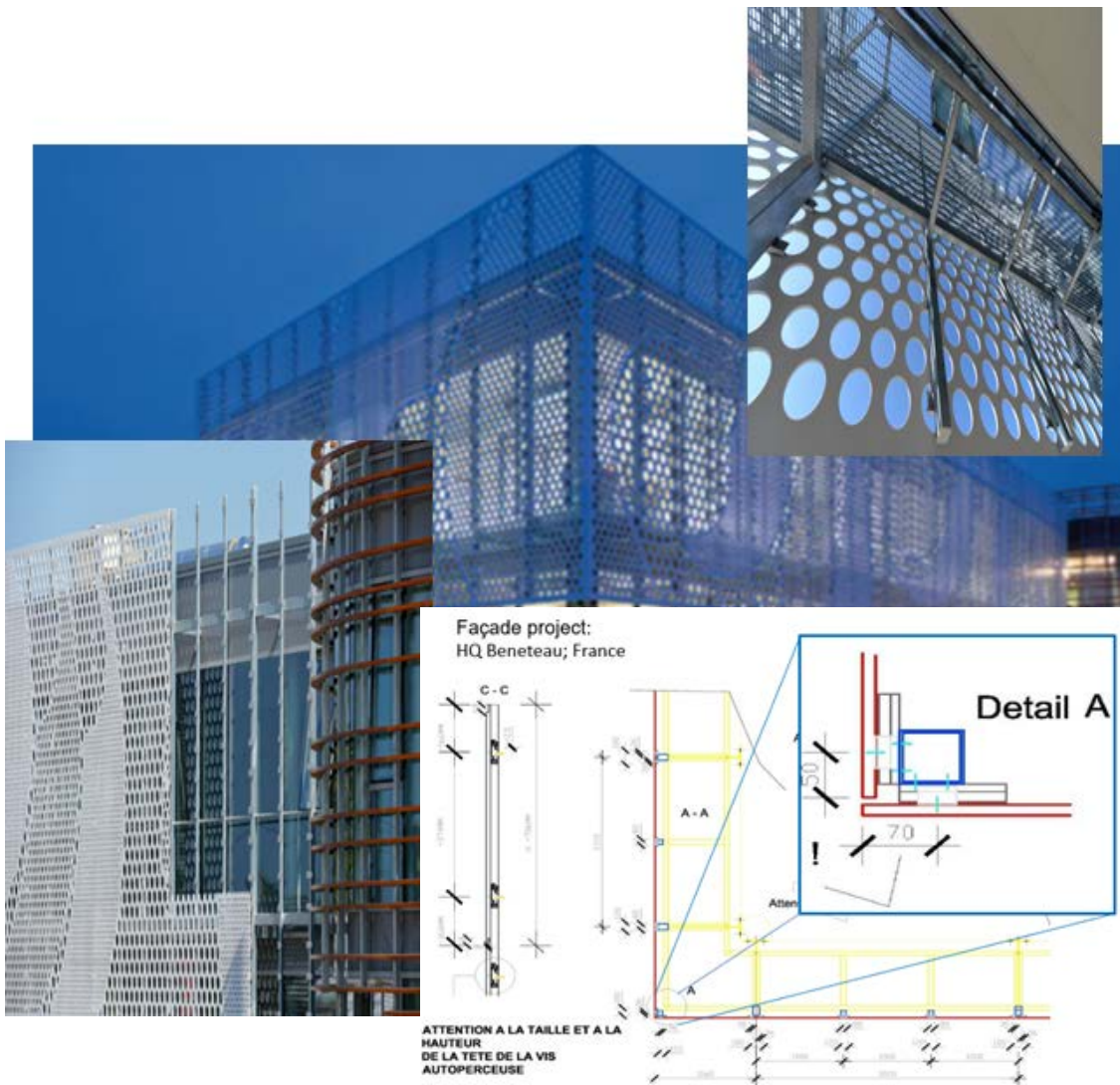
Location: Bavaria, Germany
Design: Karl Dreer GmbH
Fabrication: Karl Dreer GmbH - Klöpfer Surfaces
Material: HIMACS Alpine White
Photo credit: © Melanie Gotschke

Villa Wiese / Berlin, Germany



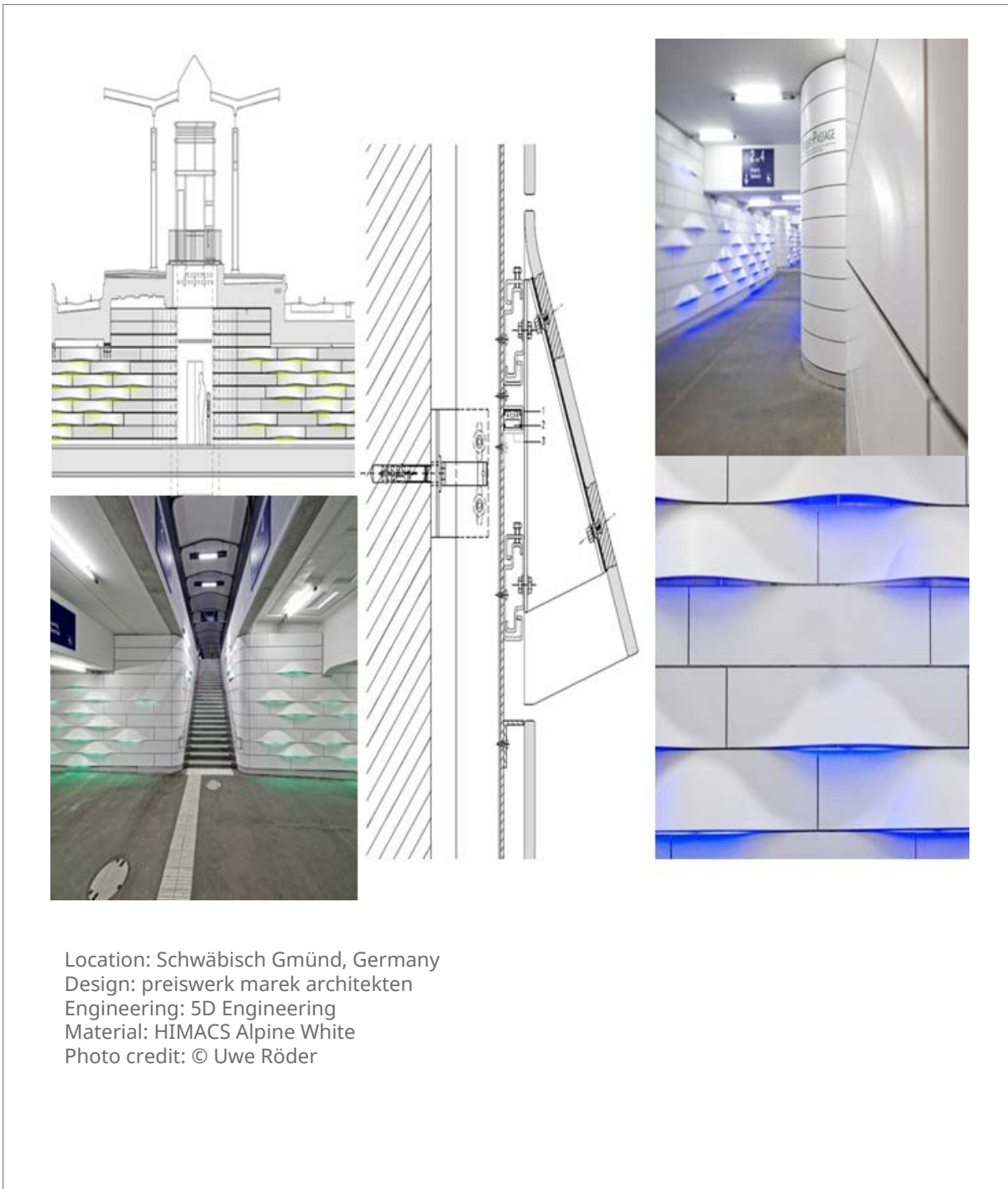
Location: Berlin, Germany
Design: Dipl.-Ing. Volker Wiese
Engineering: Kaden Klingbeil Architects
Fabrication: Kiebitzberg GmbH & Co.KG, Germany
Material: HIMACS façade panels S728 Alpine White with KEIL undercut anchor KH
Photo credit: © Dirk Wilhelmy

HQ Beneteau / France



Location: Givrand (Saint-Gilles-Croix-de-Vie area), France
Design: PAD Architectes for BERI 21
Engineering LCCA
Material: HIMACS Alpine White
Photo Credit: © Mathieu Ducros

Train station Schwäbisch Gmünd / Germany

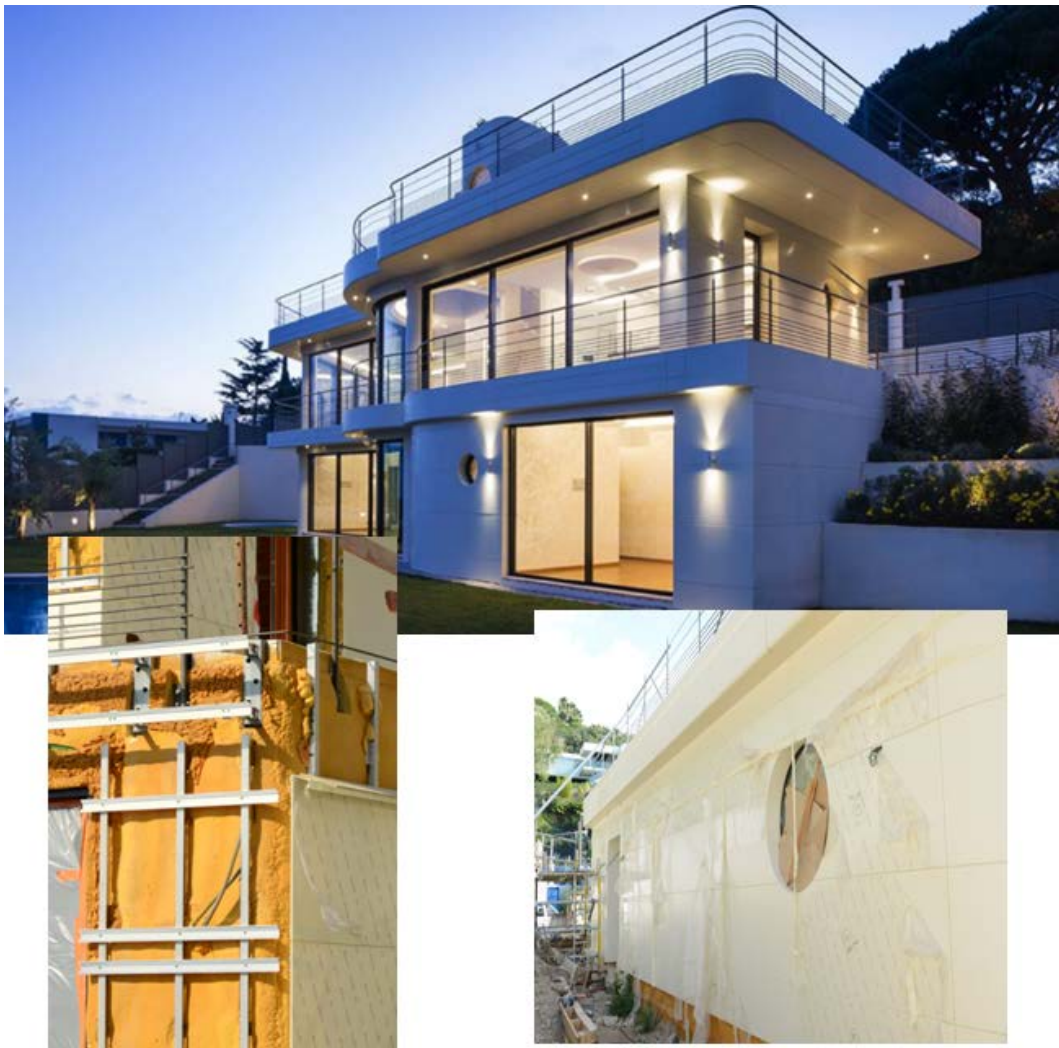


ICE LOFT, Architect Office & residential house / Hamburg, Germany



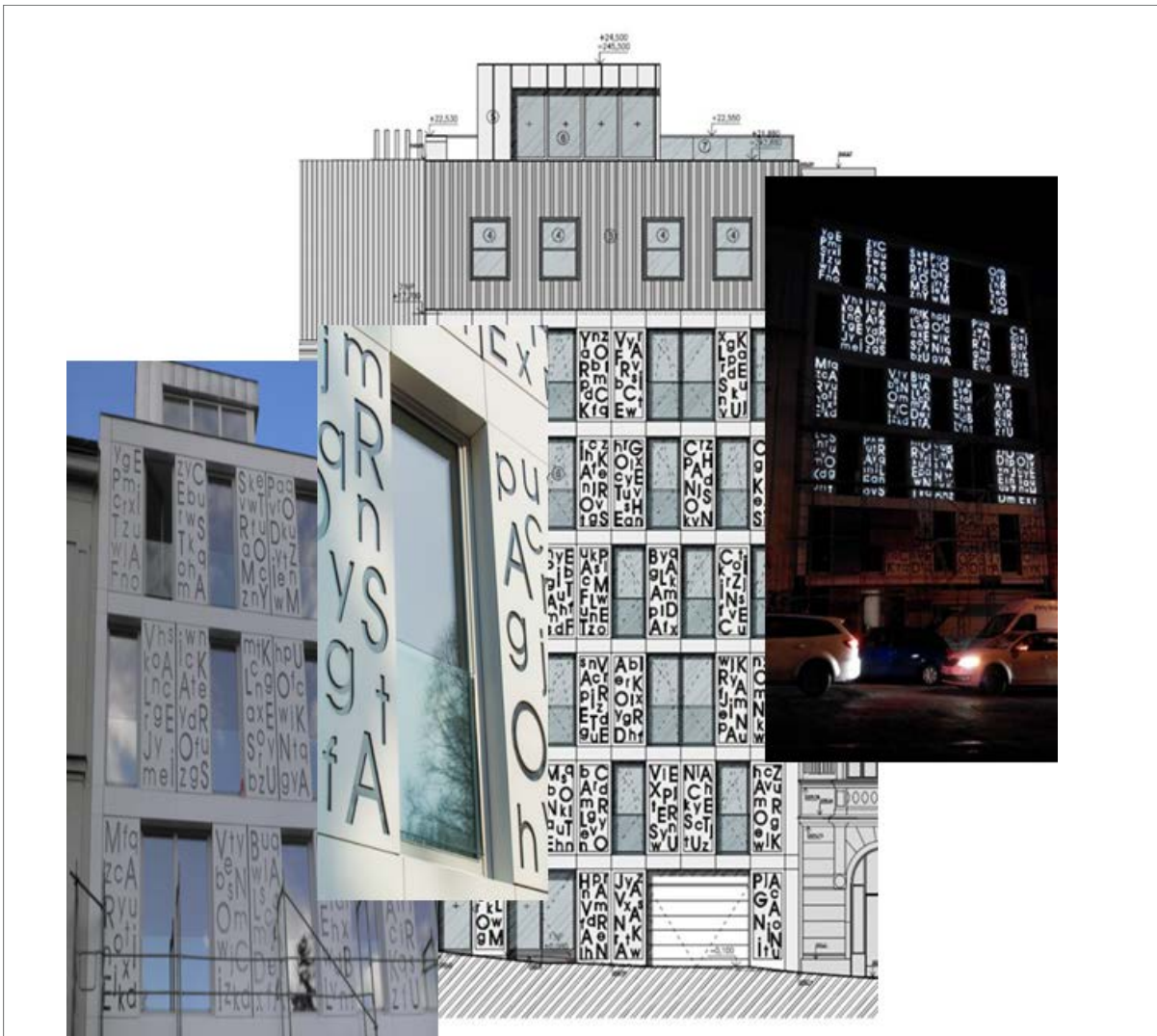
Location: Hamburg-Ottensen, Germany
Design: Köhler Architekten, Hamburg
Material: HIMACS Alpine White S028, HI-MACS® Opal S302
Photo credit: ©Nikolaus Herrmann
Others Façade Construction: Peter Knapp Dach, Fassadentechnik GmbH Bad Salzungen, Abalit
Elementos Moldeados

Private House / Riveira, France



Location: Cannes, France
Design: Pierre Guidoni, Jean Rogliano
Fabrication: Menuiserie Bareau, France
Material: HIMACS S09 Cream
Photo credit: © Mathieu Ducros

Shop & Apartment House / Prague, Czech Republic



Project: Bieblova Façade, Prague, Czech Republic
 Client: Donova, a.s.
 Architects: P6PA+Architects, s.r.o. www.p6pa.cz
 Martin Klejna, Javier Navas Fabregat
 Technical details: Ondřej Šteger, Martin Wolf, Rostislav Koziel
 HIMACS supplier: Polytrade CE, s.r.o. www.polytradece.cz
 Manufacture: Dřevovýroba Podzimek s.r.o., Duolit s.r.o., Atlas Group s.r.o.
 LED lighting: HAFELE Czech Republic, s.r.o.
 Material: HI-MACS® Alpine White 12 mm www.himacs.eu
 Photos: © Miguel Alonso

Exterior Solid Surface Material

HI·MACS

TDS – TECHNICAL DATA SHEET

HIMACS EXTERIA FACADE 2022 PART 4

- Certificates & Test Reports

Design: MAD Architecture for BERT 21
Fabrication: CAEV Architectures
© Mathieu Ducros

■ Cladding System Solutions (Certificates & Test Reports)

Healthy Building Material



ISO 9001 Quality Management System



MANAGEMENT SYSTEM CERTIFICATE

Certificate no.: 00967-2020-AQ-KOR-KAB Initial certification date: 26 September 1997 Valid: 02 December 2021 – 01 December 2024

This is to certify that the management system of

LX Hausys, Ltd. Cheongju Plant
9, Oksansandan 3-ro, Oksan-myeon, Heungdeok-gu, Cheongju-si, Chungcheongbuk-do, 28101, Republic of Korea

has been found to conform to the Quality Management System standard:
ISO 9001:2015, KS Q ISO 9001:2015

This certificate is valid for the following scope:
Design and Manufacture of Floor Covering(Wood, Polymer), Tiles(Polymer), Carpet Tiles, Acrylic Solid Surface, Wood Polymer Composite, Insulation Materials, PVC Profiles, PVC Windows, Flexible Sign Faces, PVC Coated Fabric and PVC Laminated Fabric.

Place and date:
Seoul, 29 November 2021

For the issuing office:
DNV – Business Assurance
15F, Kyobo Bldg., 1, Jongno, Jongno-gu, Seoul, Korea



Jang Sup, Lee
Management Representative

Lack of fulfillment of conditions as set out in the Certification Agreement may render this Certificate invalid.
DNV Business Assurance Korea Ltd is accredited by Korea Accreditation Board (KAB) as a Quality Management System certification body (Accreditation number: KAB-QC-10).
ACCREDITED UNIT: DNV Business Assurance Korea Ltd, 15F Kyobo Bldg., 1, Jongno, Jongno-gu, Seoul, Republic of Korea. TEL: +82 2 726 8470. dnv.kr/business

ISO 14001 Environmental Management System



MANAGEMENT SYSTEM CERTIFICATE

Certificate no.: 00958-2020-AB-HOR-KAB Initial certification date: 28 September 1997 Valid: 02 December 2021 – 01 December 2024

This is to certify that the management system of

LX Hausys, Ltd. Cheongju Plant
9, Oksansandan 3-ro, Oksan-myeon, Heungdeok-gu, Cheongju-si, Chungcheongbuk-do, 28101, Republic of Korea

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Place and date:
Seoul, 29 November 2021

For the issuing office:
DNV - Business Assurance
18F, Kyobo Bldg., 1, Jong-ro, Jongno-gu, Seoul, Korea






Jang Sup, Lee
Management Representative

Lack of fulfillment of conditions as set out in the Certification Agreement may render this Certificate invalid.
DNV Business Assurance Korea Ltd is accredited by Korea Accreditation Board (KAB) as an Environmental Management System certification body (accreditation number: KAB-BC-12).
ACCREDITED UNIT: DNV Business Assurance Korea Ltd, 18F Kyobo Bldg., 1 Jong-ro, Jongno-gu, Seoul, Republic of Korea - TEL: +82 2 724 8473 dnv.korea@dnv.com

ISO 45001 Health & Safety Management System



M1 Emission Class of Building Material

RAKENNUSTIETO

The Building Information Foundation RTS sr



EMISSION CLASSIFICATION OF BUILDING MATERIALS

Nordstock Ltd Oy

The classification working group set up by the Building Information Foundation RTS sr has approved the following product:

HI-MACS: Solids, Lucent, Sand and Pearl, Granite, Sparkle, Lucia ja Marmo and Galaxy

as belonging to emission class M1 for building materials.

The classification is valid until 11.10.2020.

Nordstock Ltd Oy has the right to equip its classified products with the classification mark and to use this classification mark when marketing these products.

The decision is in line with the requirements laid down in the Classification of Indoor Climate 2008 and the Classification of Building Materials: General Instructions.

THE BUILDING INFORMATION FOUNDATION RTS sr

Matti Rautiola
Director General

Arja Valtanen
Secretary of the Classification
Working Group

The Building Information Foundation RTS sr, P.O.B 1004, FI-00101 Helsinki, Finland
Tel. +358 207 476 400, m1.rts.fi

■ Cladding System Solutions (Certificates & Technical Data)

HIMACS LRV_2020

LRV is a measurement that tells you how much light a colour reflects, and conversely how much it absorbs. LRV runs on a scale from 0% to 100%. Zero being absolute black and 100% being a perfectly reflective white.

	COLOUR CODE	COLOUR NAME	LRV VALUE
SOLIDS	S01	Satin White	72.06
	S02	Almond	53.58
	S05	Grey	45.22
	S06	Arctic White	87.27
	S09	Cream	77.29
	S22	Black	6.92
	S25	Fiery Red	13.97
	S26	Banana	53.83
	S27	Orange	25.13
	S28	Alpine White	85.12
	S29	Ivory White	79.24
	S34	Diamond White	97.09
	S100	Coffee Brown	17.28
	S101	Jasmine Green	14.34
	S102	Babylon Beige	38.14
	S103	Concrete Grey	24.68
	S104	Toffee Brown	15.64
	S106	Lemon Squash	48.46
	S108	Marta Grey	21.47
	S109	Steel Grey	22.23
	S111	Dark Night	12.88
	S115	Deep Indigo	11.97
	S116	Festival Pink	15.38
	S117	Midnight Grey	9.09
	S118	Mink	35.32
	S119	Evergreen	30.79
S120	Cosmic Blue	27.92	
S121	Suede	60.32	
S201	Nougat Cream	64.33	
S203	Sky Blue	27.46	
S212	Light Green	58.19	

	COLOUR CODE	COLOUR NAME	LRV VALUE
LUCENT	S302	Opal	77.45
	S303	Sapphire	57.05
	S304	Ruby	69.70
	S305	Emerald	65.87

	COLOUR CODE	COLOUR NAME	LRV VALUE
CONCRETE	M551	Chic Concrete	25.35
	M552	Shadow Concrete	18.87
	M553	Ebony Concrete	11.22
	G554	Urban Concrete	31.96
	G555	Steel Concrete	23.26
	G556	Snow Concrete	65.37
	G557	Cloud Concrete	45.12

	COLOUR CODE	COLOUR NAME	LRV VALUE
MARMO	M603	Pavia	77.22
	M605	Sanremo	8.49
	M606	Aurora Bianco	78.35
	M608	Aurora Grey	58.52
	M617	Aurora Blanc	77.12
	M615	Aurora Cotton	73.51
	M614	Aurora Umber	13.03
	M601	Aurora Torano	71.82
	M612	Aurora Bisque	53.48
	M201	Temì	33.18
	M303	Capri	67.54
	M422	Cremona	54.73
	M426	Laviano	45.14
	M427	Bellizzi	8.37
	M428	Ispani	89.56
	M501	Edessa	75.75
	M904	Naples	20.22

	COLOUR CODE	COLOUR NAME	LRV VALUE
STRATO	Z001	Strato Cloud - White	75.98
		Strato Cloud - Grey	64.99
	Z003	Strato Wind - Background	83.11
		Strato Wind - Marble	82.18
	Z005	Strato Slate - Background	31.64
		Strato Slate - Background	30.99

	COLOUR CODE	COLOUR NAME	LRV VALUE
LUCIA	W001	Ice Queen	89.67
	W003	Shadow Queen	67.44
	W004	Star Queen	32.44
	W010	Red Queen	34.38

	COLOUR CODE	COLOUR NAME	LRV VALUE
SPARKLE	P102	Kold Silver	51.67

	COLOUR CODE	COLOUR NAME	LRV VALUE
GRANITE	G005	White Granite	45.30
	G007	Platinum Granite	24.98
	G031	Black Granite	5.64
	G034	Arctic Granite	76.69
	G074	Mocha Granite	10.01
	G100	Peanut Granite	43.42

	COLOUR CODE	COLOUR NAME	LRV VALUE
QUARTZ	G038	Sea Oat Quartz	52.18
	G063	Allspice Quartz	11.93
	G101	Crystal Beige	68.88

	COLOUR CODE	COLOUR NAME	LRV VALUE
SAND & PEARL	G002	Grey Sand	47.69
	G009	Black Sand	10.45
	G010	Black Pearl	7.01
	G015	Midnight Pearl	10.77
	G048	Beach Sand	50.49
	G050	Tapioca Pearl	71.21
	G105	Brown Pearl	8.68
	G106	Riviera Sand	61.57
	G107	Pebble Pearl	53.29
G108	Lunar Sand	71.86	

	COLOUR CODE	COLOUR NAME	LRV VALUE
ASTER	T010	Nebula	83.37
	T011	Venus	61.78
	T017	Andromeda	85.37
	T019	New Moon	63.73
	T020	Hercules	28.46

	COLOUR CODE	COLOUR NAME	LRV VALUE
VOLCANICS	VA001	Santa Ana	44.35
	VA022	Frosty	39.31
	VB002	Cima	15.24
	VE001	Tambora	59.15
	VG021	Maui	18.38
	VW001	Gemini	84.32

	COLOUR CODE	COLOUR NAME	LRV VALUE
LUCIA	W001	Intense Ultra Black	6.54
	W003	Intense Ultra Grey	9.99
	W004	Intense Ultra Dark Grey	7.50


HIMACS Colour Codes

Solid & Lucent Colours

NO	CODE	NAME	RAL DESIGN	RAL CLASSIC	NCS	PANTONE
1	S001	Satin White	-	-	-	11-4800 TPX
2	S002	Almond	095 80 10	-	S 2005-Y30R	13-0607 TPX
4	S034	Diamond White		9003		11-4201 TPX
5	S005	Grey	000 80 00	-	S 2500-N	14-4201 TPX
6	S006	Arctic White	-	9016	S 0300-N	11-0601 TPX
7	S009	Cream	075 92 05	-	S 0502-Y	11-0105 TPX
8	S100	Coffee Brown	060 20 05	-	S 8505-Y80R	19-0712 TPX
9	S102	Babylon Beige	090 70 10	-	S 3010-Y20R	14-0210 TPX
10	S103	Concrete Grey	000 45 00	-	S 6502-B	18-4005 TPX
11	S104	Toffee Brown	050 40 10	-	S 7010-Y30R	18-1015 TPX
12	S106	Lemon Squash	100 80 50	-	S 5070-G80Y	13-0648 TPX
13	S108	Marta Grey	000 55 00	-	S 5000-N	160-1-2 C
14	S109	Steel Grey	100 60 05	-	S 4502-Y	17-0205 TPX
15	S111	Dark Night	260 30 05	-	S 8005-R80B	433 M
16	S115	Deep Indigo	-	-	S8010-R90B	19-4010 TPX
17	S116	Festival Pink	340 50 45	-	S 2060-R30B	2415 M
18	S117	Midnight Grey	-	-	S 7502-B	19-3906 TPX
19	S118	Mink	-	-	S 7000-N	18-5102 TPG
20	S119	Evergreen	-	-	S 6020-B50G	19-5413 TPG
21	S120	Cosmic Blue	-	-	S 8010-R70B	19-3927 TPG
22	S121	Suede	-	-	S 2005-Y50R	14-0002 TPG
23	S201	Nougat Cream	095 90 10	-	S 1005-Y40R	12-0000 TPX
24	S203	Sky Blue	250 60 15	-	S 3020-R90B	644 M
25	S212	Light Green	110 80 50	-	S 0550-G50Y	373 M
26	S022	Black	000 15 00	-	S 9000-N	19-4006 TPX
27	S025	Fiery Red	020 40 50	-	S 2070-R	19-1763 TPX
28	S026	Banana	080 80 70	-	S 1060-Y10R	14-0848 TPX
29	S027	Orange	050 50 70	-	S 1080-Y60R	1665 M
30	S028	Alpine White	-	9003	-	11-4201 TPX
31	S029	Ivory White	110 90 05	-	S 0500-N	11-0602 TPX
32	S302	Opal	000 90 00	-	S 0502-B	11-4800 TPX
33	S303	Sapphire	240 90 05	-	S 1010-R90B	544 M
34	S304	Ruby	010 90 05	-	S 0510-R30B	373 M
35	S305	Emerald	180 90 10	-	S 0520-B70G	317 M
36	S922U	Intense Ultra Black	-	9005	S9000-N	419 C
37	S923U	Intense Ultra Grey	-	7016	S8000-N	19-4104 TPG
38	S924U	Intense Ultra Dark Grey	-	9017	S8500-N	19-4006 TPG

■ Cladding System Solutions (Certificates & Test Reports)

SBI EN 13501-1 carried out with EN 13823 & ISO 11925-2


MPA NRW.
Materialprüfungsamt Nordrhein-Westfalen
PRÜFEN · ÜBERWACHEN · ZERTIFIZIEREN

Außenstelle Erwitte • Auf den Thronen 2 • 59587 Erwitte • Telefon (0 29 43) 8 97-0 • Telefax (0 29 43) 8 97-35 • E-mail: erwitte@mpa.nrw.de

**Report of the classification of the reaction to
fire performance**

No. 230008323-3
issued 13 February 2012

English version

Sponsor : LG Hausys Europe GmbH
12 Avenue des Morgines
1213 Petit-Lancy, Geneva
Schweiz

Order: Classification of the reaction to fire behaviour
according to DIN EN 13501-1

Date of order: 21 November 2011

Notified Body No.: -0432-


Name of the building product which is to be classified:
Facade panels "HI-MACS®"

This report determines the classification of the above-mentioned building product in accordance with the test method stated in the standard DIN EN 13501-1.

Publishing and copying of classification reports without permission of the MPA NRW is only allowed without any changes of the content and the form of the reports.
This classification report includes 4 pages.

1

SBI EN 13501-1 carried out with EN 13823 & ISO 11925-2



MPA NRW
Materialprüfungsamt Nordrhein-Westfalen
KÖLN · DUISBURG · ESSEN · DORTMUND · MÜNSTER · OWENHAUSEN · ZÜRICH

Classification Report No. 230008323-3 issued 13 February 2012 Page 2 of 4

1 Description of the building product

Facade panels


Trade name:	HI-MACS®	
Product name:	Alpine White (CE MED)	
Product Code:	S728	
Thickness of the material:	12 mm	
Material composition:	approx. 70%	ATH (aluminium hydroxide),
	approx. 28%	PMMA & MMA,
	approx. 2%	natural pigments

Weight per unit area of the panels:	21.2 kg/m ²
Colour of the panels:	white

The facade panels are mechanically fixed using the BWM-profile system "ATK 103 S20" to calcium silicate boards according to DIN EN 13238, table 1.

2

SBI EN 13501-1 carried out with EN 13823 & ISO 11925-2



Classification Report No. 230008323-3 issued 13 February 2012 Page 4 of 4

3 Classification and direct field of application

3.1 Reference
 The classification was carried out in accordance with the clauses 11 and 14.1 of the standard DIN EN 13501-1 : 2010.

3.2 Classification
 The tested material in relation to its fire behaviour is classified as: **B**
 The additional classification regarding smoke production is: **s1**
 The additional classification regarding burning droplets / particles is: **d0**

This results in a classification of the fire behaviour of the tested material :

Fire behaviour	Smoke production	Burning droplets / particles
B	s1	d0



i.e. **B-s1,d0**

3.3 Field of application of the product
 The classification is solely valid for the building product described in clause 1 with a thickness of 12 mm, with a distance of ≥ 40 mm to other plane building products or directly laid onto substrates classified as class A1 or A2-s1, d0 according to DIN EN 13501-1 which have a thickness of at least 6 mm and a minimum density of 37.5 kg/m³.
 The facade panels are mechanically fixed using the BWM-profile system "ATK 103 S20" to calcium silicate boards according to DIN EN 13238, table 1.

4 Restrictions
 This classification report does not replace any type approval or certification of the product.
 This classification report written in English language is issued additionally to the report written in German language with the same report number. In case of doubt the German version is valid solely. This classification report is only valid in combination with the German version of the classification report.

Erwitte, 13 February 2012

Head of the testing body
 by proxy

(Dipl.-Ing. Kühnen)
 Date of issue of this English version: 16 April 2012

4

■ Cladding System Solutions (Certificates & Approval)



Deutsches Institut für Bautechnik

Approval body for construction products and types of construction
Bautechnisches Prüfamt
An institution established by the Federal and L ander Governments



Member of
ETA
www.eta.eu



Designated according to Article 28 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

European Technical Assessment

ETA-12/0583
of 12 January 2018

English translation prepared by DIBt - Original version in German language

General Part

<p>Technical Assessment Body issuing the European Technical Assessment:</p> <p>Trade name of the construction product</p> <p>Product family to which the construction product belongs</p> <p>Manufacturer</p> <p>Manufacturing plant</p> <p>This European Technical Assessment contains</p> <p>This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of</p>	<p>Deutsches Institut f�ur Bautechnik</p> <p>HI-MACS-Undercut Anchor for HI-MACS facade panels type: S728 CE MED Alpine White</p> <p>Fastener for rear fixing for facade panels made of natural acrylic stone</p> <p>L.G Hausys Europe GmbH Lyoner Stra�e 15 80528 Frankfurt/Main DEUTSCHLAND</p> <p>Herstellwerk 1</p> <p>14 pages including 3 annexes which form an integral part of this assessment</p> <p>EAD 330030-00-0601</p>
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Deutsches Institut f ur Bautechnik
Kolonnenstra e 30 B | 10829 Berlin | GERMANY | Phone: +49 30 78730-0 | Fax: +49 30 78730-320 | Email: dibt@dibt.de | www.dibt.de

Z473.10 9.08.21-458/17

■ Cladding System Solutions (Certificates & Technical Data)

HIMACS Specification Data Sheet: S028 / S728 / S828

CERTIFIED	MATERIAL CODE	COLOUR NAME	SPECIFICATION	NORM / UNIT	RESULT / CLASSIFICATION
ABP	S028	Alpine White	Density		1,738 g/cm ³
			Thermal Expansion Coefficient	EN14581	48x10 ⁻⁶ 1/°C 0.0048 mm/mK
			Tensile Strength	EN ISO 527	51.3 (%1.69) Mpa
			Flexural-E-Modulus	EN ISO 178	8900 Mpa
			Flexural Strength	EN ISO 12372	70.1 Mpa
			Ultimate Elongation	DIN EN ISO 178	1.0 <i>Efm</i>
			Fire Classification	DIN 4102	B1
			Fire Classification	EN 13501	B - s1 - d0
			Calorific Value	EN ISO 1716 MJ/kg	10.0927
			UV Test	UV Sun Light 1500h ΔE	3.251
			UV Test	UV Xenon 3000h ΔE	2.97

CERTIFIED	MATERIAL CODE	COLOUR NAME	SPECIFICATION	NORM / UNIT	RESULT / CLASSIFICATION	
IMO	ETA	S728M	Alpine White	Density	1,738 g/cm ³	
				Thermal Expansion Coefficient	EN14581	41x10 ⁻⁶ 1/°C 0.0048 mm/mK
				Tensile Strength	EN ISO 527	51.3 (%1.69) Mpa
				Flexural-E-Modulus	EN ISO 178	10000 Mpa
				Flexural Strength	EN ISO 12372	70.4 Mpa
				Ultimate Elongation	DIN EN ISO 178	0.7 <i>Efm</i>
				Fire Classification	DIN 4102	B1
				Fire Classification	EN 13501 (SBI)	B - s1 - d0
				Calorific Value	EN ISO 1716 MJ/kg	5.3834
				Train Application	EN 45545	R1 HL3
				Ship Yacht / Marine Application	IMO	Modul B Modul D

CERTIFIED	MATERIAL CODE	COLOUR NAME	SPECIFICATION	NORM / UNIT	RESULT / CLASSIFICATION	
CSTB	QB	S828	Alpine White	Density	1,738 g/cm ³	
				Thermal Expansion Coefficient	EN14581	45x10 ⁻⁶ 1/°C 0.0048 mm/mK
				Tensile Strength	EN ISO 527	51.3 (%1.69) Mpa
				Flexural-E-Modulus	EN ISO 178	8900 Mpa
				Flexural Strength	EN ISO 12372	65 Mpa
				Ultimate Elongation	DIN EN ISO 178	0.7 <i>Efm</i>
				Fire Classification	DIN 4102	Not tested
				Fire Classification	EN 13501	C - s1 - d0
				Calorific Value	EN ISO 1716 MJ/kg	8.7
				UV Test	UV Sun Light 1500h ΔE	1.223
				UV Test	UV Xenon 3000h ΔE	1.4

HIMACS Technical Specification Data Sheet (TSDS)

SPECIFICATION	UNIT	RESULT SOLIDS	RESULT GRANITE	TEST METHODS
Flexural-E-modulus	MPa	8900	7730	DIN EN ISO 178
Flexural strength	MPa	70.1	64.3	ASTM D638
Breaking elongation	%	1	1.1	DIN EN ISO 178
Tensile strength	MPa	69.5	56.3	DIN EN ISO 527
Density	g/cm3 kg/m3	1.75 1750	1.65 1650	ISO 1183 ISO 1183
Ball indentation hardness	N/mm2	257	239	DIN EN ISO 2039-1
Mohs hardness		2 to 3	2 to 3	EN 101
Pencil hardness		>9H	>9H	ISO 15184
Water absorption weight strength/thickness		<0,1% <0,1%	<0,1% <0,1%	DIN EN 438 Part 12
Impact resistance impactor drop ball test (fall height)	N mm	≥25 ≥1500	≥25 ≥1500	E DIN EN 438, 02/02 Part 2/20 E DIN EN 438, 02/02 Part 2/21
Slip resistance		>0,32 – 0,9		GMG100 (replaces R9)
Slip resistance		angle of acceptance of more than 10° to 19° = R10		DIN 51130
Climate change resistance	°C	≥0,05	≥0,05	AMK
Dry heat (pan base)	°C	≥100 (7C)		DIN 68 861, Part 7, 04-'85
Damp heat (pan base)	°C	≥100 (7C)		DIN 68 861, Part 8, 04-'85
Temperature change resistance	°C	no change		UNI 9429
Resistance to cigarette burns		6C	6B	DIN 68 861, Part 6, 11-'82
Scratch resistance		4D	4B	DIN 68 861, Part 4, 11-'81
Electrostatics Conductivity	>1x1012Ω	insulating non-conductive		DIN IEC 1340-4-1, 04-'92 EN 61340-5-1
Thermal conductivity	W/mK	0.636	0.55	DIN EN 12664
Thermal resistance	m2K/W	0.038	0.045	DIN EN 12664
Thermal Expansion Coefficient for Standard HIMACS Products	mm/mK m/m/°C	0.048 48 x 10-6	0.055	DIN EN 14581
Water vapor transmission properties - diffusion resistance factor	μ	18607	16150	DIN EN ISO 12572
Dimensional change by change in relative humidity length thickness mass	% % %	-0.03 0.06 0.05	-0.02 0.03 0.05	DIN EN 318, edit. 5, 1998
Resistance to boiling water increase in weight increase in thickness	% %	<0,1 <0,1	>0,1 <0,1	E DIN EN 438, 02/02 Part 2/12
Light fastness (Xenon)	scale 0 – 10	better than 6	better than 6	DIN 53 387, 04-'89
Food tolerance		suitable for all colours		LMBG § 31
Hygiene		suitable	suitable	LGA Hygiene Certificate

SPECIFICATION / SUBJECT	MATERIAL THICKNESS	RESULT	PRODUCT TESTED	TEST METHOD
Fire Classification	12 mm	B1	HIMACS colour range** S928, M551, G554	DIN 4102
		B1	S028 (standard)	DIN 4102 / ABP
		M1	S728, S828, S028, T017, VW01, W001	NF P92-501
		B - s1 - d0	HIMACS colour range** (2007)	EN 13501-1
	12mm plus fibre cement board	B - s1 - d0	HIMACS colour range** (2014)	EN 13501-1
	12 mm	B - s1 - d0	S728 CE MED	EN 13501-1 / SBI
		C - s1 - d0	S928	EN 13501-1
		passed	S028 (standard)	DIN 5510
passed R1/HZ3		S728 CE MED	EN 45545	
HIMACS Exteria	12 mm	IMO certified	S728 CE MED	Module B & Module D
		ETA Avis Technique	S728 S828	DIBT CSTB

* Not currently applicable to Strato, Ultra Thermoforming and Intense Ultra.
 ** Products tested in the year 2007 and 2014: Alpine White, Fiery Red & Black.

Exterior Solid Surface Material

HI·MACS

TDS – TECHNICAL DATA SHEET

HIMACS EXTERIA FACADE 2022 APPENDIX A

- Warranty



Design: Köhler Architekten
Fabrication: Peter Knapp Dach und Fassadentechnik
GmbH Abalit Elementos Moldados, Peter Grube
© Nikolaus Herrmann

■ Technical Specification Data (Warranty)

Product Warranty for exterior applications

1. The LX Hausys's natural acrylic stone, HIMACS, has been widely chosen for various interior design, projects and architectural work because of its unique properties and advantages. With increasing interest and demand from architects for new applications for exterior use, LX Hausys has run tests to evaluate the possibility of using HIMACS on the façade of a building.
2. The test focused to check possible colour change when using HIMACS in facade application. Although HIMACS® has good resistance to UV rays in general, the level of colour change could differ per patterns according to the type and quantity of pigment and other ingredients contained in different patterns. HIMACS recommended colours for exterior applications are grouped into two performance categories.

Group 1: These colours change of less than or equal to 5 ΔE units in 10 years under normally predictable circumstances.

Code	Colour	Code	Colour	Code	Colour
S002	Almond	S928	Alpine White Ultra-Thermoforming	G038	Sea Oat Quartz
S009	Cream	G002	Grey Sand	G048	Beach Sand
S028	Alpine White	G004	White Quartz	S302	Opal
S728	Alpine White-FR	S029	Ivory White	S034	Diamond White
S828	Alpine White-UV+	G034	Arctic Granite		

Code	Colour	Code	Colour	Code	Colour
S001	Satin White	S108	Marta Grey	G015	Midnight Pearl
S005	Grey	S109	Steel Grey	G050	Tapioca Pearl
S006	Arctic White	S111	Dark Night	G063	Allspice Quartz
S022	Black	S115	Deep Indigo	G074	Mocha Granite
S025	Fiery Red	S116	Festival Pink	G100	Peanut Butter
S026	Banana	S117	Midnight Grey	G101	Crystal Beige
S027	Orange	S201	Nougat Cream	G105	Brown Pearl
S100	Coffee Brown	S203	Sky Blue	G107	Pebble Pearl
S102	Babylon Beige	S212	Light Green	G108	Lunar Sand
S103	Concrete Grey	G007	Platinum Granite	S303	Sapphire
S104	Toffee Brown	G009	Black Sand	S304	Ruby
S106	Lemon squash	G010	Black Pearl	S305	Emerald

3. Gloss loss will not exceed 40% on matte finish and the colour will not leach more than the mentioned delta value, for each colour, during the first 10 years after the initial installation. In addition, LX Hausys warrants that the HIMACS colour offering will remain free from: peeling, swelling and delaminating during the first 20 years from the date when the application was completed and when the product has been stored, handled, applied and maintained in accordance with LX Hausys technical instructions and all applicable building codes.
4. During the period stated above, if any HIMACS façade panel (with its performance fulfillment to the requested local or national European building standards) shows signs of defects (subject to all the limitations stated herein), LX Hausys will at its option either provide free replacement of HIMACS façade panels or refund the original purchase price of the HIMACS façade panels determined by LX Hausys to have any of the above conditions. In order for LX Hausys to respond under this warranty, LX Hausys must be permitted to inspect the product and thereafter to follow its warranty services procedures. All decisions regarding the existence of any of the above conditions or manufacturing defects or in any case affecting this warranty shall be made by LX Hausys and shall be final and binding upon the parties.
5. This limited warranty applies only to defects appearing within ten (10) years from the date of permanent installation or twenty (20) years in the specific case of peeling, swelling and delaminating of the HIMACS façade panels. The limited warranty is only applicable if LX Hausys is notified in writing within sixty (60) days after such defects either appear or should have been discovered after the exercise of reasonable diligence.
Failure of the claiming party to notify LX Hausys within such period shall automatically relieve LX Hausys of any and all responsibility and/or liability under this Limited Warranty. LX Hausys makes no express or implied warranty (including, without limitation, the warranties of merchantability, fitness for a particular purpose even if that purpose is known to seller or from any course of dealing or trade usage) regarding the product. The purchaser assumes all risk and liability for results obtained by the use of products covered by this limited warranty, whether used singly or in combination with other materials. The warranty herein does not cover LX Hausys TM Joint Adhesive; it covers only HIMACS sheets products.
6. This warranty does not cover, and LX Hausys hereby disclaims, all liability for damage caused by physical or chemical abuse, acts of vandalism, damage from excessive heat or uneven exposure to weather conditions, fire, flood, earthquakes, accident, war, acts of God, improper design or installation of LX Hausys products, any particular application or selection of products for any particular project or design, any parts, components, sealants of other manufacturers used with LX Hausys products, or the lack of performance of LX Hausys products attributable to such items.
7. LX Hausys's obligation hereunder is limited solely to the refund of the purchase price of the HIMACS façade panels or replacement of the HIMACS façade panels for which the claim is made excluding any costs associated with fabrication, replacement or installation. In no event shall LX Hausys be liable for special, indirect, incidental, punitive, consequential or any similar damages (including, without limitation, damages for loss of business profits, business interruption or any other loss), whether or not caused by or resulting from the negligence of LX Hausys even if LX Hausys has been advised of the possibility of such damages.

8. This is the only limited warranty made in connection with the sale of HIMACS façade panels used in exterior cladding projects. No representative, dealer or any other person is authorized to make or makes any warranty, representation or promise with respect to such products. No terms or condition other than those stated herein, and no agreement or understanding, oral or written, in any way purporting to modify this limited warranty shall be binding upon LX Hausys unless made in writing and signed by an authorized LX Hausys employee.
9. Laws, building and safety codes governing the design, engineering and construction of installations vary widely. LX Hausys assumes no responsibility or obligations with respect to the selection of product for the installation or the design, engineering and construction of the installation.
10. This warranty is subject to the condition of the supply of the above-mentioned product from a LX Hausys HIMACS authorized supplier.

*This published document will lose its validity when a new one will become published.

Disclaimer

The information provided in this specific technical bulletin corresponds to our best knowledge on the subject at the date of its publication. This information may be subject to revision as new knowledge and experience becomes available. The data provided fall within the normal range of product properties and relates only to specific material designated. These data may not be valid for such material in combination with other materials or in any process, unless expressly indicated otherwise. It is offered exclusively to provide possible suggestions for your own experiments and needs approval from our company for Warranty.

This bulletin is not intended to replace for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purpose. Since our company cannot anticipate all variations in actual end-use conditions,

We make no warranties and assumes no liability in connections with any use of this information. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any patent right.

Exterior Solid Surface Material

HI·MACS

■ LX Hausys Europe GmbH

European Headquarters:
LX Hausys Europe GmbH
Lyoner Str. 15 60528
Frankfurt am Main, Germany

