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Testing laboratory of physical properties of materials, structures and buildings – Zlín
Testing laboratory No. 1007.1, accredited by the CAI according to ČSN EN ISO/IEC 17025:2018



Test report No. 238/21

Determination of thermal transmittance
according to ČSN EN 12412-2

Order No.: **415600148**

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Client: **SIA "Baltic Fenster"**
Ilūkstes iela 32-43
LV-1082 Rīga, Latvia

VAT: **LV40003799656**

Manufacturer: **see client**

Test subject:	The frame profiles of Plafen T-line TL system PVC Tilt and Turn window with insulating panel – Combination of TL70/64_TZ70/77
Test result:	$U_f = 1,3 \text{ W/(m}^2\cdot\text{K)}$

Date of receiving specimens: 3. 6. 2021
Date of test performing: 8. 6. – 9. 6. 2021 and 14. 6. – 15. 6. 2021
Test performed by: Building thermal engineering laboratory
Technical Laboratory head: Ing. Nizar Al-Hajjar
Head of test
laboratory No. 1007.1: Ing. Petra Hrdinová

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1. Test purpose

On the basis of the the order dated on 28. 5. 2021 and the contract No. 415600148, Testing laboratory of physical properties of materials, structures and buildings – Zlín, Testing laboratory No. 1007.1, ITC a.s., division CSI, workplace in Zlín, carried out for the client SIA "Baltic Fenster", Ilūkstes iela 32-43, LV-1082 Rīga, Latvia, thermal transmittance test of the frame profiles of Plafen T-line system PVC Tilt and Turn window with insulating infill panel – combination of TL70/64_TZ70/77 according to ČSN EN ISO 12412-2. The tests were carried out in the corresponding spaces of the testing laboratory, address: K Cihelně 304, 764 32 Zlín – Louky, Czech republic.

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:

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

where $U_{m,t}$ is the measured thermal transmittance of the infill insulation and the frame, in W/(m²·K);

A_f the frame area; frame area is the larger of two projected areas seen from both sides, in m²;

A_{fi} the remaining area of the infill insulation ($A_{fi} = A_t - A_f$), in m²

A_t the projected metering area, in m²;

$\Delta\theta_n$ 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 W/(m²·K);

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

3. Description of testing products – Specimen No. 091/21

Frame and sash	Frame TL 70/64 / frame reinforcement ME 60 L/Z, 1,4 mm thick; sash TZ 70/77 / sash reinforcement ME 60 L/Z, 1,4 mm thick; manufacturer of main profiles: "PLAFEN" LTD., UL. SADOVAYA, D. 7 DZERJINSKII, RUSSIA
Other profiles	glazing bead TG 24 with double coextruded sealing
Insulating panel	Sandwich panel 23,9 mm thick: 0,8 mm PVC – 22,3 mm thermal insulation of XPS foam – 0,8 mm PVC
Sealing	Inner and outer gasket: made of Thermoelastoplast TEP materiál, inserted in the groove, bent in the corners; outer glazing gasket: inserted in the groove, bent in the corners
Drainage and decompression	Drainage of the sash: inlet 4 holes ø8 mm, outlet 4 holes ø6 mm; decompression of the sash: not performed; frame drainage: inlet 4 holes ø8 mm and outlet 2 holes of ø10 mm; decompression of the frame: not performed
Hardware	All-Peripheral Hardware Vorne, 9 point closure, 2 tilt and turn hinges, controlling by handle

Note The testing laboratory is not responsible for the accuracy of the technical data, specifications and the test specimen information supplied by the customer. The technical specifications and drawing documentation supplied by the customer are given in the annexes No. 1 and no. 2. A photo of the cut profile from the test specimen – see annex No. 2.

One specimen of 800 mm x 800 mm size was prepared from infill insulating panel after profile thermal transmittance test. Thermal resistance test was performed on this specimen by means of guarded hot plate (P 80) Z 07 3010 according to ISO 8302. The average measured value of thermal resistance of the infill panel is: $R = 0,6397 \text{ m}^2 \cdot \text{K/W}$ for mean temperature $t_{\text{str}} = 10,21 \text{ }^\circ\text{C}$.

Size: Window frame: 1 230 mm x 1 480 mm
 Sash: 1 160 mm x 1 410 mm
 Infill: 1 000 mm x 1 260 mm

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

- P 80 Measurement assembly – Temperature, electric current

M 07 1083

- Push-pulling rule

M 07 1104

- Raking balance weighing machine up to 200kg

M 07 1020

- Digital thickness gauge

M 07 1148

- Digital depth gauge

M 07 1145

- Electric thermometer

M 07 1034

- ELMER, MPE4 type (electrometer)

M 07 1142

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: 22,0 °C

Average relative humidity in the laboratory: 51,0 %

Table of measured values

Measured quantity	Physical unit	Measurement results	
		Specimen No.	
		091/21	
Inside air temperature θ_{ni}	°C	20,78	
Outer air temperature θ_{ne}	°C	-0,20	
Input power to hot box Φ_{in}	W	51,949	
Surround panel heat flow Φ_{sur}	W	1,734	
The heat flow rate through the edge zone Φ_{edge}	W	1,975	
Test specimen heat flow Φ_f	W	15,572	
Thermal insulation infill heat flow Φ_{fi}	$\text{m}^2 \cdot \text{K/W}$	32,667	
Total surface thermal resistance $R_{s,t}$	$\text{W}/(\text{m}^2 \cdot \text{K})$	0,157	
Thermal transmittance of the frames U_f	$\text{W}/(\text{m}^2 \cdot \text{K})$	1,325	
Time of measuring in stable state	hod	8	
Design test specimen area A_f	m^2	0,5604	
Relative frame and sash area (inner/outer) A_f / A_t	%	30,8 / 30,8	

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

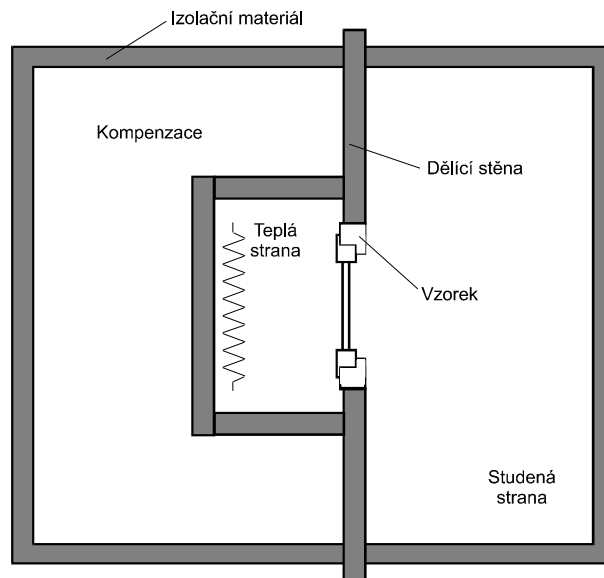
Hot box area $A_{HB} = 2,465 \text{ m}^2$.

Thermal resistance of surround panel in $\text{m}^2 \cdot \text{K/W}$:

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

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;
 $\theta_{\text{me,sur}}$ the mean temperature value of both surfaces of testing surround panel in °C.
 Linear thermal transmittance $\Psi_{\text{edge}} = 0,01737$ W/(m·K); the frame thickness $w = 70$ 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 $U_{\text{rec},20} = 1,3$ W/(m ² ·K)	ČSN EN 12412-2	091/21	1,3 Conformity

The conformity assessment of the test result with requirement is performed according to the decision rule in accordance with ILAC - G8: 09/2009 "Guidelines on Decision Rules and Statements of Conformity".

The extended measurement uncertainty of thermal transmittance $u_U = 4,0$ %.

Responsible for the test and report elaborated by:

Bc. Michal Huňa

Annex No. 1**Technical specification*****Specification of test product - plastic window or door*****1. Drawing test product:**

- Front view includes dimensions of the frame and sash (fixed /visible/ glazed parts), schematic illustration of the location of hardware components and way of opening
- Specimen cross-section (vertical: lower frame including seals and glazing), (horizontal for architraves); (horizontal and vertical: door with a threshold); main dimensions and identifications of the used profiles, drainage design and compression in the frame and sash (dimensions, location and number of holes)

2 Manufacturer / Construction (window, door, casement door):

Plafen LTD, Russia -

3 Title (type) of the window and door system:

Polyvinyl chloride frost-resistant profiles of the Plafen trademark of the T-line system

4 Specification of the components and their factories; state the materials and manufacturer's marking

- Main profiles factory:	Frame specimen size B x H: 1.270x1.430	Sash: size b x h: 1.430x0.640	clapper + architrave, the way of sealing to the sash (sealant, profile):
- Reinforcement, thickness factory:	Reinforcement ME 60 L/Z 25x32x25 – 1,4 mm	Reinforcement ME 60 L/Z 25x32x25 – 1,4 mm	
- Other profiles factory:	mullion a transom, glazing bar, threshold profiles, sash drainage		
- Sealing factory:	Inner + performing in the corners* Production of Obninskpoliplast LLC. Seal material Thermoelastoplast TEP welded seals	Central + performing in the corners* Production of Obninskpoliplast LLC. Seal material Thermoelastoplast TEP welded seals	
	outer+ performing in the corners* Production of Obninskpoliplast LLC. Seal material Thermoelastoplast TEP welded seals	threshold	
- Sealing factory:	of the glazing: outer+ performing in the corners* welded seals	Glazing bead a sealing profile + performing in the corners*	
Glazing unit/Insulating infill panel factory:	Type, marking and composition of IGU including the coating and spacer type or infilling panel Sandwich panel 24 mm thick and composition: 1,2 mm PVC – 21,6 mm thermal insulation XPS – 1,2 mm PVC		

5 Drainage performing and compression in the frame and sash (for example: 3 holes (5x30)mm down into profile, 2 holes /openings/ (5x28)mm with formed cover; 2 upper holes; interrupting of the outer profile sealing in the length always (50) mm, ...

Sash drainage: inlet 2 holes on the left and right sides diameter 6 mm, outlet 2 holes diameter 6 mm, sash decompression: not performed; frame drainage: inlet 2 holes on the left and right sides diameter 6 mm and outlet 2 holes diameter 6 mm

6 Hardware (marking of the type and manufacturer):

Vorne, Turkey

Closures (right, left sash, others): number of point closures, way of controlling, supporting thrusts, special points
Sash on the right side, one

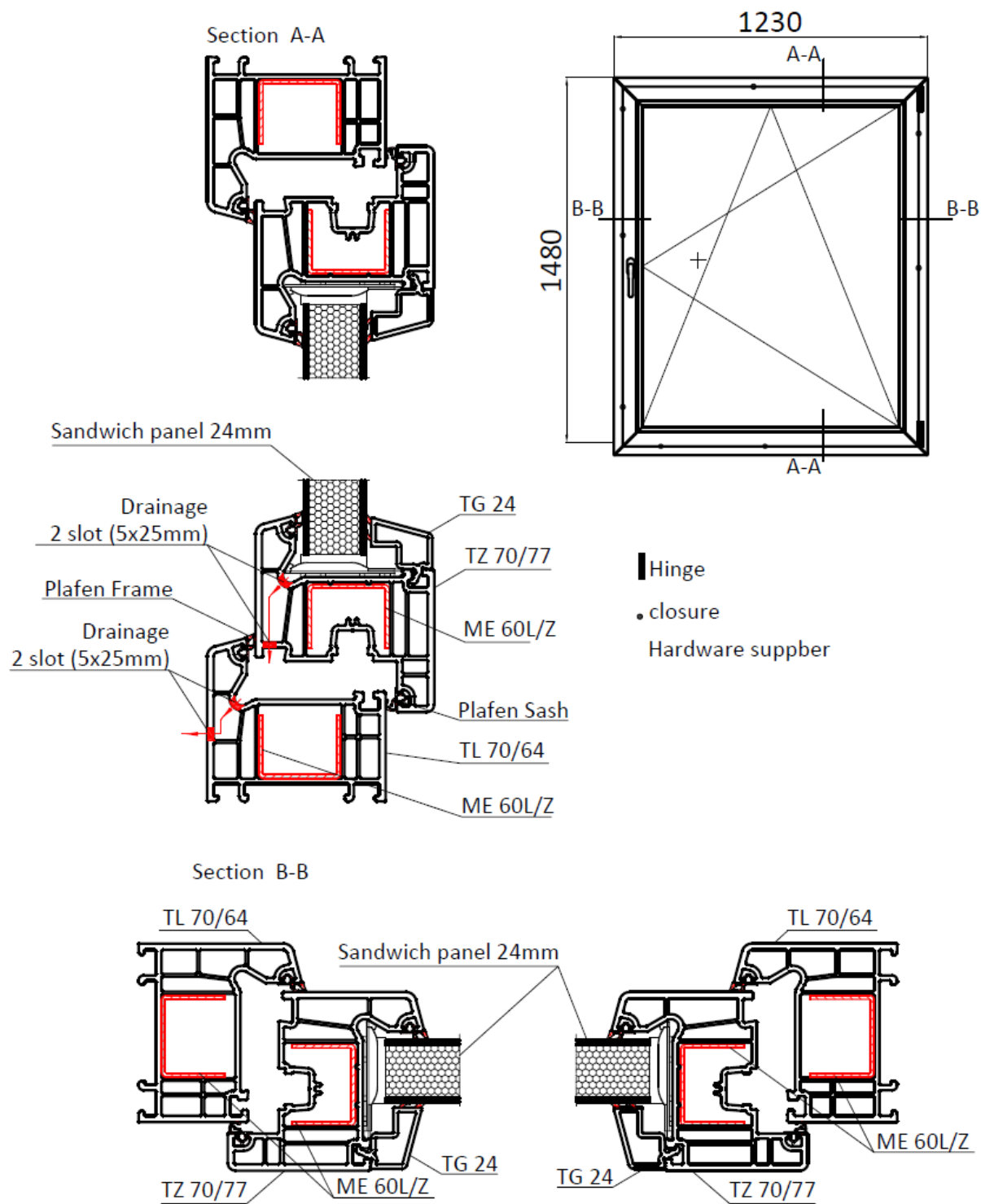
Hinges (right, left sash, others): type (hung-casement, tilt and turn)
Right-hand swing-out

7 Note: (surface treatment, sealants used in the sealing, glazing, bed stabilization)**8 Production date:**

* Performing in the corners: continuous bent, cut out, cut, cut and glued in the corners, welded, bent, and others

The scheme and the cross section of the test specimen

TEST SAMPLE (T-Line TL70/64_TZ70/77)

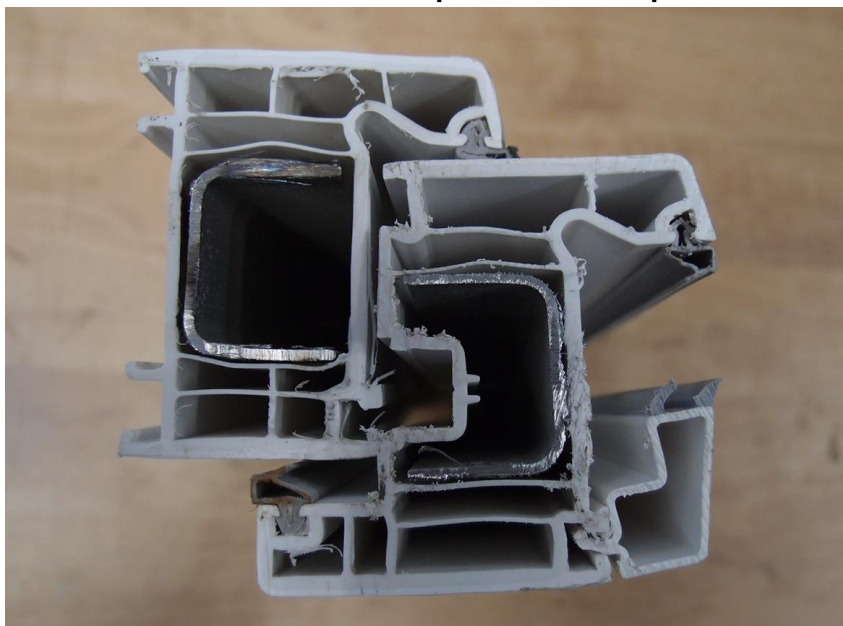


Annex No. 2

The photos of the specimen mounted in the testing frame (surround panel)
warm side cold side



Photo of the cut test specimen frame profiles



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