



CENTRUM STAVEBNÍHO INŽENÝRSTVÍ, a. s.
CENTRE OF BUILDING CONSTRUCTION ENGINEERING,
Joint Stock Company

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Door and window testing laboratory, heat and acoustical engineering No. 1007.1, accredited by the Czech Accreditation Institute, o.p.s



Test report No. 183/13

Determination of thermal transmittance
according to ČSN EN 12412-2

Order No.: 363 855

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Customer: **ADOPEN PLASTİK ve İNŞAAT SANAYİ A.Ş.**
Organize sanayi 2. Etap
07040 Antalya, TÜRKİYE

Manufacturer: See customer

Test subject: **The frames of composite tilt and turn window, 752 PENWOOD system**

Test result: **$U_t = 1,1 \text{ W/(m}^2 \cdot \text{K)}$**

Date of receiving specimens: 4.6.2013

Date of test performing: 5. 6. – 6. 6. 2013 a 10. 6. – 11. 6. 2013

Test performed by laboratory: Building thermal engineering

Laboratory head: Ing. Nizar Al-Hajjar

Head of test

laboratory No. 1007.1: Ing. Miroslav Figalla

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Datum: 25.6.2013

1. Test purpose

On the basis of the customer order and the order No. 363 855 the test laboratory of opening infillings, building thermal engineering and acoustics No. 1007.1 CSI Prague, a.s. (Center of Building Construction Engineering, Joint Stock Company) with the place of work in Zlin carried out for the customer ADOPEN PLASTIK ve İNŞAAT SANAYİ A.Ş., Organize sanayi 2. Etap, Antalya, Turkiye, the test of thermal transmittance of the frames of composite tilt and turn window, 752 PENWOOD system according to ČSN EN 12412-2.

2. Description of test subject

The test purpose is determination of the thermal transmittance U_f found by measurement according to ČSN EN 12 412-2, article 5.3.1 "Thermal performance of windows, doors and shutters - Determination of thermal transmittance by hot box method - Part 2: frames ". The measured value of thermal transmittance U_f is determined on the basis of following equation:

$$U_f = \frac{U_{m,t} A_t \Delta\theta_n - \Lambda_{fi} \Delta\theta_{s,fi} A_{fi}}{A_f \Delta\theta_n} \quad \text{W}/(\text{m}^2 \cdot \text{K})$$

where $U_{m,t}$ is the measured thermal transmittance of the infill insulation and the frame, in $\text{W}/(\text{m}^2 \cdot \text{K})$;

A_f the frame area; frame area is the larger of two projected areas seen from both sides, in m^2 ;

A_{fi} the remaining area of the infill insulation ($A_{fi} = A_t - A_f$), in m^2

A_t the projected metering area, in m^2 ;

$\Delta\theta_n$ the difference between the environmental temperature on each side of the test specimen under test, in K;

Λ_{fi} the thermal conductance of the infill insulation, in $\text{W}/(\text{m}^2 \cdot \text{K})$;

$\Delta\theta_{s,fi}$ the surface difference temperature of the infill insulation, in K.

3. 3. Description of testing products - Test specimen No. 178/13

Technical documentation: Test specimen cross section and profile photos - see annex No.1.

Description:

| | |
|----------------------------|---|
| Frame and sash | Frame - 77109-11000, composite material (PVC + wood); sash - 77109-15000, composite material (PVC + wood); manufacturer: ADOPEN |
| Other profile | Glazing bead 20101-07600 with coextruded sealing; manufacturer: ADOPEN |
| Infilling panel | Infilling sandwich panel with total thickness 32,8 mm and consists of: 1,5 mm PVC – 29,8 mm thermal insulation – 1,5 mm PVC |
| Sealing | inner – 34024 - 32021; outer gasket – 34024 - 31021; infilling panel outer gasket – 34024 - 31021; manufacturer: ADOPEN |
| Drainage and decompression | Drainage and decompression of the sash – 2 holes with (30 x 5) mm size, frame drainage – 3 intake holes with (30 x 5) mm size and 2 outlet holes with (30 x 5) mm size, decompression of the frame – 3 intake holes with (30 x 5) mm size |
| Hardware | All-Peripheral hardware – ROTO NT, 10-point closure, safety-catch, handle, manufacturer ROTO FRANK NT, Germany |

Two specimens of 500 mm x 500 mm size were prepared from the infill insulating panel after the thermal transmittance test of the window profiles. Thermal resistance test was performed on these specimens by means of guarded hot plate (P 50) Z 07 1001 and (P 51) Z 07 1003 according to ISO 8302. The average measured value of thermal resistance of the infill panel is: $R = 1,0368 \text{ m}^2 \cdot \text{K}/\text{W}$ for mean temperature $t_{sif} = 10,10 \text{ }^\circ\text{C}$.

The cross-section of the tested window - see annexes No. 1; The photos of installed specimen in the testing frame and the cut profiles - see annexes No. 2 and 3.

| | | |
|-------|------------------------|---------------------------|
| Size: | Window frame: | 1 230 mm x 1 480 mm |
| | Sash: | 1 165 mm x 1 415 mm |
| | Relative frame area: | 32,0 % of the window area |
| | Glazing: | 995 mm x 1 245 mm |
| | Relative glazing area: | 68,0 % of the window area |

Condition of samples upon receipt: without apparent deficiencies.

4. TESTING REGULATIONS USED AND TESTING EQUIPMENT

4.1 Regulations

| | |
|------------------|------------------|
| - ČSN EN 12412-2 | Testing standard |
| - ČSN 73 0540 | Related standard |

4.2 Used apparatus and equipment

| | |
|---|-----------|
| - Vertical chamber | Z 07 3008 |
| - guarded hot plate apparatus (P 51) | Z 07 1003 |
| - guarded hot plate apparatus (P 50) | Z 07 1001 |
| - Push-pulling rule | M 07 1104 |
| - Raking balance weighing machine up to 200kg | M 07 1020 |
| - Digital thickness gauge | M 07 1098 |
| - Digital depth gauge | M 07 1099 |
| - Electric thermometer | M 07 1034 |
| - ELMER, MPE4 type (electrometer) | M 07 1132 |

5. Deviations from testing methods and procedures

6. Description of used non-standardized method

7. Results of measurement

| | |
|---|---------|
| Average air temperature in the laboratory during the measurement: | 20,3 °C |
| Average relative humidity in the laboratory: | 42,0 % |

Table of measured values

| Measured quantity | Physical unit | Measurement results Test specimen No. 178/12 |
|---|-----------------------|---|
| Inside air temperature θ_{ni} | °C | 21,17 |
| Outer air temperature θ_{ne} | °C | 0,15 |
| Input power to hot box Φ_{in} | W | 39,377 |
| Surround panel heat flow Φ_{sur} | W | 1,765 |
| The heat flow rate through the edge zone Φ_{edg} | W | 1,981 |
| Test specimen heat flow Φ_f | W | 13,905 |
| Insulating panel Heat flow Φ_{fi} | W | 21,725 |
| Total surface thermal resistance $R_{s,t}$ | m ² .K/W | 0,159 |
| Thermal transmittance U_f | W/(m ² .K) | 1,137 |
| Time of measuring in stable state | hod | 8 |
| Projected test specimen area A_f | m ² | 0,5816 |
| Relative frame and sash area A_f / A_t | % | 32,0 |

Air speed on the cold side 1,8 m/s; air flow direction up along the specimen
 Air speed on the warm side 0,1-02 m/s; air flow direction up along the specimen
 Hot box area $A_{HB} = 2,465 \text{ m}^2$.

Thermal resistance of surround panel in m².K/W:

$$R_{sur} = (d_{sur} / \lambda_{sur}); \lambda_{sur} = 0,03179 + 0,00012 \theta_{me,sur}$$

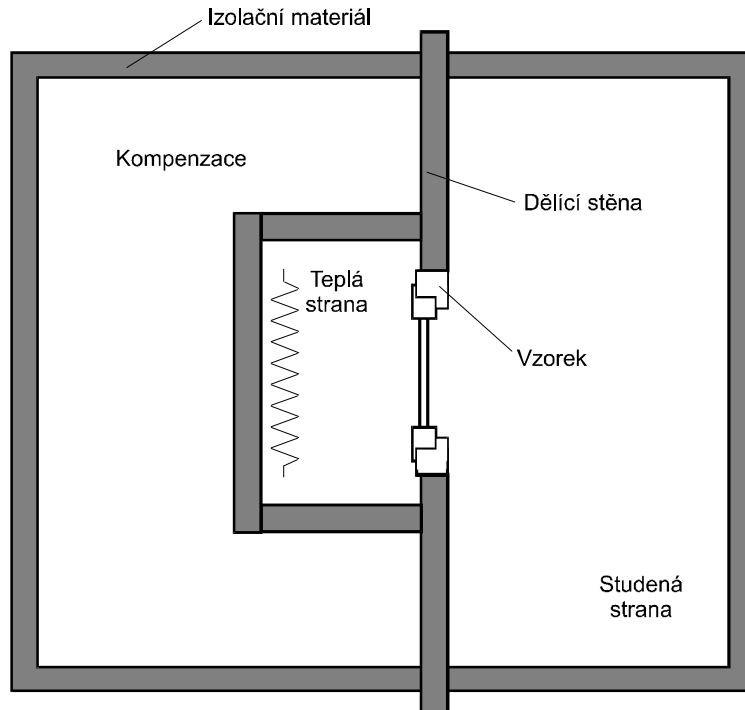
where λ_{sur} is thermal conductivity of testing surround panel in W/(m.K);

d_{sur} the thickness of testing surround panel, its value is 0,250 m;

$\theta_{me,sur}$ the mean temperature value of both surfaces of testing surround panel
in °C.

Linear thermal transmittance $\Psi_{edge} = 0,01739 \text{ W}/(\text{m}\cdot\text{K})$, frame installing depth in the surround panel $w = 70 \text{ mm}$.

The scheme of the testing equipment is in figure1.



Key: Kompenzace: Compensation; Dělicí stěna: Surround Panel; izolační materiál: Insulating material; Vzorek: Specimen; Teplá strana: Warm side; Studená strana: Cold side

figure1 - Testing equipment scheme

8. Evaluation

| Serial No. | Parameter title | Technical regulation Requirement | Testing method | Test specimen No. | Test result Requirement conformity |
|------------|---|---|----------------|-------------------|------------------------------------|
| 1. | Thermal transmittance U_f [W/(m ² .K)] | ČSN 73 0540 Part 2 Recommended thermal transmittance $U_{rec,20} \leq 1,3$ | ČSN EN 12412-2 | 178/13 | 1,1 Conformity |

The conformity test result evaluation with the requirement is given in accordance with the document ILAC – G8:2009: "Instructions for conformity interpretation with the specification"

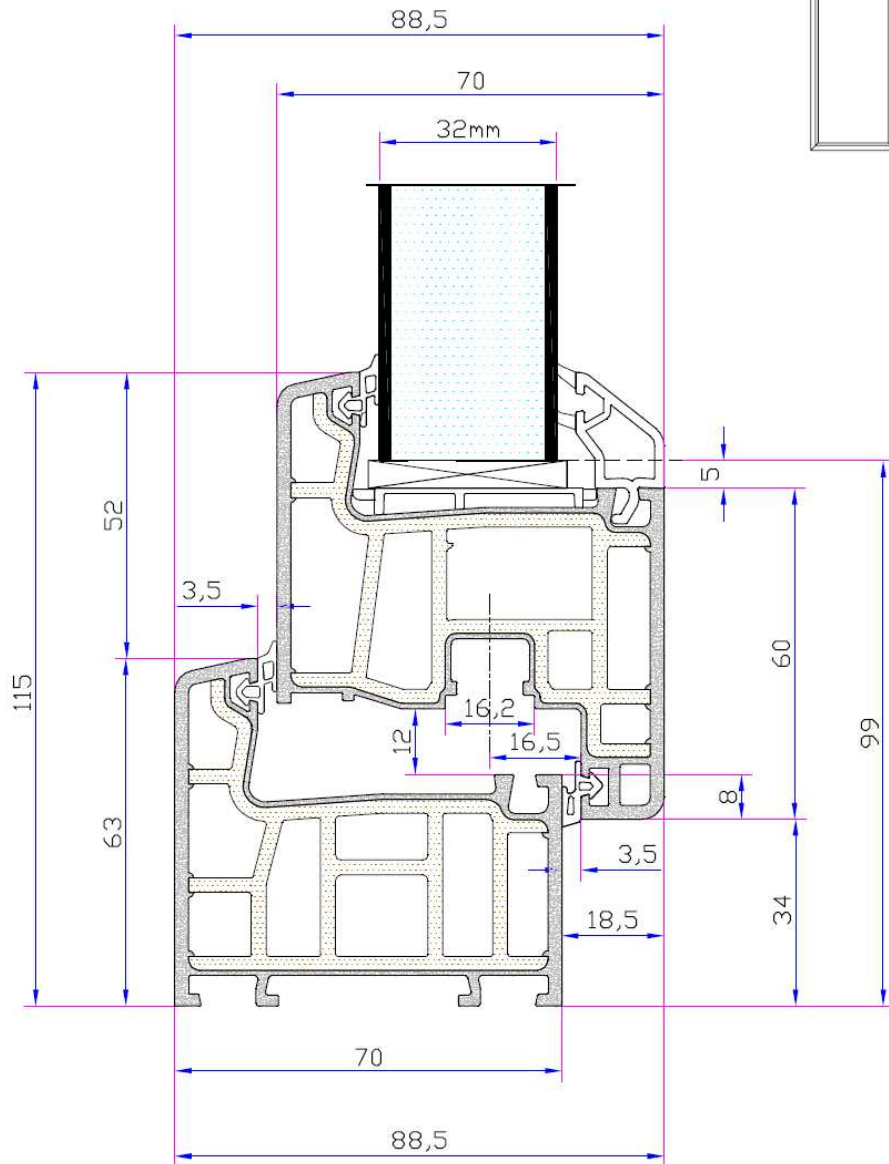
The extended measurement uncertainty of thermal transmittance is $U_U = \pm 3,0 \%$.

Responsible for the test:
Report elaborated by:

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Ing. Nizar Al-Hajjar

Annex No. 1

SYSTEM OF PENWOOD (W 750)



Profiles System " 12 / 20 - 13 "



SCALE :
1 \ 1

750 PENWOOD SYSTEM

WINTECH

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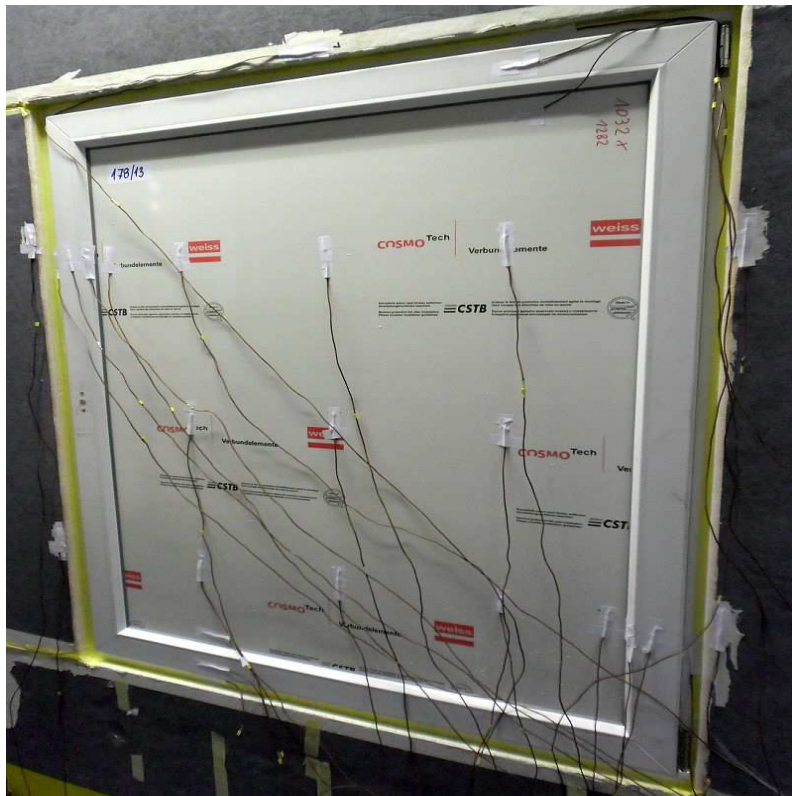
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Annex No. 2

Cold side



Warm side



Annex No. 3

