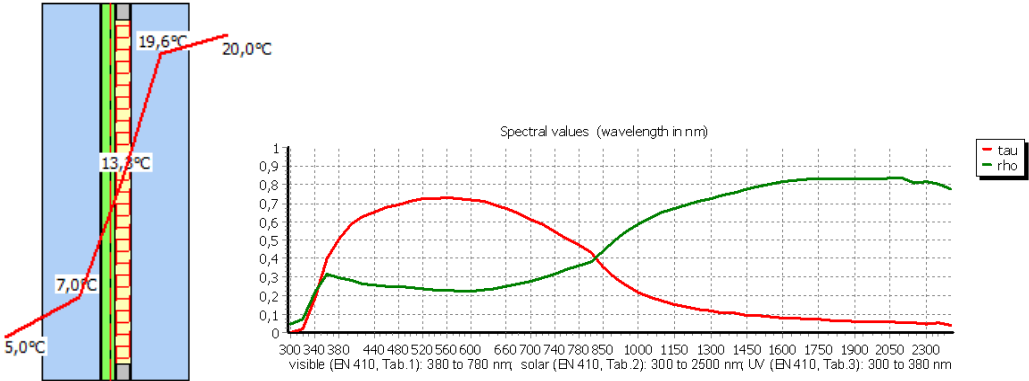




WINSLT® Add-On vacuum

How is vacuum glass calculated?





Technical details

- The calculation is based on ISO/FDIS 19916-1:2018, Annex C:

$$\frac{h_p + h_r + h_a}{h_v} \text{ Vacuum space conductance [W/(m}^2\text{K)]}$$

h_p Thermal conductance of the pillar array [W/(m²K)]

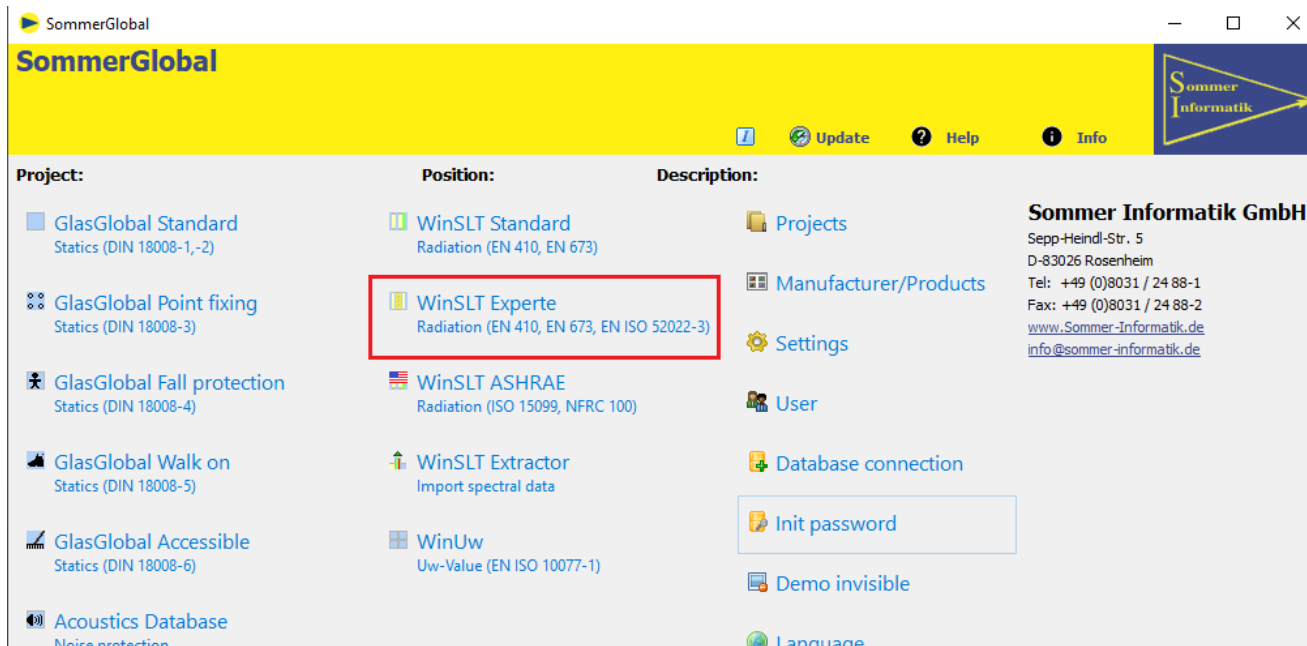
h_a Thermal conductance of the low pressure gas [W/(m²K)]

- h_g (cable) = h_c (convection) = 0
- h_r (radiation) remains unchanged compared to "normal" air spaces
- Consider in the calculation according to EN 673 and EN 52022-3



Start project

- In order to start a new project, the WINSLT® program must be started via the start screen.

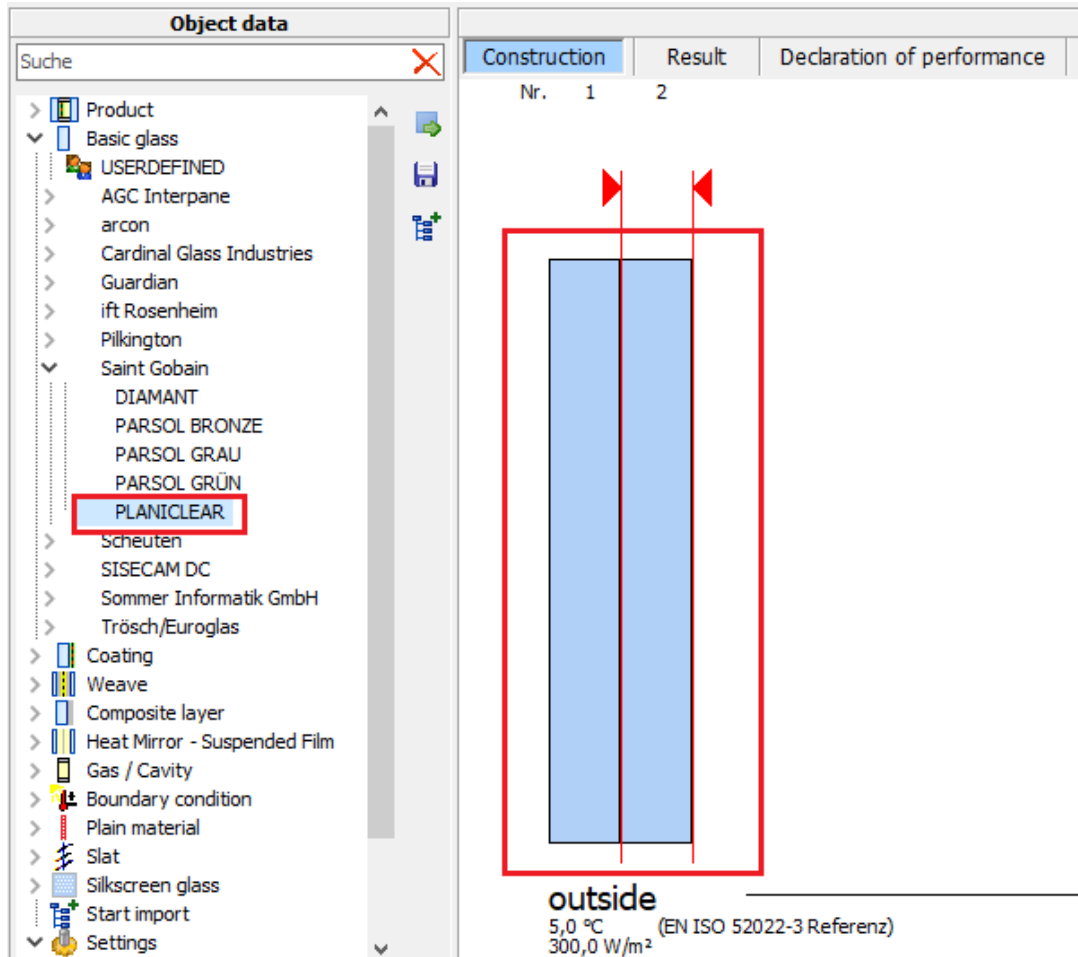


Calculate vacuum glass

- Start project
- Insert basic glass
- Insert coating
- Insert vacuum
- Calculation
- Printout

Insert basic glass

- Specify the desired basic glass



	Construction	Result	Declaration of performance
Nr.	1	2	

outside
5,0 °C (EN ISO 52022-3 Referenz)
300,0 W/m²

Calculate vacuum glass

- ✓ Start project
- Insert basic glass
- Insert coating
- Insert vacuum
- Calculation
- Printout

Insert coating

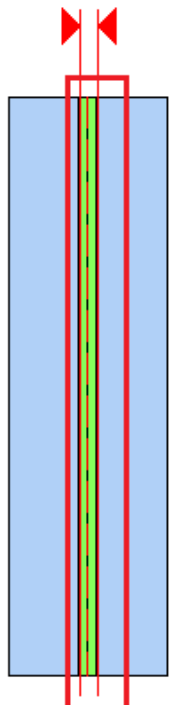
- Specify a coating, if required

Object data

Suche ✖

- > Product
- > Basic glass
- ▼ Coating
 - USERDEFINED
 - > AGC Interpane
 - > arcon
 - > Cardinal Glass Industries
 - > Guardian
 - > Pilkington
 - ▼ Saint Gobain
 - > Sun protection layer (HC)
 - > Self-cleaning
 - > Combination layer
 - > Sun protection layer
 - ▼ Thermal protection layer
 - ECLAZ (en=3%)
 - ECLAZ II (en=3%)
 - ECLAZ ONE (en=1%)
 - ECLAZ ONE II (en=1%)**
 - PLANITHERM ONE (en=1%)
 - PLANITHERM ONE II (en=1)
 - PLANITHERM TOTAL+ (en=
 - PLANITHERM XN (en=3%)
 - PLANITHERM XN II (en=3%
 - > Scheuten
 - > Combination layer
 - > Thermal protection layer
 - > Sencoglas
 - > SISECAM DC

Construction	Result	Declaration of performance	CE
Nr. 1	2		
BE	2		



outside

5,0 °C (EN ISO 52022-3 Referenz)
300,0 W/m²

Calculate vacuum glass

- ✓ Start project
- ✓ Insert basic glass
- **Insert coating**
- Insert vacuum
- Calculation
- Printout

Insert vacuum

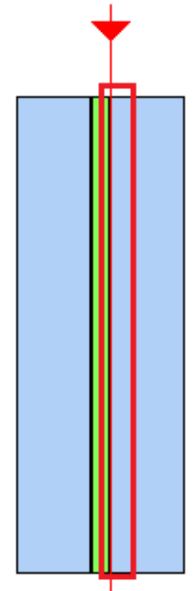
- The vacuum can be added via "Gas/Cavity" under the item "Userdefined".

Object data

Suche ✕

- > Product
- > Basic glass
- > Coating
- > Weave
- > Composite layer
- > Heat Mirror - Suspended Film
- ▼ Gas / Cavity
 - USERDEFINED
 - Gas mixer
 - vacuum**
 - 90% Argon
 - 90% Krypton
 - Air
 - Air ventilated
- > Boundary condition
- > Plain material
- > Slat
- > Silkscreen glass
- > Start import
- ▼ Settings
 - Declaration of performance
 - general
 - characteristics
 - Printout

Construction	Result	Declaration of performance	CE
Nr. 1	2	3	
BE	2		



outside
5,0 °C (EN ISO 52022-3 Referenz)
300,0 W/m²

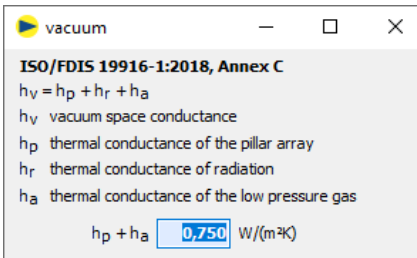
Calculate vacuum glass

- ✓ Start project
- ✓ Insert basic glass
- ✓ Insert coating
- **Insert vacuum**
- Calculation
- Printout

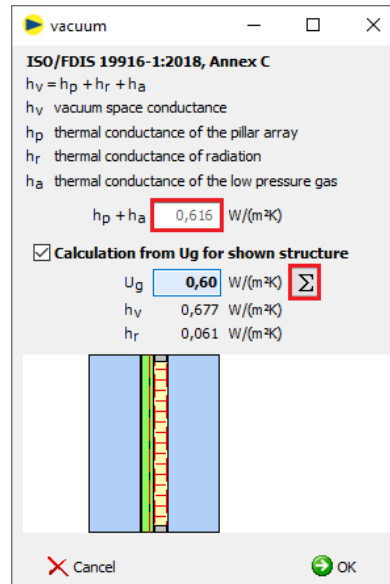
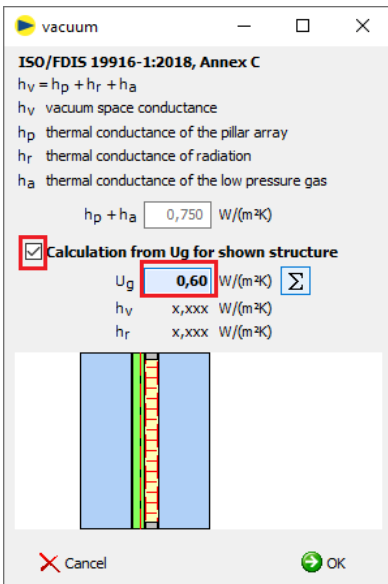


Insert vacuum

➤ If available, the "hp + ha" value can be entered directly.



➤ By ticking "Calculation from Ug..." the "hp + ha value" can be determined automatically from the entered Ug value.



Calculate vacuum glass

- ✓ Start project
- ✓ Insert basic glass
- ✓ Insert coating
- Insert vacuum
- Calculation
- Printout



Insert vacuum

➤ The vacuum is added to the structure as a gap.

The screenshot shows the software interface with the following components:

- Object data tree:** Shows a hierarchy including Product, Basic glass, Coating, Weave, Composite layer, Heat Mirror - Suspended Film, Gas / Cavity, and USERDEFINED. Under USERDEFINED, there is a 'vacuum' entry with properties: vacuum hp+ha = 0,616 W/(m²K), 90% Argon, 90% Krypton, and Air ventilated.
- Construction table:**

Nr.	BE	Description	Thickness (mm)
1		PLANICLEAR	4,00
2		PLANITHERM ONE (en...	0,00
3		vacuum hp+ha = 0,61...	1,00
4		PLANICLEAR	4,00
- Layer info table:**

Name	vacuum.hp+ha = 0,616 ...
Thickness (mm)	1,00
Ventilated	vacuum
Filling factor	0,00
Argon	0,00
Crypton	0,00
Xenon	0,00
SF6	0,00
- Diagram:** A cross-section diagram of a glass unit with 'outside' at 5,0 °C and 'inside' at 20,0 °C. A red double-headed arrow indicates the vacuum gap between the panes.

Calculate vacuum glass

- ✓ Start project
- ✓ Insert basic glass
- ✓ Insert coating
- **Insert vacuum**
- Calculation
- Printout

➤ For later use, the generated vacuum is created as a user-defined entry in the tree.

A close-up of the software tree showing the 'vacuum' entry under 'USERDEFINED' highlighted with a red box. The entry name is 'vacuum hp+ha = 0,616 W/(m²K)'. Below it, the properties '90% ARGON' and '90% KRYPTON' are partially visible.



Calculation

- Start the calculation using the totals character
- After the calculation, the results are displayed

Expert EN 410, EN 673, EN ISO 52022-3 - Untitled - User: ADMIN

Project Print Import/Export Settings View Help Quit

Project: [] Position: 02 Installation angle: 90,00 ° vertical
 Description: [] Group: [] System height: 1,50 m (<= 3m)
 Language D: english Template LE: [] Rw (C; Ctr): 0 (0 ; 0) dB
 Remark: []

T_v 0,72 (Lighttransmission) ρ_v 0,23 (Lightreflection outside) g (EN 410) 0,48 Ug (W/m²K) 0,6 (0,60)

User-defined materials are used

Object data	Construction	Result	Declaration of performance	CE
Nr. 1	2 3 4			
BE	2			

outside 5,0 °C (EN ISO 52022-3 Referenz) 300,0 W/m² → inside 20,0 °C

Calculate vacuum glass

- ✓ Start project
- ✓ Insert basic glass
- ✓ Insert coating
- ✓ Insert vacuum
- Calculation
- Printout



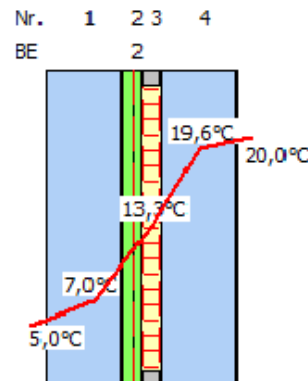
Printout

Calculation SommerGlobal

Position: 02

Layer composition (outside to inside)

Number	BE	Description	mm
1		PLANICLEAR	4,00
2	2	PLANITHERM ONE (εn=1%)	
3		vacuum hp +ha = 0,616 W/(m²K) *	1,00
4		PLANICLEAR	4,00
* USERDEFINED			9,00



Transmission, reflexion, absorption

$\rho_V = 0,23$ (Light reflection factor outside)

$\rho'_V = 0,22$ (Light reflection factor inside)

$\rho_e = 0,40$ (direct radiation reflection factor outside)

$\rho'_e = 0,40$ (direct radiation reflection factor inside)

α_e 1 = 0,12; 3 = 0,02 (direct radiation absorption factor)

EN 410

SC = 0,55 (Shading Coefficient, g/0,87)

$T_{UV} = 0,29$ (ultraviolet transmittance)

$T_V = 0,72$ (Light transmission)

$T_e = 0,46$ (direct radiation transmission factor)

$R_a = 98$ (general color rendering index (CRI))

$q_i = 0,02$ (secondary heat inside)

Calculate vacuum glass

- ✓ Start project
- ✓ Insert basic glass
- ✓ Insert coating
- ✓ Insert vacuum
- ✓ Calculation
- **Printout**



More information

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