# DENEY SERTİFİKASI
# *Test Certificate*

Test
TS EN ISO/IEC 17025
AB-0531-T

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| AB-0531-T |
| 140.1735.1/2022 |
| 04.03.2022 |

Façade Testing Institute

***Müşterinin Adı ve Adresi*** / *Customer's Name & Address:* *Selectron Elektrokimya San. ve Tic. Ltd. Şti. Atatürk Bulvarı Köstemir Cad. No:74 Silivri / İstanbul*

***Numunenin Adı ve Tarifi*** / *Sample's Name & Description:* *Arbor Timber Curtain Wall System 50*

***Numune Kabul Tarihi*** / *Acceptence Date of Item:* -

***FTI Proje No*** / *FTI Project No:* 2022.1478

***Uygulanan Normlar*** / *Norms Applied:* *EN ISO 12631,EN ISO 10077-2*

***Sonuçlar*** / *Results:* *Thermal Transmittence of Curtain Wall : Ucw = 1,25 W/m²K*

***Test Tarihi*** / *Date of Test*
03.03.2022

***Sayfa Sayısı*** / *Number of Pages*
1 / 14

Deney laboratuvarı olarak faaliyet gösteren FTI Fasad Teknoloji Merkezi, TÜRKAK 'tan AB-0531-T numarası ile TS EN ISO/IEC 17025 standardına göre akredite edilmiştir.
*FTI Facade Testing Institute accredited by TURKAK under registration number AB-0531-T for TS EN ISO/IEC 17025 as test laboratory.*

Türk Akreditasyon Kurumu (TÜRKAK) deney laboratuvarlarının tanınırlığı konusunda Avrupa Akreditasyon Birliği (EA) ile Çok Taraflı Anlaşma ve Uluslararası Laboratuvar Akreditasyon Birliği (ILAC) ile karşılıklı tanıma anlaşması imzalamıştır.
*Turkish Accreditation Agency (TURKAK) is a signatory to the European co-operation for Accreditation (EA) Multilateral Aggrement (MLA) and to the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognation Arrangement (MRA) for the recognation of test reports.*

Deney ve/veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney metotları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir. Bu sertifika yalnız test edilen numuneye ait sonuçları içerir ve ekte sunulan ilgili test raporu ile birlikte geçerlidir.
*The test and/or measurement results, the uncertainties (if applicable) with confidence probability and test methods are given on the following pages. This certificate includes the test results of the specimen which is identified above and its valid with the related test report.*

***Mühür*** / *Seal*

***Tarih*** / *Date*
04.03.2022

***Hazırlayan*** / *Prepared by*
Onur ÖZBEK
*Test Mühendisi* / *Testing Engineer*

***Onaylayan*** / *Approved by*
Emre ARSLAN
*Laboratuvar Müdürü* / *Laboratory Manager*

FTI Fasad Teknoloji Merkezi / *FTI Façade Testing Institute*
Çakıl Mahallesi Şehit Teğmen Tamer Aydın Sok. No: 76/2 34540 Çatalca / İstanbul / TÜRKİYE
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# ANALYSIS REPORT

**Referenced Method** : EN ISO 12631 Thermal performance of curtain walling – Calculation of thermal transmittance

**Product / Project** : Arbor Timber Curtain Wall System 50

**Prepared by** : Onur ÖZBEK

## 1. PREFACE

This report contains the results of thermal transmittance analysis, which were performed by FTI Facade Testing Institute at the address; Çakıl Mah. Şehit Teğmen Tamer Aydın Sok. No: 76/2 34540 Çatalca – Istanbul / TURKIYE.
Test sample is Arbor Timber Curtain Wall System 50 has been designed by Selectron Elektrokimya San. ve Tic. Ltd. Şti.

## 2. CLIENT

Selectron Elektrokimya San. ve Tic. Ltd. Şti.
Atatürk Bulvarı Köstemir Cad. No:74
Silivri / İstanbul

## 3. ANALYSIS METHODS

Thermal transmittance analysis has been carried out according to the standards indicated below.

| Document No | Date of Publication | Content of Document |
|---|---|---|
| EN ISO 12631 | 2017 | Thermal performance of curtain walling – Calculation of thermal transmittance |
| EN ISO 10077-2 | 2017 | Thermal performance of windows, doors and shutters – Calculation of thermal transmittance – Part2: Numerical Method for Frames |

*Single equivalent thermal conductivity method is used in accordance with EN ISO 10077-2 for assessment of cavities and single assessment method is used in in accordance with EN ISO 12631 for the curtain walling calculation. Thermal joints results detailed in the report are provided by computer simulation using Frame Simulator Software Program.*

*Details submitted by the customer are taken into account in material assignments. Non-continuous materials such as corner wedges, glass supporter elements etc. are disregarded for frame analysis.*

## 4. ANALYZING TEAM

Thermal transmittance analysis was performed on 03.03.2022 by the followings:

| | | |
|---|---|---|
| Emre ARSLAN | FTI | Laboratory Manager |
| Onur ÖZBEK | FTI | Testing Engineer |

## 5. DESCRIPTIONS OF THE SYSTEM

| | |
|---|---|
| Type of sample | Curtain Wall |
| System name | Arbor Timber Curtain Wall System 50 |
| Dimensions of sample | 855 x 1785 mm |
| Surface area of sample | 1,52 $m^2$ |

Glass type (vision)

$Ug_v$ = 1.1 $W/m^2K$

External: 4 mm tempered low-e
Gap : 16 mm Argon
Internal : 44.2 mm

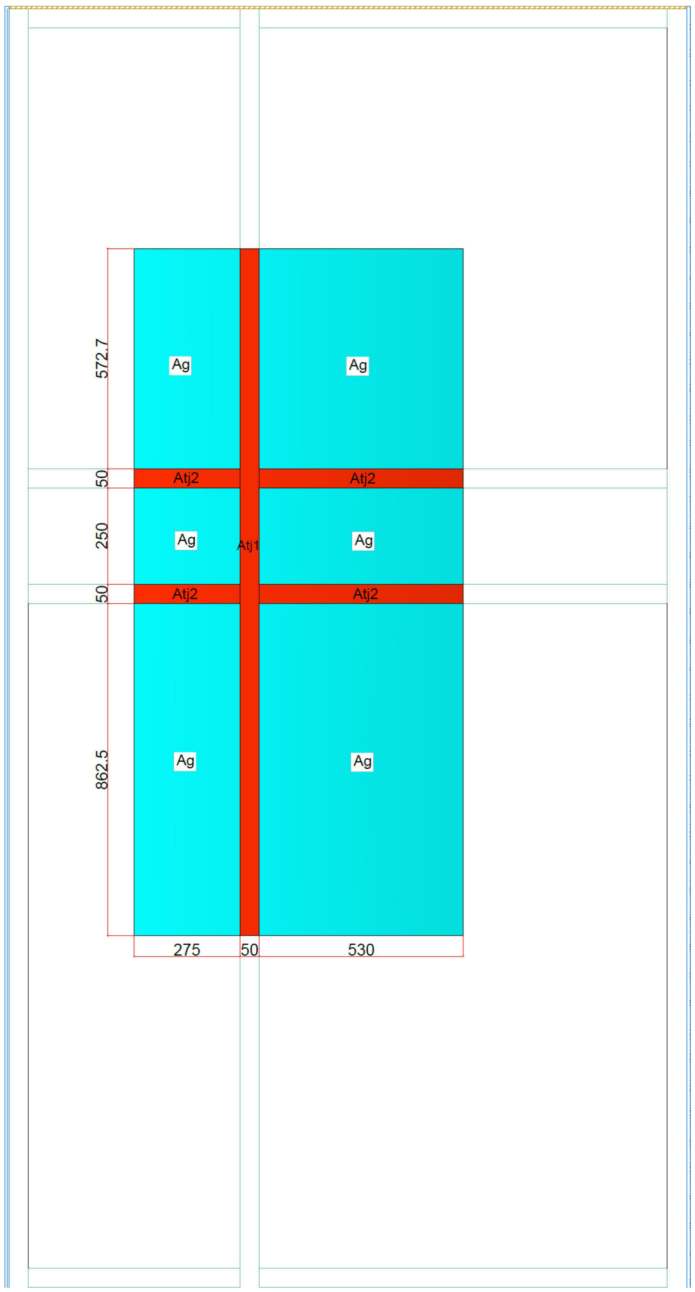
*Please refer to detailed drawings presented on pages 12-14 for the system details. Information in the table above, detailed system drawings and information inside have been submitted to FTI Façade Testing Institute under the responsibility of customer.*

## 6. INITIAL CONDITIONS

| | |
|---|---|
| Outdoor Temperature | 0 $^0C$ |
| Indoor Temperature | 20 $^0C$ |

## 7. SYSTEM DETAILS & THERMAL TRANSMITTANCE ANALYSIS

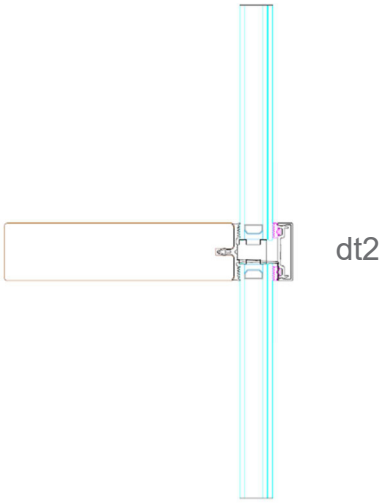
System details and thermal conduction analysis are detailed below:

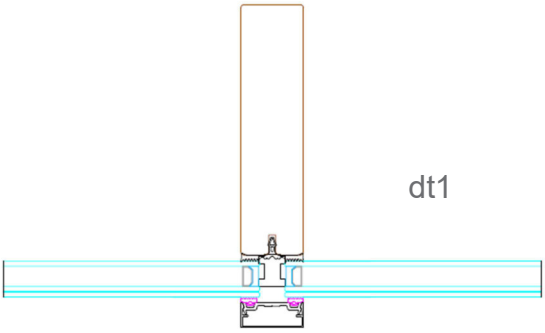



Atj1 = 0,08926 $m^2$

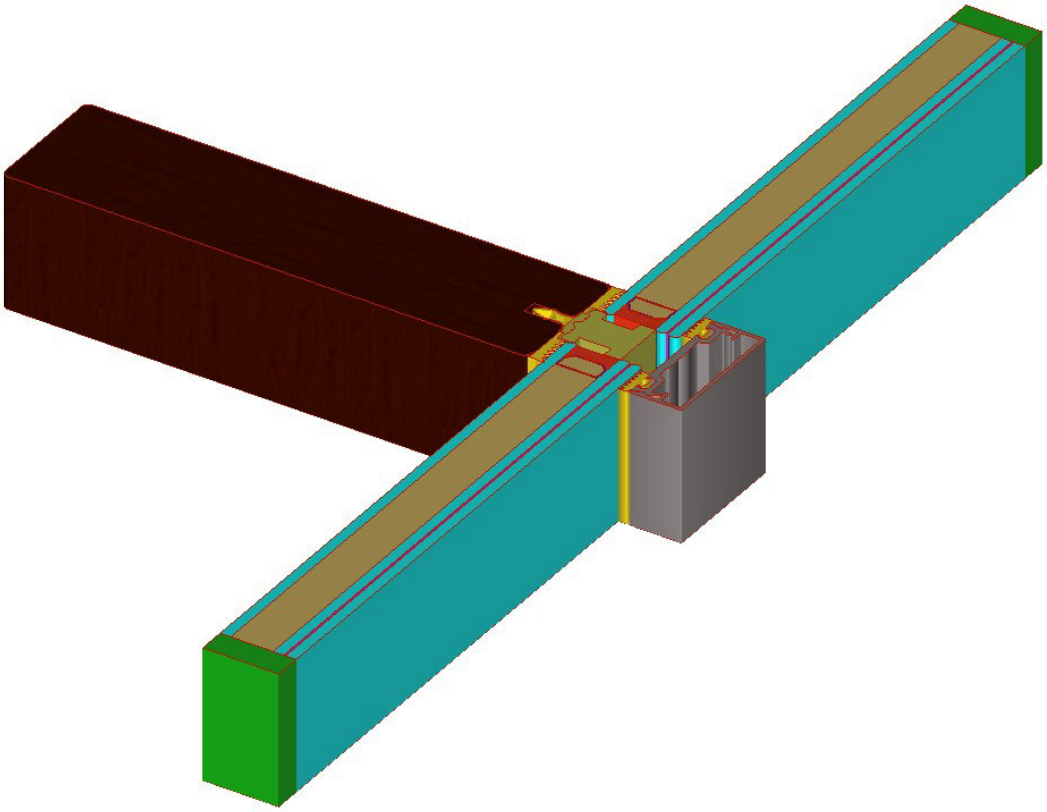
Atj2 = 0,0805 $m^2$

Ag = 1,35658 $m^2$



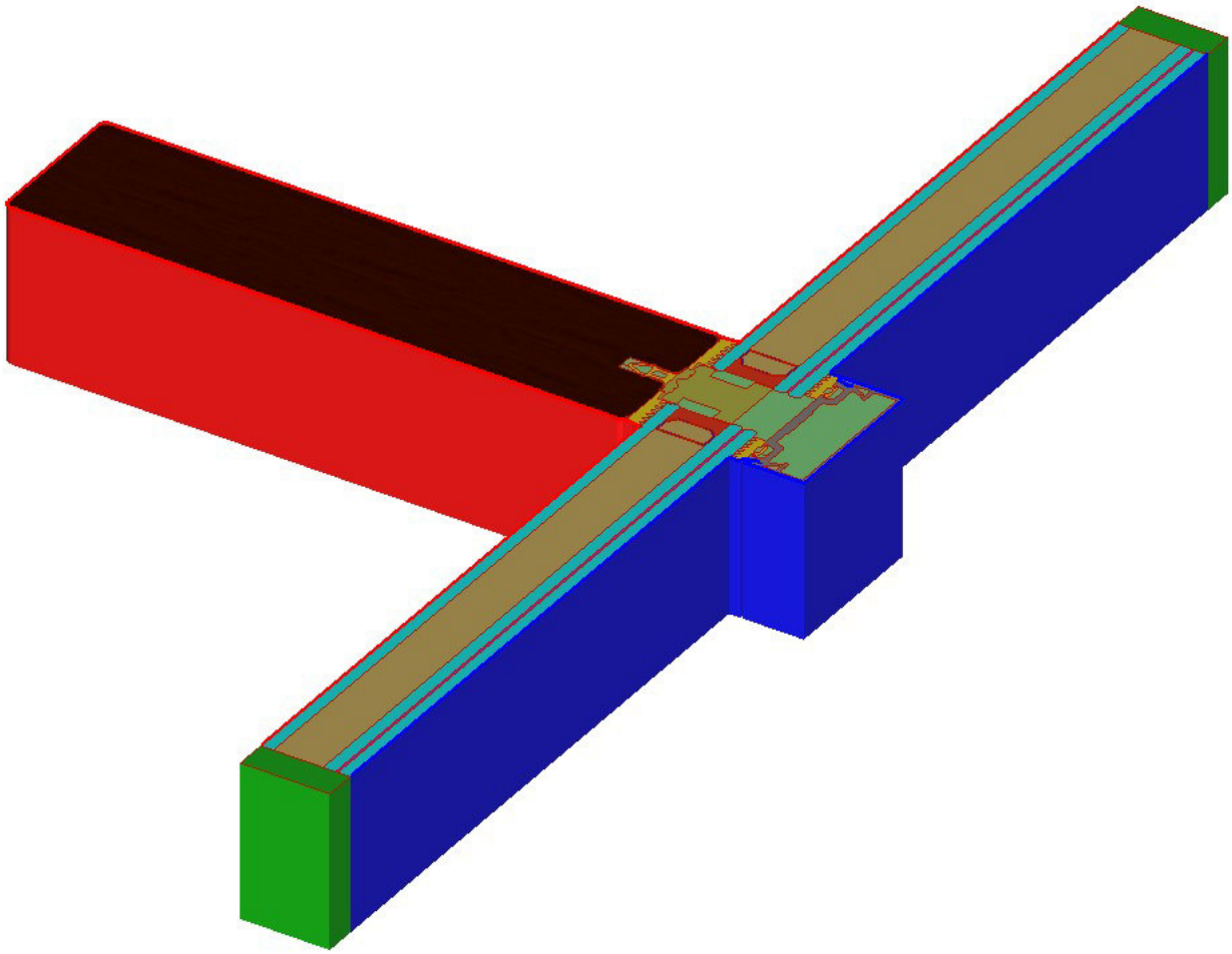



### 7.1 Thermal Transmittance of Thermal Joint – Detail 1



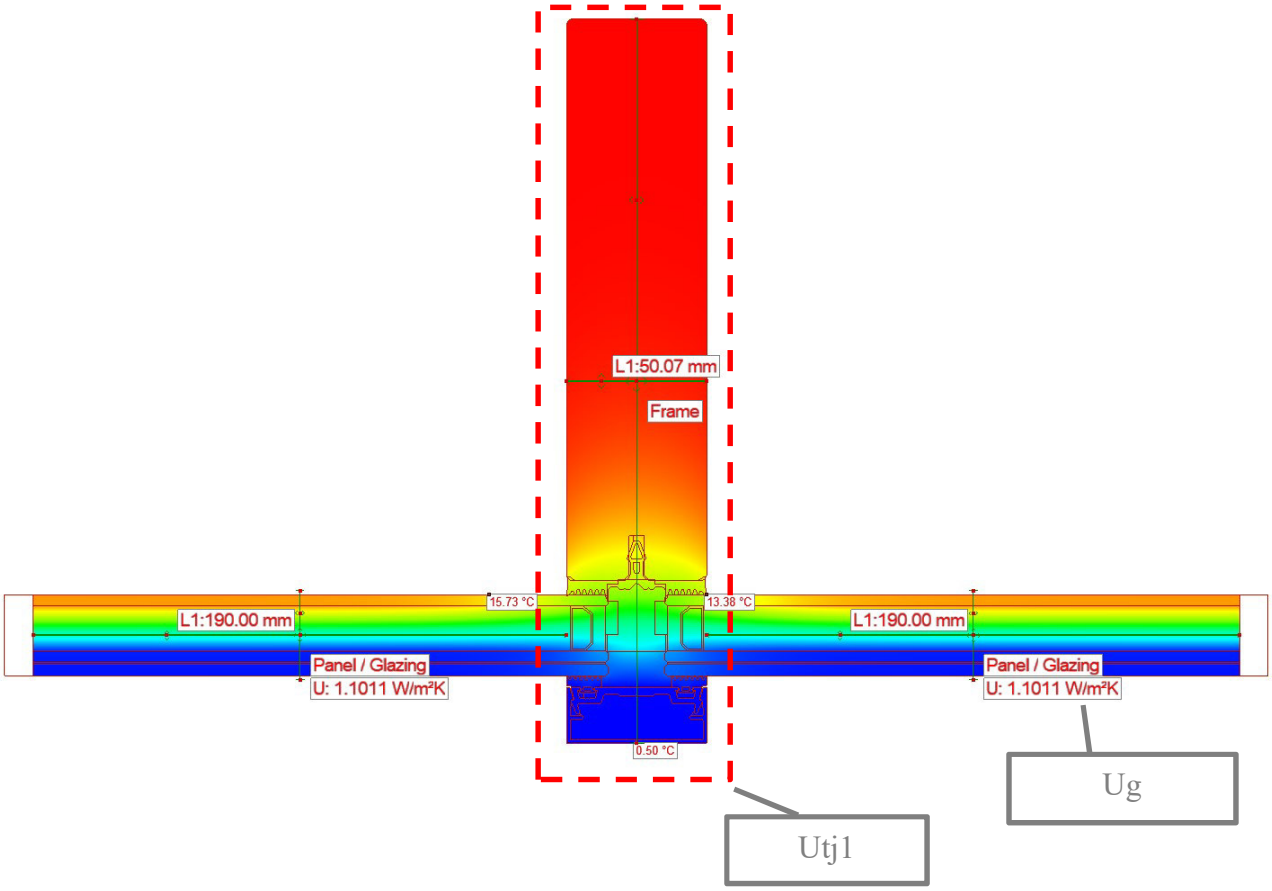
Materials

| Name | Type | Cavity type | λx [W/mK] | λy [W/mK] | ε | Qperm [g/m²] | Color |
|---|---|---|---|---|---|---|---|
| Soda lime glass | Standard | | 1.0000 | 1.0000 | 0.900 | 500.000 | |
| Silicone pure | Standard | | 0.3500 | 0.3500 | 0.900 | 500.000 | |
| EPDM sponge formed | Standard | | 0.0500 | 0.0500 | 0.900 | 500.000 | |
| Adiabatic | Adiabatic | | 0.0000 | 0.0000 | 0.900 | 500.000 | |
| EPDM | Standard | | 0.2500 | 0.2500 | 0.900 | 500.000 | |
| PVC rigid | Standard | | 0.1700 | 0.1700 | 0.900 | 500.000 | |
| Aluminium (raw) | Standard | | 160.0000 | 160.0000 | 0.300 | 500.000 | |
| Softwood | Standard | | 0.1300 | 0.1300 | 0.900 | 500.000 | |
| Polysobutylene | Standard | | 0.2000 | 0.2000 | 0.900 | 500.000 | |
| Standard | Standard | | 0.0221 | 0.0221 | 0.900 | 500.000 | |



Boundaries

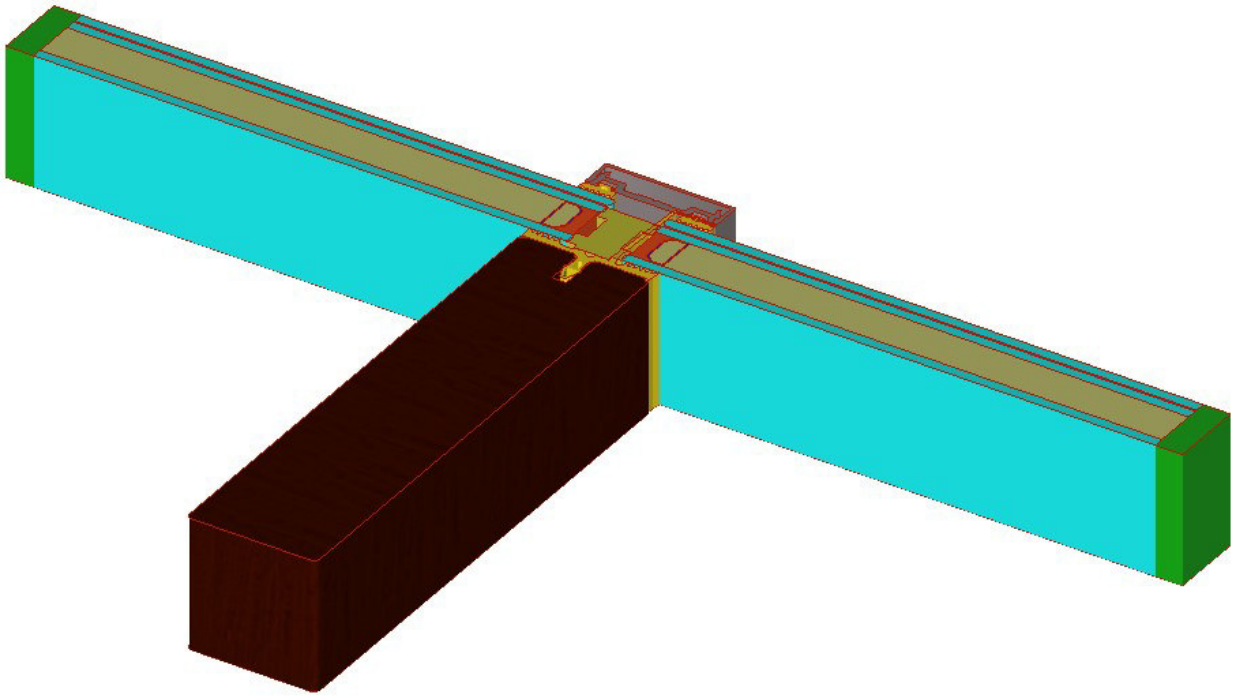
| ID | Name | Type | Col. | Boundary T [°C] | R type | R [m²K/W] | Gas type | Flow rate type | Flow rate [W/m²] | U-Factor surface | Flow dir. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Internal | Environment air | | 20.000 | Constant | 0.1300 | Air | Constant | 0.000 | Use segment settings | - |
| 1 | External | Environment air | | 0.000 | Constant | 0.0400 | Air | Constant | 0.000 | Use segment settings | - |




| Calculated results for detail tj1 thermal joint | | |
|---|---|---|
| | **Frame Simulator Utj (thermal transmittance of detail tj 1)** | **Atj1 (Area of detail tj1)** |
| Utj1 | 2,4352 W/m²K | 0,08926 m² |

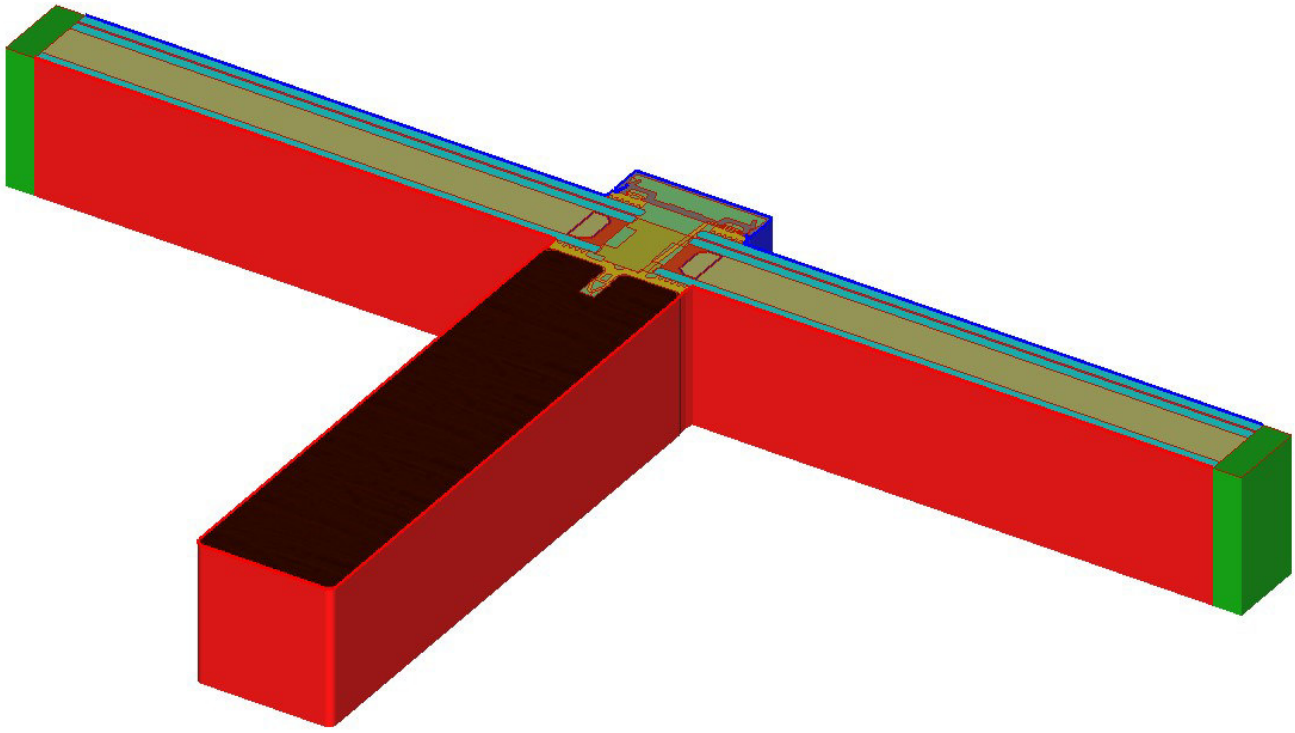
| | **Frame Simulator Ug (thermal transmittance of glass)** |
|---|---|
| Ug | 1,1 W/m²K |

### 7.2 Thermal Transmittance of Thermal Joint – Detail 2



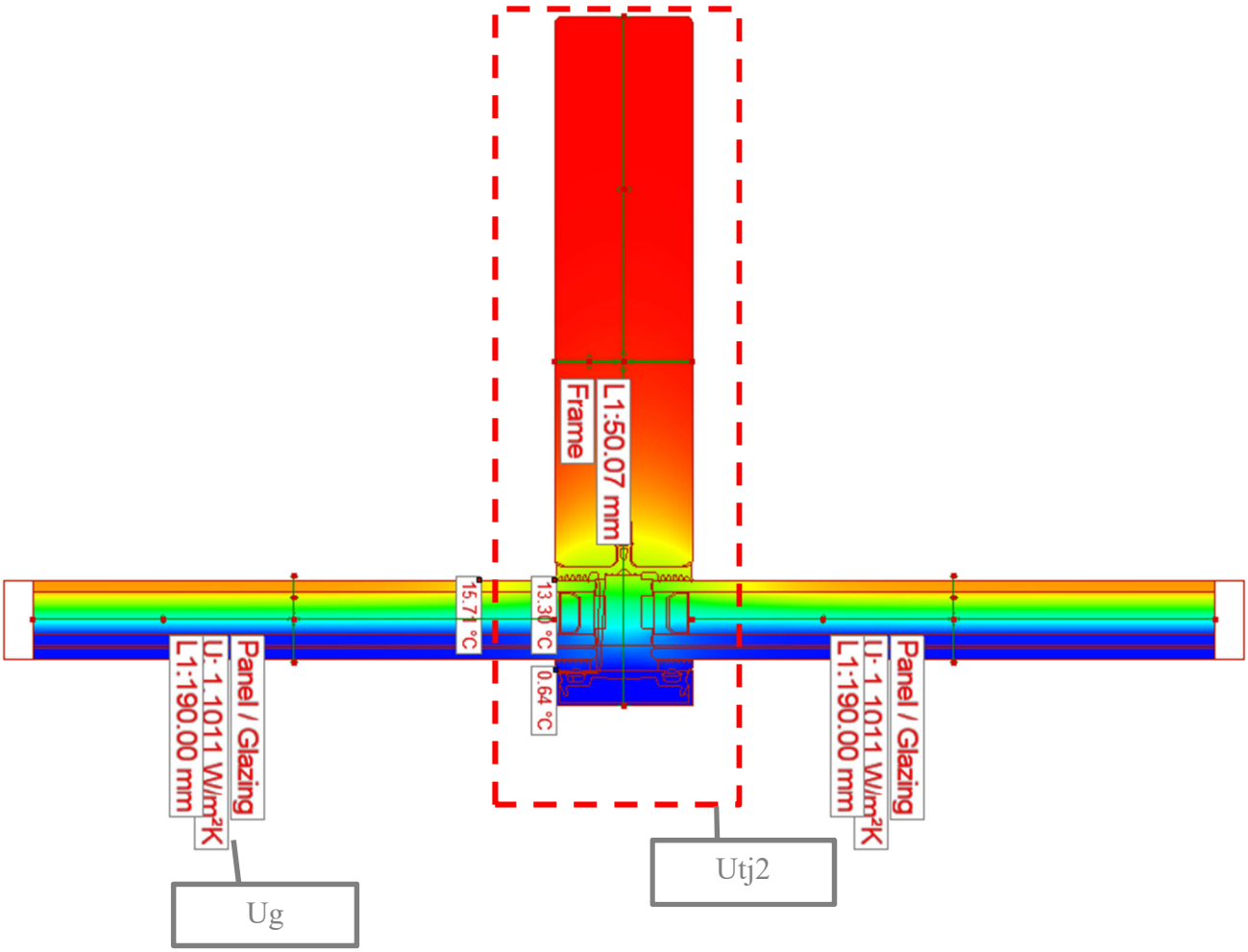
Materials

| Name | Type | Cavity type | λx [W/mK] | λy [W/mK] | ε | Qperm [g/m²] | Color |
|---|---|---|---|---|---|---|---|
| Softwood | Standard | | 0.1300 | 0.1300 | 0.900 | 500.000 | |
| Soda lime glass | Standard | | 1.0000 | 1.0000 | 0.900 | 500.000 | |
| Silicone pure | Standard | | 0.3500 | 0.3500 | 0.900 | 500.000 | |
| EPDM | Standard | | 0.2500 | 0.2500 | 0.900 | 500.000 | |
| EPDM sponge formed | Standard | | 0.0500 | 0.0500 | 0.900 | 500.000 | |
| PVC rigid | Standard | | 0.1700 | 0.1700 | 0.900 | 500.000 | |
| Polysobutylene | Standard | | 0.2000 | 0.2000 | 0.900 | 500.000 | |
| Adiabatic | Adiabatic | | 0.0000 | 0.0000 | 0.900 | 500.000 | |
| Aluminium (anodized/coated) | Standard | | 160.0000 | 160.0000 | 0.900 | 500.000 | |
| Standard | Standard | | 0.0221 | 0.0221 | 0.900 | 500.000 | |



Boundaries

| ID | Name | Type | Col. | Boundary T [°C] | R type | R [m²K/W] | Gas type | Flow rate type | Flow rate [W/m²] | U-Factor surface | Flow dir. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Internal | Environment air | | 20.000 | Constant | 0.1300 | Air | Constant | 0.000 | Use segment settings | - |
| 1 | External | Environment air | | 0.000 | Constant | 0.0400 | Air | Constant | 0.000 | Use segment settings | - |



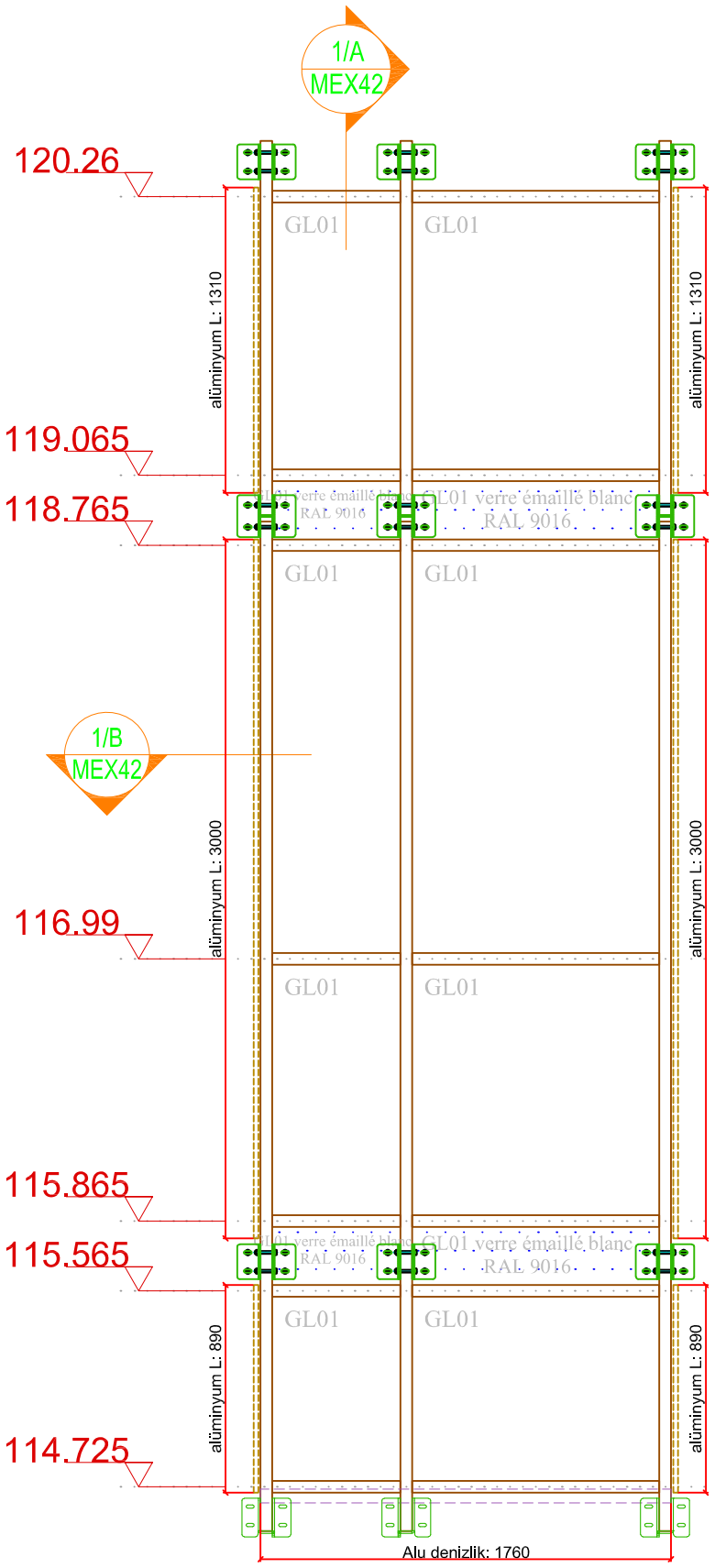

| Calculated results for detail tj2 thermal joint | | |
|---|---|---|
| | **Frame Simulator Utj (thermal transmittance of detail tj 2)** | **Atj2 (Area of detail tj2)** |
| Utj2 | 2,4805 W/m²K | 0,0805 m² |

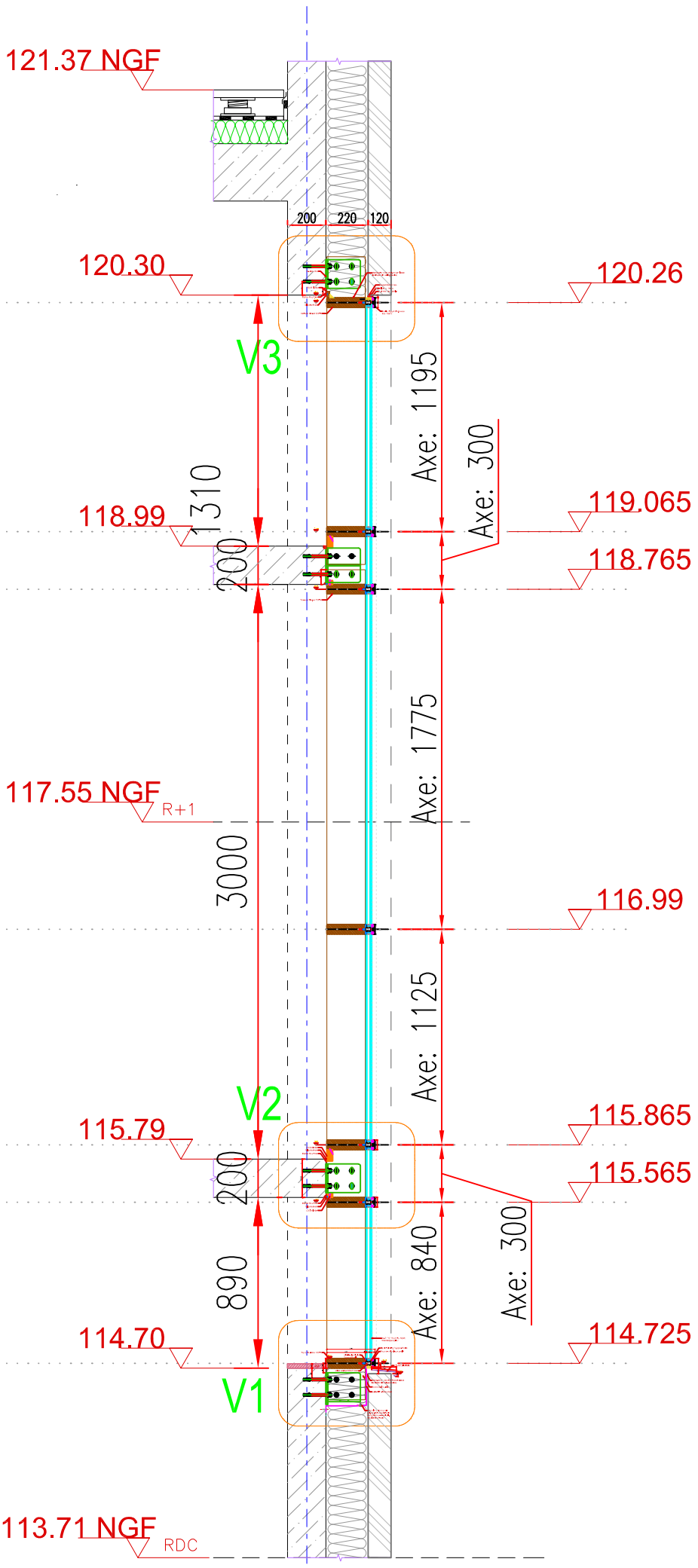
| Calculated results for detail tj2 thermal joint | |
|---|---|
| | **Frame Simulator Ug (thermal transmittance of glass)** |
| Ug | 1,1 W/m²K |

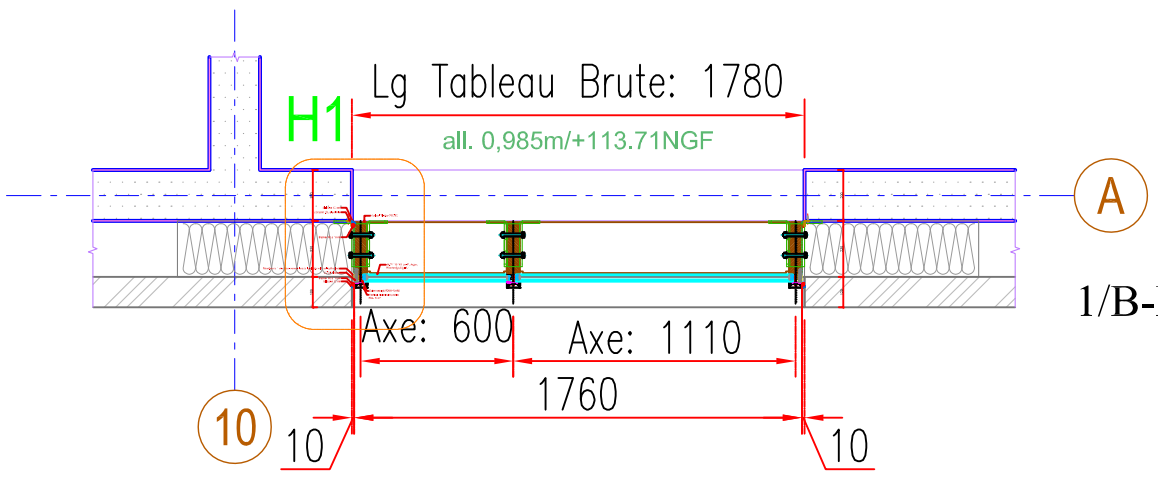
## 8. Ucw - VALUE ANALYSIS OF MODUL

| | | | |
|---|---|---|---|
| **Parameters of $tj_1$ detail** | **$U_{tj1}$ (W/m²K)** | **$A_{tj1}$ (m²)** | **$U_{tj1}$* $A_{tj1}$** |
| | 2,4352 | 0,08926 | 0,217365 |
| **Parameters of $tj_2$ detail** | **$U_{tj2}$ (W/m²K)** | **$A_{tj2}$ (m²)** | **$U_{tj2}$* $A_{tj2}$** |
| | 2,4805 | 0,0805 | 0,19968 |
| **Glass** | **$U_g$ (W/m²K)** | **$A_g$ (m²)** | **$U_g$* $A_g$** |
| | 1,1 | 1,35658 | 1,49224 |

| | |
|---|---|
| $U_{cw} \quad =$ | $\frac{\Sigma\,(A_g * U_g) + \Sigma\,(A_{tj} * U_{tj})}{\Sigma\,(A_g) + \Sigma\,(A_{tj})}$ |
| $U_{cw} \quad =$ | *1,25 (W/m²K)* |
| *Measurement uncertainty is not included in the test / calculation results and declarations of conformity.* | |

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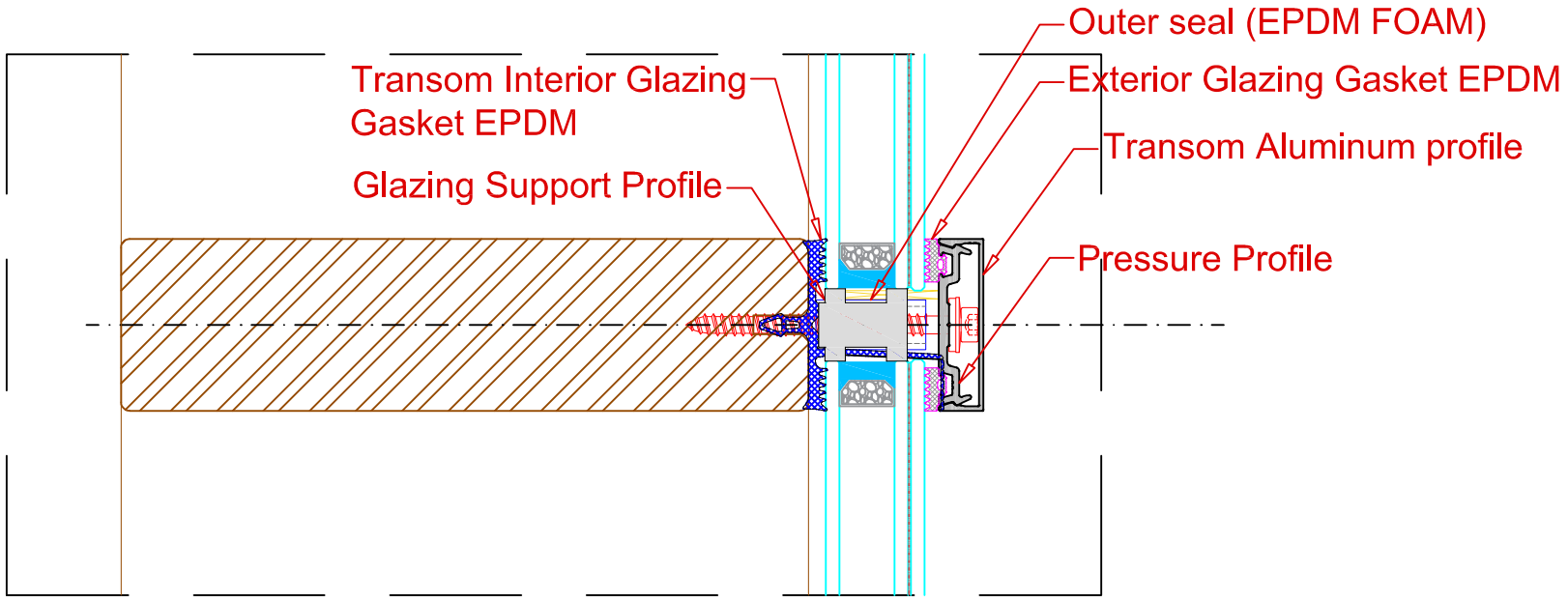


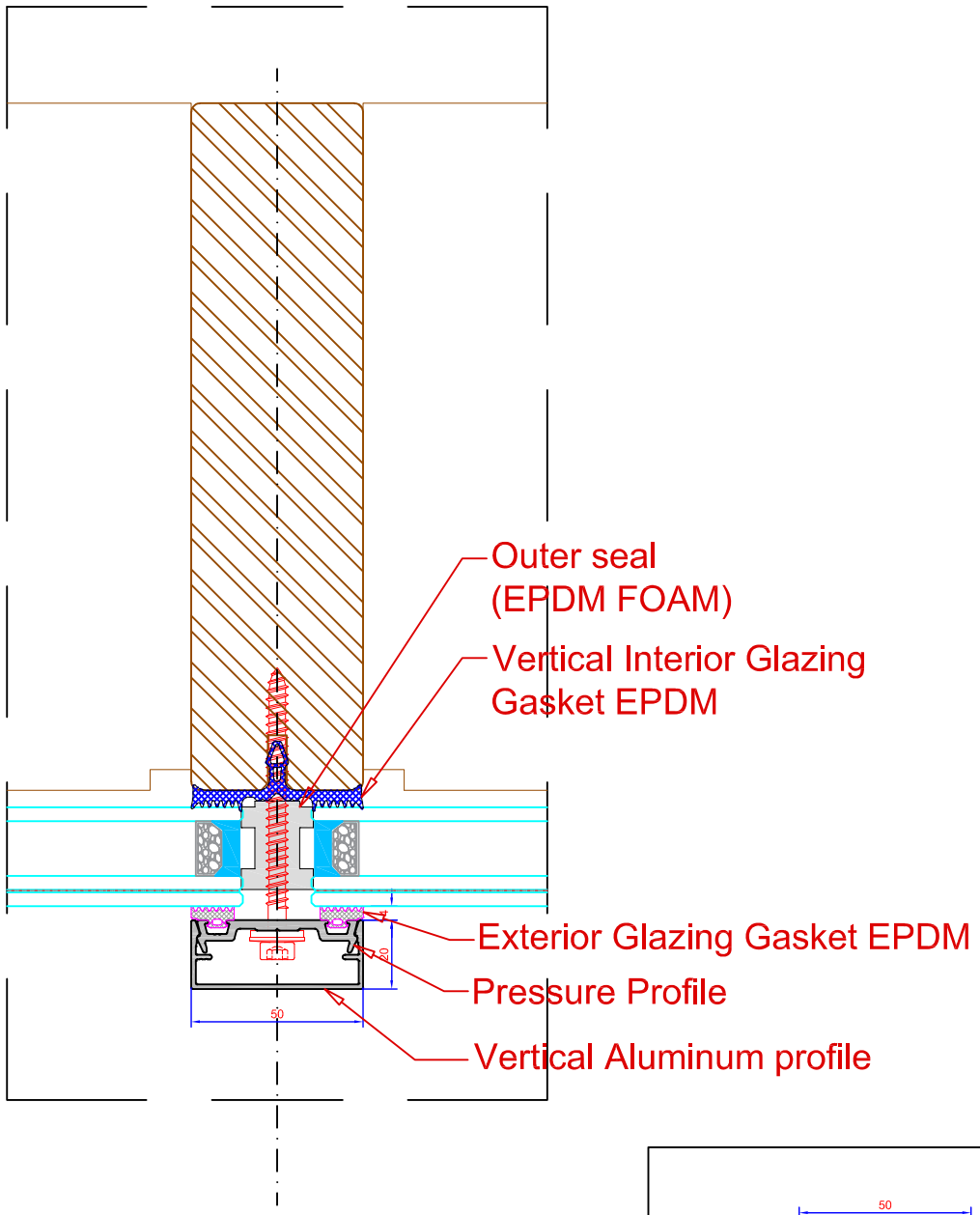




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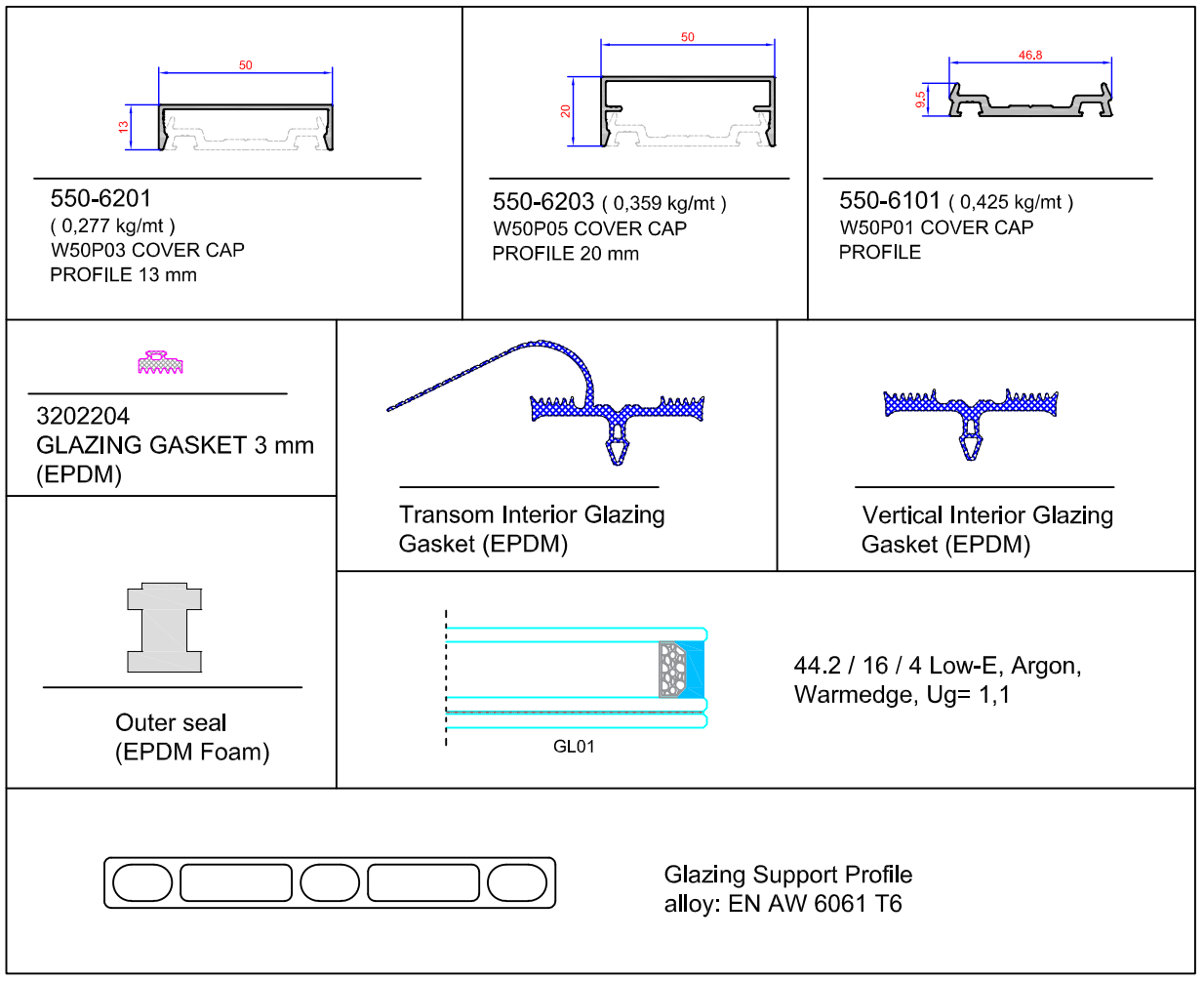
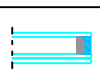



| Glasses | | |
|---|---|---|
| Preview | Code | Explanation |
|  | GL01 | 44.2 / 16 / 4 Low-E, Argon, Warmedge, Ug= 1,1 |