

# Stella PC3710 Perimeter Channel: U-Value and Condensation Analysis

STUDY OF PC3710 SHOE DETAIL

RO - SEPTEMBER 23, 2020

## Analysis Notes

The thermal performance of the PC3710 Perimeter Channel has been evaluated in the following report considering six different glass configurations (outlined below). The channel geometry used was provided by Stella and assumed to be accurate to real components.

This report is prepared for research and informational purposes only. These results are only a guide to the actual system performance and should not be interpreted as exact performance. This analysis is performed at ideal steady-state conditions and does not account for any outside influences, three-dimensional interactions, or final installation of the system in the field.

## Glass Make-Ups

1 1/4" glazing units:

	90% Argon Condition	Air Gap Condition
Outer Lite	9.4mm Clear with LowE (VRE1-59) on Exterior	9.4mm Clear with LowE (VRE1-59) on Exterior
Space	13mm 90% Argon/10% Air Mix	13mm Air
Inner Lite	9.4mm Clear	9.4mm Clear

## Glazing spacers:

The three types of glazing spacers examined in this analysis are based on the Viracon catalogue of products. The THERM files for these elements were obtained from the Viracon Design & Education Resources website. The spacers reviewed are:

- Viracon VTS
- Viracon Stainless Steel
- Viracon Aluminum

## Modeling Assumptions

1. Models were constructed during ideal conditions.
2. Three-dimensional heat transfers are not represented.
3. Effects of surrounding conditions are not included in this analysis.
4. Non-continuous elements are not modeled.

## Test Procedure

The components evaluated in this study were modeled using NFRC approved software:

- Frame and Edge Modeling: THERM 7.6
- Centre-of-Glass Modeling: WINDOW 7.6

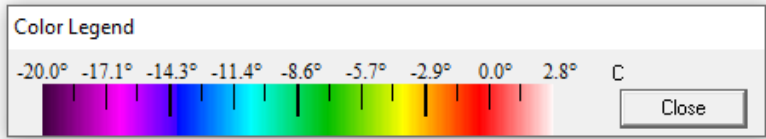
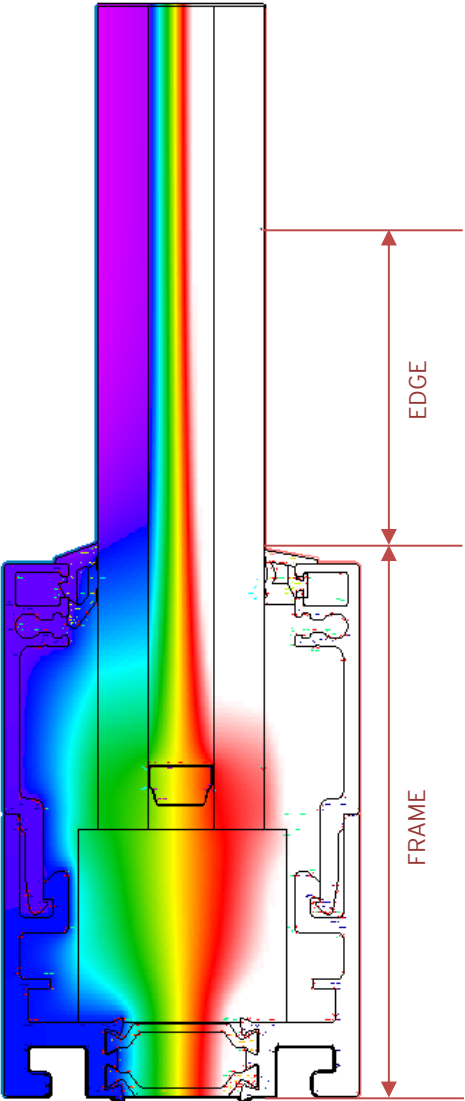
## Design Guides

The perimeter channel was evaluated in accordance with the following:

- ANSI/NFRC 100-2017: Procedure for Determining Fenestration Product U-Factors
- THERM 7.6: This program calculates heat loss through frame and edge-of-glass components using finite difference analysis. The program solves for temperature and heat flow distribution through the cross-section. The temperature distribution can then be used to determine overall heat loss, total and component U-Factors, and local temperatures at points of interest.
- WINDOW 7.6: This program calculates U-Factor and center-of-glazing (COG) temperatures using a two-dimensional heat flow analysis.

90% Argon with Viracon Stainless Steel Spacer

Exterior Temp: -18°C/-0.4°F (NFRC 100-2010 Exterior)  
Interior Temp: 21°C/70°F (Interior Thermally Broken Frame Convection)  
Relative Humidity: 30%  
Dew Point: 2.8°C/37.1°F



U-Factors

	U-factor W/m2-K	delta T C	Length mm	Rotation	
Frame	3.1864	39.0	107.802	90.0	Projected in Glass Plane
Edge	1.7406	39.0	63.5	90.0	Projected in Glass Plane

Display

☒ U-factor  
☐ R-value

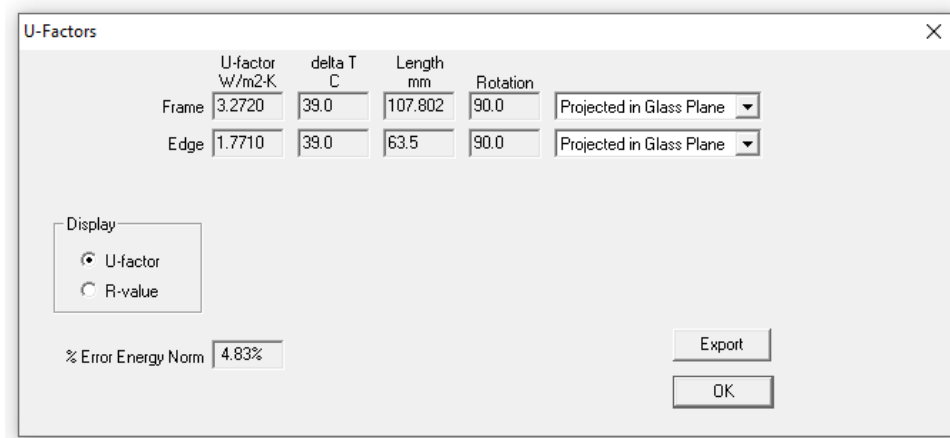
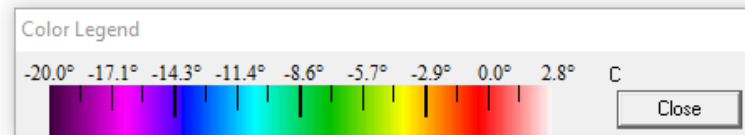
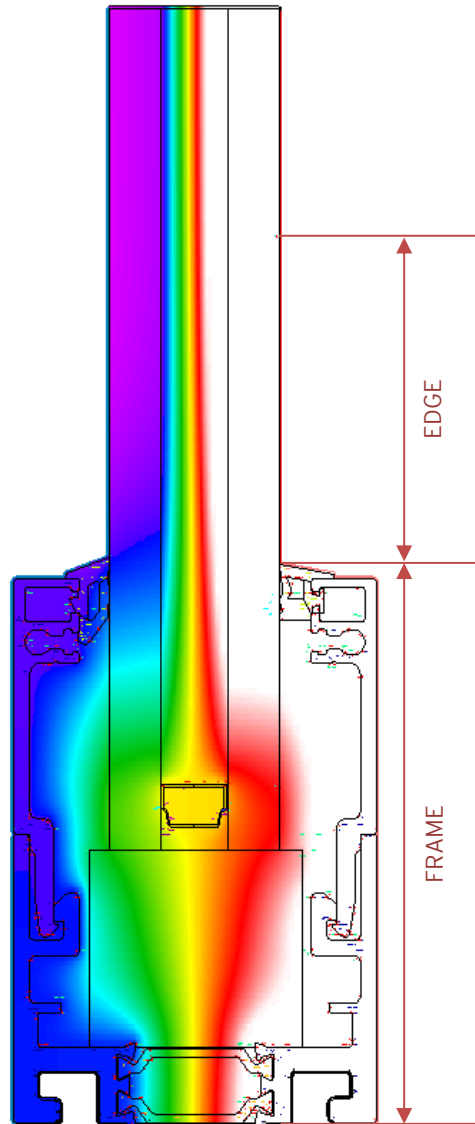
% Error Energy Norm 4.80%

Export

OK

## 90% Argon with Viracon Aluminum Spacer

Exterior Temp: -18°C/-0.4°F (NFRC 100-2010 Exterior)  
Interior Temp: 21°C/70°F (Interior Thermally Broken Frame Convection)  
Relative Humidity: 30%  
Dew Point: 2.8°C/37.1°F



	U-factor W/m2-K	delta T C	Length mm	Rotation	
Frame	3.2720	39.0	107.802	90.0	Projected in Glass Plane
Edge	1.7710	39.0	63.5	90.0	Projected in Glass Plane

Display

☒ U-factor  
☐ R-value

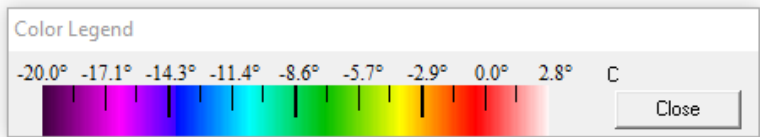
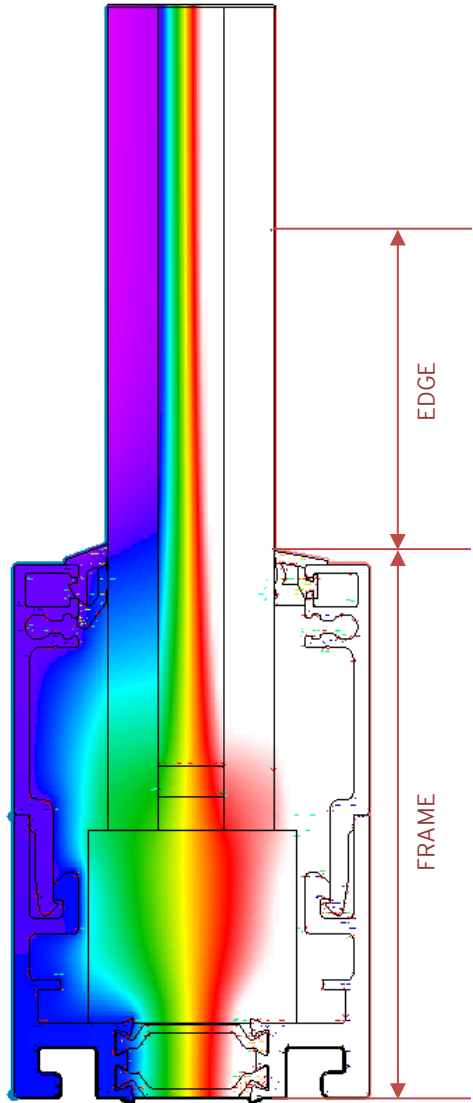
% Error Energy Norm 4.83%

Export

OK

90% Argon with Viracon Thermoplastic Spacer

Exterior Temp: -18°C/-0.4°F (NFRC 100-2010 Exterior)  
Interior Temp: 21°C/70°F (Interior Thermally Broken Frame Convection)  
Relative Humidity: 30%  
Dew Point: 2.8°C/37.1°F



U-Factors

	U-factor W/m <sup>2</sup> -K	delta T C	Length mm	Rotation	
Frame	3.1461	39.0	107.742	90.0	Projected in Glass Plane
Edge	1.6388	39.0	107.461	90.0	Projected in Glass Plane

Display

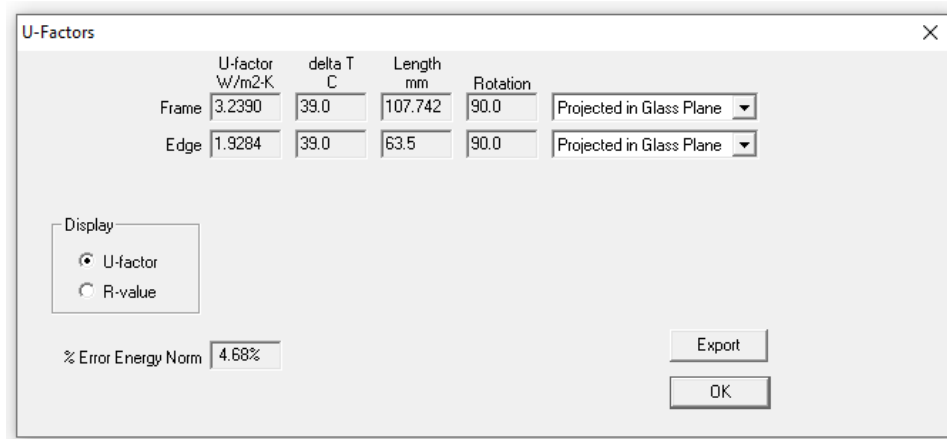
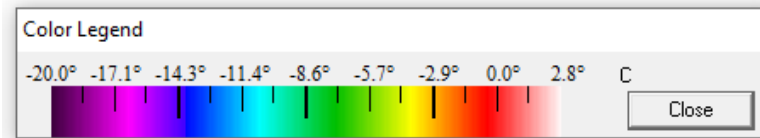
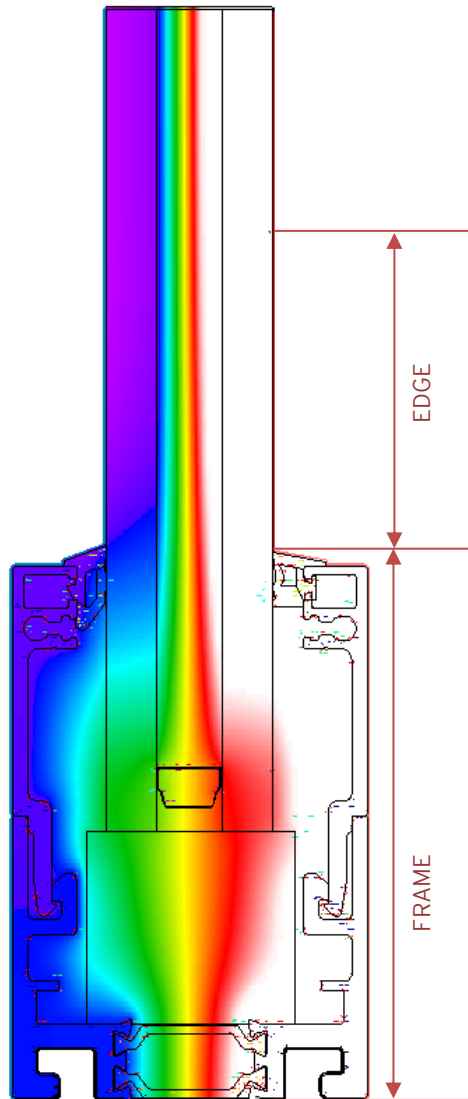
☒ U-factor  
☐ R-value

% Error Energy Norm 4.21%

Export  
OK

## Air gap with Viracon Stainless Steel Spacer

Exterior Temp: -18°C/-0.4°F (NFRC 100-2010 Exterior)  
Interior Temp: 21°C/70°F (Interior Thermally Broken Frame Convection)  
Relative Humidity: 30%  
Dew Point: 2.8°C/37.1°F



	U-factor W/m2-K	delta T C	Length mm	Rotation	
Frame	3.2390	39.0	107.742	90.0	Projected in Glass Plane
Edge	1.9284	39.0	63.5	90.0	Projected in Glass Plane

Display

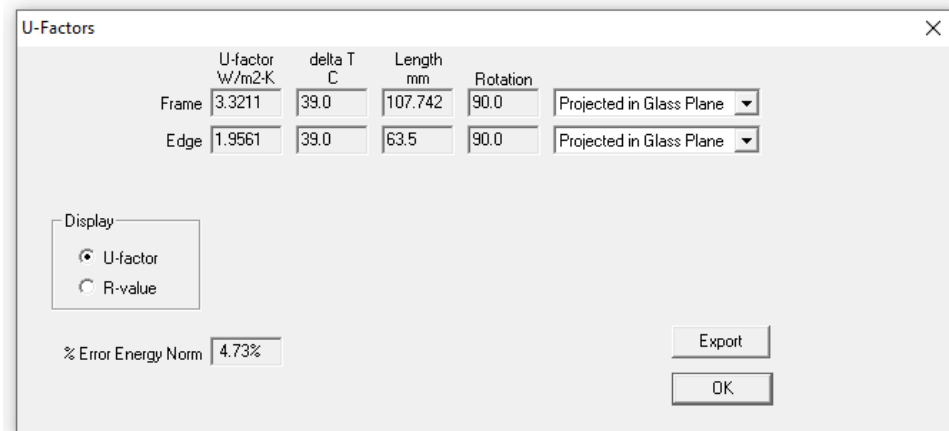
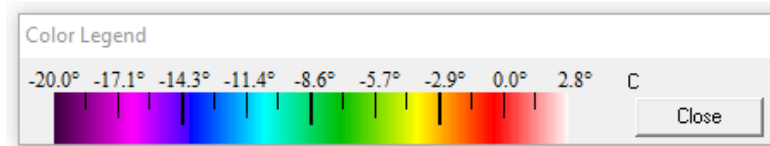
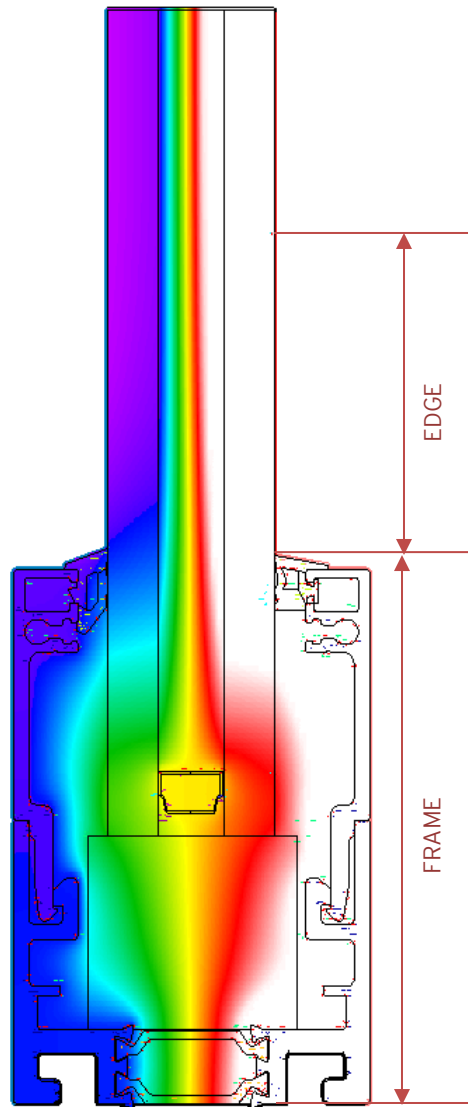
☒ U-factor  
☐ R-value

% Error Energy Norm 4.68%

Export  
OK

## Air gap with Viracon Aluminum Spacer

Exterior Temp: -18°C/-0.4°F (NFRC 100-2010 Exterior)  
Interior Temp: 21°C/70°F (Interior Thermally Broken Frame Convection)  
Relative Humidity: 30%  
Dew Point: 2.8°C/37.1°F



U-Factors

	U-factor W/m2-K	delta T C	Length mm	Rotation	
Frame	3.3211	39.0	107.742	90.0	Projected in Glass Plane
Edge	1.9561	39.0	63.5	90.0	Projected in Glass Plane

Display

☒ U-factor  
☐ R-value

% Error Energy Norm 4.73%

Export  
OK



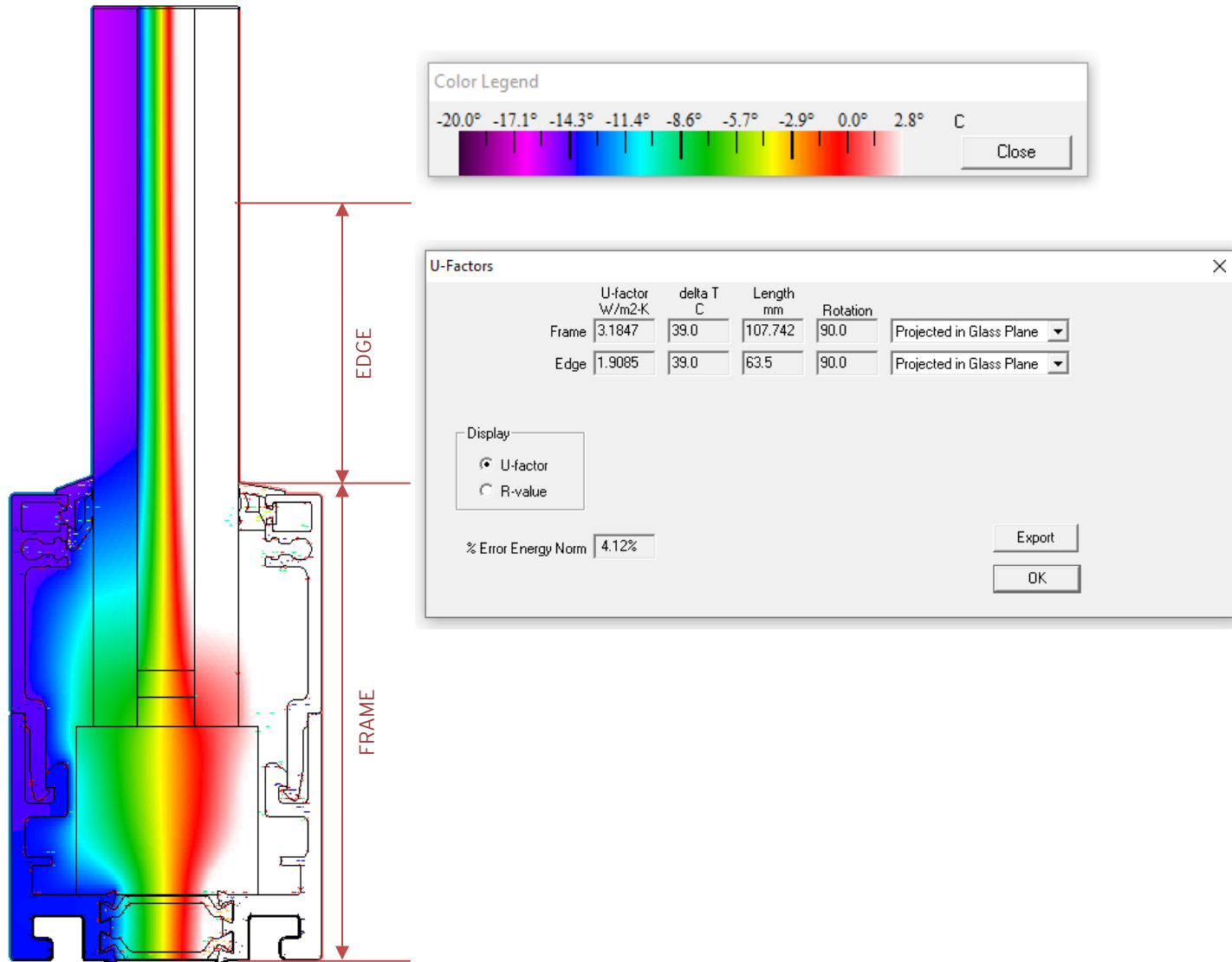
### Air gap with Viracon Thermoplastic Spacer

Exterior Temp: -18°C/-0.4°F (NFRC 100-2010 Exterior)

Interior Temp: 21°C/70°F (Interior Thermally Broken Frame Convection)

Relative Humidity: 30%

Dew Point: 2.8°C/37.1°F



## Summary:

Combination	Location	U-Value (W/m <sup>2</sup> -K)
Argon with Stainless Steel Spacer	Frame	3.1864
	Edge	1.7406
Argon with Aluminum Spacer	Frame	3.2720
	Edge	1.7710
Argon with Thermoplastic Spacer	Frame	3.1461
	Edge	1.6388
Air Gap with Stainless Steel Spacer	Frame	3.2390
	Edge	1.9284
Air Gap with Aluminum Spacer	Frame	3.3211
	Edge	1.9561
Air Gap with Thermoplastic Spacer	Frame	3.1847
	Edge	1.9085