



Do you wonder...

... about the change of your U_w values when installing an air-filled IGU instead of a gas filled one?

Calculations prove that the overall performance of a window is not highly affected when using air filled glass units

It is too short-sighted to base the performance of a window only on the U_g value. It is important to look at the window as a whole. Basically, the U_g value is not set in stone. By increasing the cavity, better U_g values can be achieved even with air filling.

If we compare different combinations on the complete window as a next step, we see that the air filling hardly brings any drawbacks, but a better spacer significantly increases living comfort.



1 U_g values for gas-filled and air-filled IGUs

Gas-filled IGUs have the advantage to offer very low U_g values. But also an air-filled triple glazed unit offers good U_g values with a difference of only 0,2 W/m²K. The same look at high performing coatings available on the market, shows that in some cases the difference can even be just at 0,1 W/m²K. It's always helpful to increase the cavity as this helps to achieve best U_g values also with air-filling. Highly performing profile systems allow the necessary IG thicknesses.

CLIMATOP XN / ECLAZ									
Heat transition coefficient – U_g value (W/m ² k) according to EN 673-4/2011									
cavity (mm)	2 x 8	2 x 10	2 x 12	2 x 14	2 x 15	2 x 16	2 x 18	2 x 20	2 x 24
cavity air	1,3	1,1	0,9	0,8	0,8	0,8	0,7	0,6	0,7
cavity Argon	1,0	0,8	0,7	0,6	0,6	0,6	0,5	0,5	0,5
cavity Krypton	0,7	0,6	0,4						
Gas filling level (Ar/Kr) according to product specification / Low-e coatings pos. 2 + 5 / Emissivity 0,03 / Vertical installation									

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CLIMATOP ONE / ECLAZ ONE / SKN / XTREME									
Heat transition coefficient – U_g value (W/m ² k) according to EN 673-4/2011									
cavity (mm)	2 x 8	2 x 10	2 x 12	2 x 14	2 x 15	2 x 16	2 x 18	2 x 20	2 x 24
cavity air	1,2	1,0	0,9	0,8	0,7	0,7	0,6	0,6	0,6
cavity Argon	0,9	0,8	0,7	0,6	0,6	0,5	0,5	0,5	0,5
cavity Krypton	0,6	0,5	0,4						
Gas filling level (Ar/Kr) according to product specification / Low-e coatings pos. 2 + 5 / Emissivity 0,01 / Vertical installation									



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2 Comparison of U_w values

Looking at the whole window now we see the overall impact on the U_w value of different combinations. A highly performing spacer bar compensates the lower U_g value, if on the other side a gas-filled unit has a lower performing glass-edge.

Furthermore, the use of high-performing spacer bars goes along with a much lower risk of condensation at the glass edge. This leads to a valuable increase of the living comfort.

FRAME MATERIAL	IGU	U_g VALUE	SPACER	 U_w VALUE	 CONDENSATION *
PVC (SEE CALC. 3.1)	4/14ag/4/14ag/4	0,6	Aluminium	0,975	-5 °C
	4/14air/4/14air/4	0,8	ULTIMATE	0,995	-20 °C
PVC (SEE CALC. 3.2)	4/15ag/4/15ag/4	0,6	Aluminium	0,975	-5 °C
	4/15air/4/15air/4	0,7	ULTIMATE	0,925	-20 °C
WOOD (SEE CALC. 3.3)	4/15ag/4/15ag/4	0,6	Aluminium	1,102	-3 °C
	4/15air/4/15air/4	0,7	ULTIMATE	1,022	-22 °C
ALUMINIUM (SEE CALC. 3.4)	4/15ag/4/15ag/4	0,6	Aluminium	1,209	-5 °C
	4/15air/4/15air/4	0,7	ULTIMATE	1,057	-25 °C

*with 20°C inside and 50% rel. humidity



3 Detailed Calculations

3.1 PVC window with triple glazing and 2 x 14 mm cavities

In this case, the use of SWS Ultimate instead of an aluminium spacer nearly equalizes the lower U_g value of the air-filled unit. The performance of the window with $U_w = 0,995 \text{ W/m}^2\text{K}$ is only slightly lower than the gas-filled IG combination.

$U_w = 0.98 (0.975) \text{ W/m}^2\text{K}$		$U_w = 1.00 (0.995) \text{ W/m}^2\text{K}$	
	Single sash a=1.23m - b=1.48m		Single sash a=1.23m - b=1.48m
	PVC $U_f = 1.2 \text{ W/m}^2\text{K}$ Frame width 0.11m		PVC $U_f = 1.2 \text{ W/m}^2\text{K}$ Frame width 0.11m
	Triple glazing $U_g = 0.6 (0.60) \text{ W/m}^2\text{K}$ Structure: 4/4/4 g = 60%		Triple glazing $U_g = 0.8 (0.80) \text{ W/m}^2\text{K}$ Structure: 4/4/4 g = 62%
	Aluminium $\Psi_g = 0.078 \text{ W/mK}$		SWS ULTIMATE $\Psi_g = 0.031 \text{ W/mK}$
	Georgian bars none		Georgian bars none

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3.2 PVC window with triple glazing and 2 x 15 mm cavities

With better coatings and 15 mm cavities, the U_g values differ just 0,1 $\text{W/m}^2\text{K}$. For this combination, the U_w performance of the window with air-filled IG and our SWS Ultimate is already 0,05 $\text{W/m}^2\text{K}$ better.

$U_w = 0.98 (0.975) \text{ W/m}^2\text{K}$		$U_w = 0.93 (0.925) \text{ W/m}^2\text{K}$	
	Single sash a=1.23m - b=1.48m		Single sash a=1.23m - b=1.48m
	PVC $U_f = 1.2 \text{ W/m}^2\text{K}$ Frame width 0.11m		PVC $U_f = 1.2 \text{ W/m}^2\text{K}$ Frame width 0.11m
	Triple glazing $U_g = 0.6 (0.60) \text{ W/m}^2\text{K}$ Structure: 4/4/4 g = 60%		Triple glazing $U_g = 0.7 (0.70) \text{ W/m}^2\text{K}$ Structure: 4/4/4 g = 62%
	Aluminium $\Psi_g = 0.078 \text{ W/mK}$		SWS ULTIMATE $\Psi_g = 0.031 \text{ W/mK}$
	Georgian bars none		Georgian bars none

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3.3 WOOD window with triple glazing and 2 x 15 mm cavities

Also with a wooden window, SWS Ultimate bar more than equalize the slightly higher U_g value of the air filled unit. The overall window performance is 0,1 $\text{W/m}^2\text{K}$ better than with gas-filling and aluminium spacer.

$U_w = 1.1 (1.102) \text{ W/m}^2\text{K}$		$U_w = 1.0 (1.022) \text{ W/m}^2\text{K}$	
	Single sash a=1.23m - b=1.48m		Single sash a=1.23m - b=1.48m
	Wood $U_f = 1.3 \text{ W/m}^2\text{K}$ Frame width 0.11m		Wood $U_f = 1.3 \text{ W/m}^2\text{K}$ Frame width 0.11m
	Triple glazing $U_g = 0.7 (0.70) \text{ W/m}^2\text{K}$ Structure: 4/4/4 g = 62%		Triple glazing $U_g = 0.8 (0.80) \text{ W/m}^2\text{K}$ Structure: 4/4/4 g = 62%
	Aluminium $\Psi_g = 0.089 \text{ W/mK}$		SWS ULTIMATE $\Psi_g = 0.031 \text{ W/mK}$
	Georgian bars none		Georgian bars none

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3.4 ALU window with triple glazing and 2 x 15 mm cavities

The same applies for aluminium windows: the advantage they take of the use of all our products is 0,152 $\text{W/m}^2\text{K}$ on the U_w value. This clearly shows that all components need to be taken into consideration.

$U_w = 1.2 (1.209) \text{ W/m}^2\text{K}$		$U_w = 1.1 (1.057) \text{ W/m}^2\text{K}$	
	Single sash a=1.23m - b=1.48m		Single sash a=1.23m - b=1.48m
	Alu / Metal $U_f = 1.4 \text{ W/m}^2\text{K}$ Frame width 0.11m		Alu / Metal $U_f = 1.4 \text{ W/m}^2\text{K}$ Frame width 0.11m
	Triple glazing $U_g = 0.7 (0.70) \text{ W/m}^2\text{K}$ Structure: 4/4/4 g = 62%		Triple glazing $U_g = 0.8 (0.80) \text{ W/m}^2\text{K}$ Structure: 4/4/4 g = 62%
	Aluminium $\Psi_g = 0.089 \text{ W/mK}$		SWS ULTIMATE $\Psi_g = 0.031 \text{ W/mK}$
	Georgian bars none		Georgian bars none

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