



Sommer Informatik GmbH





GLASGLOBAL® 16612

The software solution for the calculation of glass
statics according to EN 16612



EN 16612



DIN 18008



Differences on the resistance side

- Partial safety factors γ_M
- Consideration of shear bond via omega values (EN 16612, Anhang D)
- Other coefficients for edge strength (k_e), Surface profile (k_{sp}) and hardening (k_v)

Differences on the impact side

- Partial safety factors γ_G resp.. γ_Q
- k_{mod} –Values



Validation

Validation by the
University of Munich

PROFESSUR FÜR BAUKONSTRUKTION UND BAUPHYSIK
VOM DIBT ANERKANNTE PRÜFSTELLE BAY40

der Bundeswehr
Universität München

FAKULTÄT FÜR BAUINGENIEURWESEN UND UMWELTWISSENSCHAFTEN
INSTITUT FÜR KONSTRUKTIVEN INGENIEURBAU

Bericht- b-04-18-12c

Validierung der Berechnungssoftware „GLASGLOBAL“

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Neubiberg, den 25.10.2021

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Start GLASGLOBAL® 16612

GLASGLOBAL® 16612
is a component from the
large product range of
Sommer Informatik

SommerGlobal

SommerGlobal

<input type="checkbox"/> GLASGLOBAL® Standard Statik (DIN 18008-1,-2)	<input type="checkbox"/> WINSLT® Standard Strahlung (EN 410, EN 673)
<input type="checkbox"/> GLASGLOBAL® FEM Punkthalter Statik (DIN 18008-3)	<input type="checkbox"/> WINSLT® Experte Strahlung (EN 410, EN 673, EN ISO 52022-3)
<input type="checkbox"/> GLASGLOBAL® Absturz Statik (DIN 18008-4)	<input type="checkbox"/> WINSLT® ASHRAE Strahlung (ISO 15099, NFRC 100)
<input type="checkbox"/> GLASGLOBAL® Begehbar Statik (DIN 18008-5)	<input type="checkbox"/> WINSLT® Extractor Import Spektraldaten
<input type="checkbox"/> GLASGLOBAL® Betretbar Statik (DIN 18008-6)	<input type="checkbox"/> WinTHS Thermischer Stress (NF DTU 39 P3)
<input type="checkbox"/> GLASGLOBAL® 16612 Statik (EN 16612)	<input type="checkbox"/> Schall Datenbank Schallschutz



Specifications - Material

The settings for strengths and partial safety factors allow adaptation to any country-specific specifications for EN 16612.

Specifications

User: ADMIN

Material | Deflection | Impact

Material Characteristics

	characteristic strength $f_{g;k} / f_{b;k}$ (N/mm ²)	Partial safety factor $\gamma_{M;A} / \gamma_{M;v}$
ANG	45,0	1,8
Ornamental glass*	33,0	1,8
Wire glass*	27,0	1,8
FTG(-H/-HF) (Float)	120,0	1,2
FTG(-H/-HF) (ornament)*	90,0	1,2
FTG(-H/-HF) (enamel)	75,0	1,2
HSG (Float)	70,0	1,2
HSG (ornament)*	55,0	1,5
Borosilicat**	45,0	1,2
LSG (Float)	45,0	1,8
LSG (HSG)	70,0	1,2
LSG (LSG Float)	120,0	1,2

* EN 1279-5
** The permissible stress and the coefficient for material parts safety is not regulated in the norm

Edge strength factor k_e (8.1.2) for non four-side support	0,8
Factor for the glass surface profile k_{sp} (8.1.3)	1,0
Strengthening factor k_v (8.2.3)	1,0



Specifications - Actions

The same applies to the coefficients on the action side.

Specifications

User

User ADMIN

Material Deflection Impact

Coefficients

	γ_G / γ_Q	ψ_0	k_{mod}
Dead load	1,10		0,29
Low installation	1,10		0,29
High installation	1,10		0,29
Climate winter	1,10	0,3	0,58
Climate summer	1,10	0,3	0,58
Snow (height \leq 1000 m)	1,10	0,5	0,45
Snow (height $>$ 1000 m)	1,10	0,7	0,45
Wind pressure (10 min)	1,10	0,6	0,74
Wind suction (10 min)	1,10	0,6	0,74
Wind pressure (3 s)	1,10	0,6	1,00
Wind suction (3 s)	1,10	0,6	1,00
Line load (5 min)	1,10	0,7	0,77
Line load (30 s)	1,10	0,7	0,89



Geometry

Geometry

Standard Expert

$h = 1250$

$b = 1500$

$\beta = 90^\circ$

Construction	Shape	Support	Dimensions
<input type="radio"/> Single <input checked="" type="radio"/> Double <input type="radio"/> Triple	<input checked="" type="radio"/> Rectangle	<input checked="" type="radio"/> Four-sided	Width b: 1500 mm
Installation angle	<input type="radio"/> Triangle	<input type="radio"/> Three-sided width free	Height h: 1250 mm
<input type="radio"/> Horizontal glazing 0° - 74°	<input type="radio"/> Parallelogram	<input type="radio"/> Three-sided height free	
<input checked="" type="radio"/> Vertical glazing 75° - 105°	<input type="radio"/> Trapezium	<input type="radio"/> Double-sided height free	
Installation angle 90,00°	<input type="radio"/> Special shapes	<input type="radio"/> Double-sided width free	
		<input type="radio"/> Clamped below	

Pane structure

- Single glass, LSG symmetrical and asymmetrical

Project steps



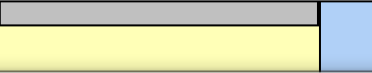
- Project details
- Use
- Geometry
- Construction**
- Wind load/Lawine
- Air Load
- Altitude
- Line load
- Membrane stress
- Result
- Load case combinations
- Proposal Module

Construction

Single Double Triple

Nr	Product	Thickness (mm)	Description
1	Glass outside	8,76	2x(ANG4-0,76)
2	GD1/Spacer	16,00	Aluminium (EN ISO 10077-2)
3	Glass inside	8,76	2x(ANG4-0,76)

Construction

Nr.	1	2	3
			

Glass pane select ...

Type of glass

- ANG**
- Ornamental glass
- Wire glass
- FTG (float)
- FTG (ornament)

Single glass **LSG symmetric** LSG asymmetric

Single glass: 4 mm
 Interlayer: 0,76 mm
 Number of panes: 2
 Total thickness: 8,76 mm

Basic glass
 Sommer Informatik GmbH Standard
 PVB
 Consider shear coupling
 Only Usability



Shear connector

Omega method according to EN 16612, Annex D

Database with manufacturer spec. omega values

Result

manufacturer	Product description	IDENT
Trosifol® Interlayer	SentryGlas® (SG 5000)	uni-p-0006

Object data

ident: u-p-0005
 Description:
 manufacturer: Trosifol® Interlayer
 Noise protection

spectral data SLT

Papers

Date	Description	Dokument



Wind/snow elasticity

- Free input of all loads

Project steps	
<input checked="" type="checkbox"/> Project details	
> <input type="checkbox"/> Geometry	
> <input checked="" type="checkbox"/> Construction	
> <input checked="" type="checkbox"/> Wind load	
> <input type="checkbox"/> Air Load	
> <input type="checkbox"/> Altitude	
> <input type="checkbox"/> Line load	
> <input type="checkbox"/> Membrane stress	
> <input type="checkbox"/> Result	

Wind load				
	Load outside		Load indoors	
LF pressure	<input type="text" value="1,00"/>	kN/m ²	<input type="text" value="0,00"/>	kN/m ²
LF suction	<input type="text" value="-1,00"/>	kN/m ²	<input type="text" value="0,00"/>	kN/m ²
Load Duration	<input type="text" value="10 min"/>			(10 min)

Climate load

➤ Climate loads are either calculated with default values or defined manually

➤ Temperature and air pressure changes, climate loads and surcharges for summer and winter can be included in the calculation

Air Load			
Temperature Change		Surcharge	
<input type="radio"/> Without <input checked="" type="radio"/> Standard +20K -25K <input type="radio"/> Input Summer <input type="text" value="20"/> K Winter <input type="text" value="-25"/> K		Temperature in K	Pressure isochor in kN/m ²
Pressure change		Summer	
<input type="radio"/> Without <input checked="" type="radio"/> Standard -20hPa +40hPa <input type="radio"/> Input Summer <input type="text" value="-20"/> hPa Winter <input type="text" value="40"/> hPa		Absorption <input checked="" type="radio"/> Without increase <input type="radio"/> Absorption 30% to 50% +9 +3 <input type="radio"/> Absorption up to 50% +18 +6	
		Ventilation	
		<input checked="" type="radio"/> Without increase <input type="radio"/> Sun protection inside (ventilated) +9 +3 <input type="radio"/> Sun protection inside (not ventilated) +18 +6 <input type="radio"/> Insulation behind +35 +12	
		Winter	
		<input checked="" type="radio"/> Without increase <input type="radio"/> Unheated buildings -12 -4	
Climate stress in kN/m²			
GD1			
<input type="checkbox"/> Manual input	Summer	<input type="text" value="8,80"/>	
	Winter	<input type="text" value="-12,50"/>	



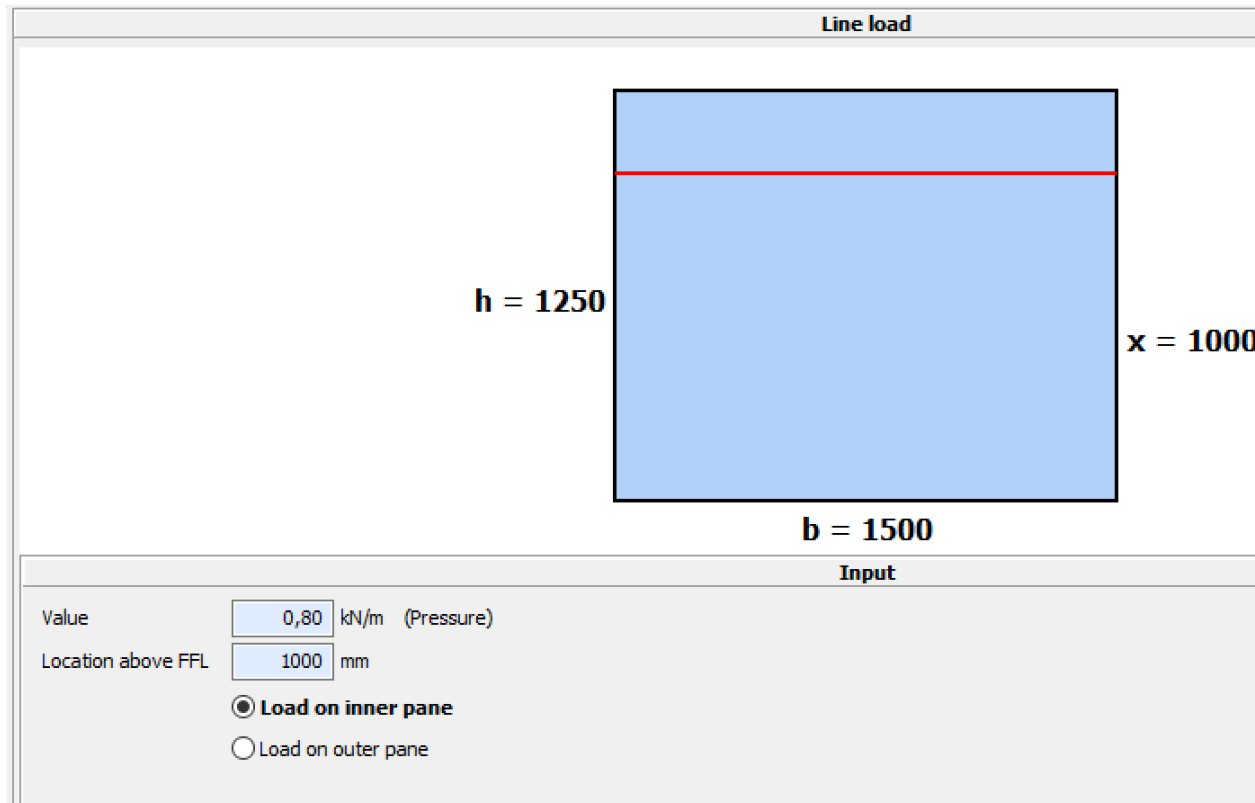
Location height

➤ The height difference between the production site and the installation site resulting in a load for insulating glass can be determined by entering the heights.

Altitude	
Difference between the local height	
<input type="radio"/> Without	Production height: <input type="text" value="300"/> m <input type="button" value="Postcode"/>
<input type="radio"/> Defaults (+400 m / -400 m)	Height of installation: <input type="text" value="600"/> m <input type="button" value="Postcode"/>
<input type="radio"/> Production level known	
<input type="radio"/> Height of installation known:	
<input checked="" type="radio"/> Both heights known	
<input type="radio"/> Air pressure considered during production (+50 m / -50 m)	
Load in kN / m²	
<input type="checkbox"/> Manual input	maximum <input type="text" value="3,60"/>
	minimal <input type="text" value="0,00"/>

Line load

- Load in kN/m, attack height and load side for vertical glazing

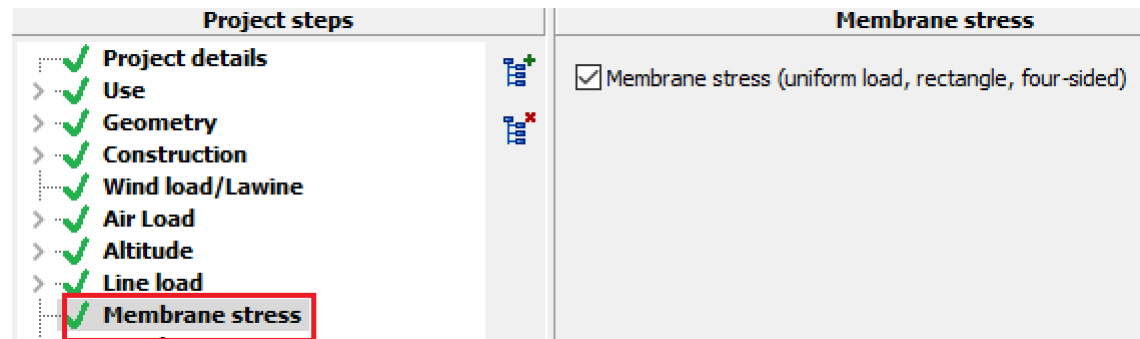


The screenshot shows a software interface for defining a line load on a window pane. The main area displays a blue rectangle representing the window pane with dimensions $h = 1250$ and $x = 1000$. A red horizontal line is drawn across the top of the rectangle, representing the line load. Below the rectangle, the width is labeled $b = 1500$. The interface is titled "Line load" and has an "Input" section at the bottom. The input section contains the following fields and options:

Input	
Value	<input type="text" value="0,80"/> kN/m (Pressure)
Location above FFL	<input type="text" value="1000"/> mm
	<input checked="" type="radio"/> Load on inner pane
	<input type="radio"/> Load on outer pane

Membrane voltage

- by simply setting a check mark, the membrane stress can be taken into account in the calculation
- Nonlinear calculation





Result

The output of the results is done by specifying the used parameters

- Overall result
- Indication of the existing utilization

h = 1250

b = 1500

Dead load			Total weight	75,00 kg	Wind load			Manual input
cos(90,0°) = 0,00								
	top / external	Middle	Bottom / Internal			Load case: Pressure	Load outside	Load indoors
Dead load	0,20 kN/m ²	-	0,20 kN/m ²				1,00 kN/m ²	0,00 kN/m ²
effective	0,00 kN/m ²	-	0,00 kN/m ²			Load case: Suction	-1,00 kN/m ²	0,00 kN/m ²
Air Load					Local heights			
	GD1	GD2	isochorous pressure			Installation	Production	Load
Summer	19 K	-	-30 hPa			600 m	300 m	0,00 kN/m ²
Winter	-26 K	-	30 hPa			600 m	300 m	3,60 kN/m ²
Load summer	9,46 kN/m ²	-						
Load winter	-11,84 kN/m ²	-						
Line load								
Load	0,80 kN/m		Location above	1000 mm	Load on inner pane (Pressure)			
Proof OK (max. utilization: 91,31 %) ** Check proof of impact resistance!								
<small>Proof of impact resistance required. Pendulum fall height according to SIA 2057 table 14: 700 mm max. Load case Stress: without lamination, inside, Nr. 18: Weight (1,35 * 1,00), Low installation (1,35 * 1,00), Climate winter (1,00 * 0,60), Wind suction (1,00 * 0,60), Line load (1,50 * 1,00) max. Deflection = -9,56 mm (Load case without lamination, Nr. 15) -> max. chord shortening 0,20 mm Nachweis im Bruchzustand: SIA 2057, table 9: Keine zusätzlichen Nachweise erforderlich (NB0)</small>								

Load combinations

➤ the decisive load cases are generated automatically

➤ there is also the possibility to define own load cases

Load case combinations (Gamma * Psi)

Temporarily (Other) constantly (weight, installation)
 User-defined exceptionally

The load combinations listed are relevant generally.
 In specific cases, other load cases are relevant.
 For the definition of the load combinations of agents is responsible.

Nr	Weight	Low installation	High installation	Climate winter	Climate summer	Wind pressure	Wind suction	Line load	Print
1	1,35 * 1,00							1,50 * 1,00	Yes
2	1,35 * 1,00						1,50 * 1,00		Yes
3	1,35 * 1,00					1,50 * 1,00			Yes
4	1,35 * 1,00		1,00 * 1,00		1,50 * 1,00				Yes
5	1,35 * 1,00	1,00 * 1,00		1,50 * 1,00					Yes
6	1,35 * 1,00	1,00 * 1,00		1,50 * 0,60			1,50 * 0,60	1,50 * 1,00	Yes
7	1,35 * 1,00		1,00 * 1,00		1,50 * 0,60		1,50 * 0,60	1,50 * 1,00	Yes
8	1,35 * 1,00	1,00 * 1,00		1,50 * 0,60			1,50 * 1,00	1,50 * 0,70	Yes
9	1,35 * 1,00		1,00 * 1,00		1,50 * 0,60		1,50 * 1,00	1,50 * 0,70	Yes
10	1,35 * 1,00	1,00 * 1,00		1,50 * 1,00			1,50 * 0,60	1,50 * 0,70	Yes
11	1,35 * 1,00		1,00 * 1,00		1,50 * 1,00		1,50 * 0,60	1,50 * 0,70	Yes
12	1,35 * 1,00	1,00 * 1,00		1,50 * 0,60		1,50 * 0,60		1,50 * 1,00	Yes
13	1,35 * 1,00		1,00 * 1,00		1,50 * 0,60	1,50 * 0,60		1,50 * 1,00	Yes
14	1,35 * 1,00	1,00 * 1,00		1,50 * 0,60		1,50 * 1,00		1,50 * 0,70	Yes
15	1,35 * 1,00		1,00 * 1,00		1,50 * 0,60	1,50 * 1,00		1,50 * 0,70	Yes
16	1,35 * 1,00	1,00 * 1,00		1,50 * 1,00		1,50 * 0,60		1,50 * 0,70	Yes
17	1,35 * 1,00		1,00 * 1,00		1,50 * 1,00	1,50 * 0,60		1,50 * 0,70	Yes

Lastfall hinzufügen...

Lastfall

	γ_G, γ_Q	ψ
Gewicht	1,10	1,00
Winddruck	1,10	1,00
Windsog		
Streckenlast	1,10	0,70

Suggestion module - glass thicknesses

The Glass *Thicknesses* module lists different thicknesses for the outer and inner pane, which fulfill the verification, and indicates the degree of utilization for each combination

Vorschlagsmodul			
Glasdicken		Größenmatrix	
Dickere Scheibe möglichst	↓ außen/oben	symmetrisch	↑ innen/unten
<input checked="" type="checkbox"/> Nicht taugliche Kombinationen ausblenden	11 Vorschläge anzeigen. 0 für alle Vorschläge.		
<input type="checkbox"/> Filter Gesamtdicke			
Scheibe außen/oben (2x(Float4-0,76))	Scheibe innen/unten (2x(Float4-0,76))	Ergebnis	
2 x 5 mm	2 x 5 mm	Nachweis OK (max. Ausnutzung: 95,15 %)	
2 x 6 mm	2 x 5 mm	Nachweis OK (max. Ausnutzung: 89,12 %)	
2 x 6 mm	2 x 6 mm	Nachweis OK (max. Ausnutzung: 66,21 %)	
2 x 8 mm	2 x 5 mm	Nachweis OK (max. Ausnutzung: 82,49 %)	
2 x 8 mm	2 x 6 mm	Nachweis OK (max. Ausnutzung: 81,59 %)	
2 x 8 mm	2 x 8 mm	Nachweis OK (max. Ausnutzung: 69,21 %)	
2 x 10 mm	2 x 5 mm	Nachweis OK (max. Ausnutzung: 90,08 %)	
2 x 10 mm	2 x 6 mm	Nachweis OK (max. Ausnutzung: 92,71 %)	
2 x 10 mm	2 x 8 mm	Nachweis OK (max. Ausnutzung: 84,51 %)	
2 x 10 mm	2 x 10 mm	Nachweis OK (max. Ausnutzung: 69,42 %)	
2 x 12 mm	2 x 5 mm	Nachweis OK (max. Ausnutzung: 93,89 %)	



Suggestion module - size matrix

The size matrix represents the results of the current setup as a function of any dimensions.

Vorschlagsmodul																			
Glasdicken		Größenmatrix																	
Breite b	500 mm bis 2000 mm	Schrittweite		100 mm											Aufbau	2x(Float4-0,76) SZR 16 2x(Float4-0,76)			
Höhe h	500 mm bis 2000 mm	Schrittweite		100 mm											Winddruck/-sog	500 mm x 500 mm: 0,54 / -0,67 kN/m ² 2000 mm x 2000 mm: 0,54 / -0,67 kN/m ²			
<input checked="" type="radio"/> Spannung Ausnutzung in % <input type="radio"/> Durchbiegung Ausnutzung in %															Schnee	---			
															Klimalast	8,80 / -12,50 kN/m ²			
															Ortshöhe	7,20 / 3,60 kN/m ²			
															Streckenlast	1,00 kN/m; x = 1000 mm			
															Membranspannung	Nein			
Σ Vorschläge berechnen																			
h \ b	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800					
500	95,9%	108,0%	120,0%	128,0%	133,3%	136,7%	138,7%	139,8%	140,3%	140,3%	139,9%	139,4%	138,8%	138,0%	13				
600	108,0%	99,0%	109,6%	116,5%	121,0%	123,7%	125,3%	126,2%	126,4%	126,3%	125,9%	125,3%	124,6%	123,8%	12				
700	120,0%	109,6%	96,4%	101,7%	104,8%	106,7%	107,7%	108,1%	108,1%	107,9%	107,5%	106,9%	106,2%	105,5%	10				
800	128,0%	116,5%	101,7%	87,7%	89,7%	90,8%	91,2%	91,3%	91,1%	90,8%	90,3%	89,8%	89,2%	88,5%	8				
900	133,3%	121,0%	104,8%	89,7%	76,9%	77,4%	77,4%	77,3%	76,9%	76,5%	76,0%	75,5%	74,9%	74,4%	7				
1000	136,7%	123,7%	106,7%	90,8%	77,4%	66,5%	66,3%	65,9%	65,5%	65,0%	64,5%	64,0%	63,5%	62,9%	6				
1100	138,7%	125,3%	107,7%	91,2%	77,4%	78,4%	80,8%	82,8%	84,5%	86,0%	87,4%	88,5%	89,4%	90,2%	9				
1200	139,8%	126,2%	108,1%	93,2%	101,6%	109,2%	116,0%	122,1%	126,9%	131,2%	134,9%	138,2%	141,0%	143,5%	14				
1300	140,3%	126,4%	108,1%	94,2%	105,4%	116,0%	126,0%	135,5%	144,4%	151,2%	157,5%	163,1%	168,1%	172,7%	17				
1400	140,3%	126,3%	107,9%	90,8%	102,3%	114,0%	125,6%	137,0%	148,0%	158,6%	166,8%	174,4%	181,3%	187,7%	19				
1500	139,9%	125,9%	107,5%	90,3%	98,5%	110,2%	122,1%	134,2%	146,3%	158,2%	169,9%	178,9%	187,3%	195,2%	20				
1600	139,4%	125,3%	106,9%	89,8%	95,8%	107,0%	118,7%	130,8%	143,2%	155,7%	168,1%	180,5%	190,0%	198,9%	20				
1700	138,8%	124,6%	106,2%	90,1%	98,1%	105,2%	116,4%	128,2%	140,4%	153,0%	165,8%	178,6%	191,4%	201,1%	21				
1800	138,0%	123,8%	105,5%	91,8%	100,6%	108,3%	115,4%	126,8%	138,7%	151,1%	163,9%	176,8%	189,8%	202,9%	21				
1900	137,2%	122,9%	104,7%	92,9%	102,4%	110,9%	118,3%	126,5%	138,1%	150,2%	162,8%	175,7%	188,8%	201,9%	21				
2000	136,4%	122,1%	103,9%	93,8%	103,7%	112,9%	121,0%	128,0%	138,5%	150,4%	162,7%	175,5%	188,5%	201,6%	21				



Interfaces

The exchange of projects is possible between all modules

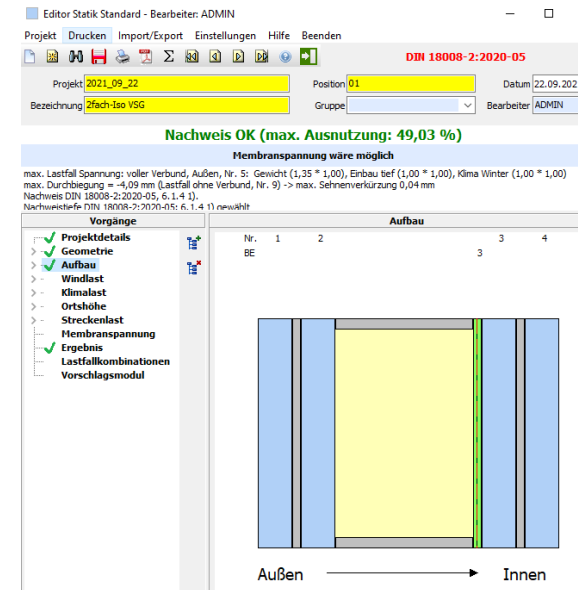
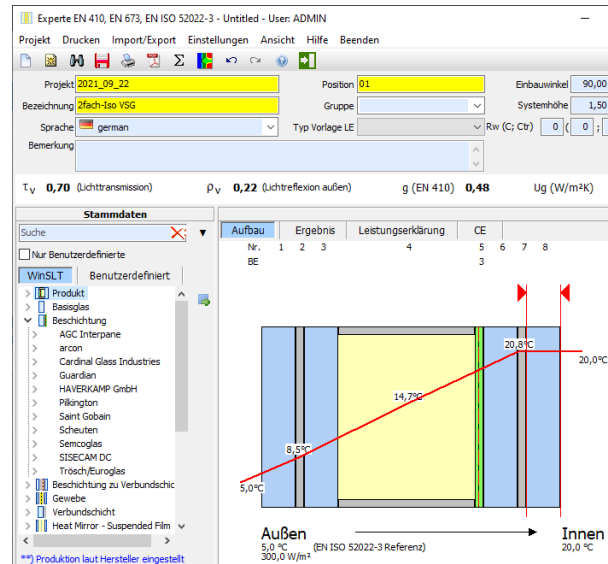
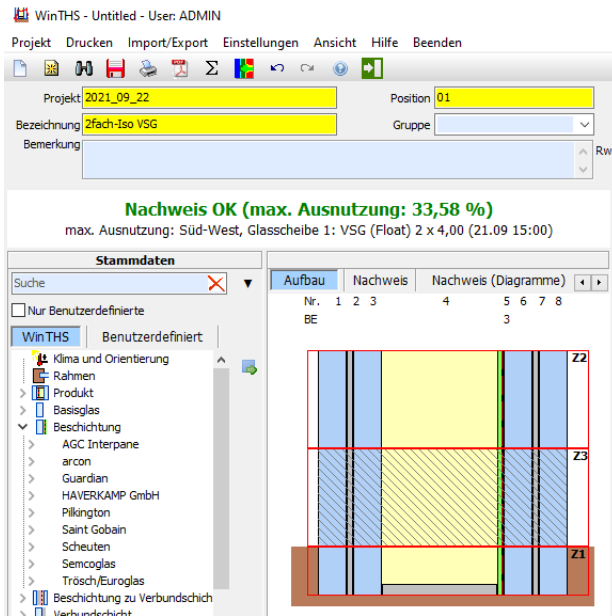
WinTHS
Thermischer Stress (NF DTU 39 P3)



WINSLT® Experte
Strahlung (EN 410, EN 673, EN ISO 52022-3)



GLASGLOBAL® 16612
Statik (EN 16612)





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