CENTRUM STAVEBNÍHO INŽENÝRSTVÍ, a. s.
CENTRE OF BUILDING CONSTRUCTION ENGINEERING,
Joint Stock Company
Workplace Zlín, K Cihelně 304, 764 32 Zlín - Louky

L 1007.1

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

Test report
No. 016/14
Determination of thermal transmittance according to ČSN EN 12412-2

Order No.: **463 328**

Number of pages including the annexes: **6**
Number of copies: **3**
Copy No.: **2**

Customer: **GEALAN Fenster-Systeme GmbH**
Hofer Strasse 80
95145 Oberkotzau, Deutschland

Manufacturer: **See customer**

Test subject:	**The frame profiles of GEALAN S 9000 PVC Tilt and Turn window with central sealing and without central sealing**
Test result:	**U_f = 0,89 W/(m^2.K) – with central sealing;** **U_f = 0,97 W/(m^2.K) – without central sealing**

Date of receiving specimens: 15. 1. 2014

Date of test performing: 20. 1. – 23. 1. 2014

Test performed by: Building thermal engineering laboratory
Laboratory head: Ing. Nizar Al-Hajjar

Head of test laboratory No. 1007.1: Ing. Miroslav Figalla

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CENTRUM STAVEBNÍHO INŽENÝRSTVÍ, a.s. pracoviště ZLÍN
Laboratoř otvorových výplní, stavební tepelné technika a akustiky č.1007.1
AKREDITOVANÁ národním akreditačním orgánem

30. 1. 2014

1. Test purpose

On the basis of the customer order and the order No. 463 328the 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 GEALAN Fenster-Systeme GmbH, Hofer Strasse 80, 95145 Oberkotzau, Deutschland, thermal transmittance test of the frame profiles of GEALAN S 9000 system, PVC Tilt and Turn window with with insulating infill panel with central sealing and without central sealing according to ČSN EN ISO 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:

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

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

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 $W/(m^2 \cdot K)$;

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

3. Description of testing products

–Test specimen 6015-6003 No. 014/14: Window frames without central sealing

–Test specimen 6016-6003 No. 015/14: Window frames with central sealing

Frame and sash	Frame 6015A0Q (6016A0Q) with integrated foam; frame reinforcement 6716 51, sash 6003 00Q; reinforcement 6706 51; manufacturer and supplier of main PVC and reinforcement profiles GEALAN, Germany
Other profiles	glazing bead 613600 with extruded gasket
Insulating panel	Sandwich panel 36,0 mm thick: 1,5 mm PVC – 33,0 mm hard foam - 1,5 mm PVC
Sealing	outer gasket 3167 92; central sealing 6101 90S; inner gasket 8167 90; glazing gasket 3167 92; manufacturer of main sealing profiles GEALAN, Germany
Hardware	All-Peripheral Hardware Sigenia Favorit SI Line, 6 point closure, safety-catch, 2 tilt and turn hinges, handle

Two specimens of 500 mm x 500 mm size were prepared from infill insulating panel after profile thermal transmittance test. 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 = 0,965 $m^2.K/W$ for mean temperature t_{str} = 9,5 °C.

Test specimen cross section – see annex No. 1 and the photos of the cut profiles - see annex No.2.

Size:	Window frame:	1 230 mm x 1 480 mm
	Sash:	1 130 mm x 1 380 mm
	Infill:	970 mm x 1 220 mm

Condition of samples upon receipt: without apparent deficiencies.

4. TESTING REGULATIONS USED AND TESTING EQUIPMENT

4.1 Regulations

- ČSN EN 412-2	Testing standard
- ČSN 73 0540	Related standard

4.2 Used apparatus and equipment

- Vertical chamber	Z 07 3008
– Plate apparatus P 80	Z 07 3010
- 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

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6. Description of used non-standardized method

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7. Results of measurement

Average air temperature in the laboratory during the measurement: 20,2 °C
Average relative humidity in the laboratory: 43 %

Table of measured values

Measured quantity		Physical unit	Measurement results Test specimen No.	
			014/14	015/14
Inside air temperature	θ_{ni}	°C	19,61	19,92
Outer air temperature	θ_{ne}	°C	0,38	0,17
Input power to hot box	Φ_{in}	W	34,881	34,596
Surround panel heat flow	Φ_{sur}	W	1,612	1,656
The heat flow rate through the edge zone	Φ_{edg}	W	1,252	1,286
Test specimen heat flow	Φ_{sp}	W	11,842	11,252
Total surface thermal resistance	$R_{s,t}$	$m^2 \cdot K/W$	20,174	20,402
Measured thermal transmittance	U_m	$[W/(m^2.K)]$	0,155	0,171
Standardized thermal transmittance	U_{st}	$[W/(m^2.K)]$	0,967	0,894
Time of measuring in stable state		hod	8	
Design test specimen area	A_{sp}	m^2	0,6370	
Relative frame and sash area	A_f / A_{sp}	%	35,0	

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 $A_{HB} = 2,465\ m^2$.

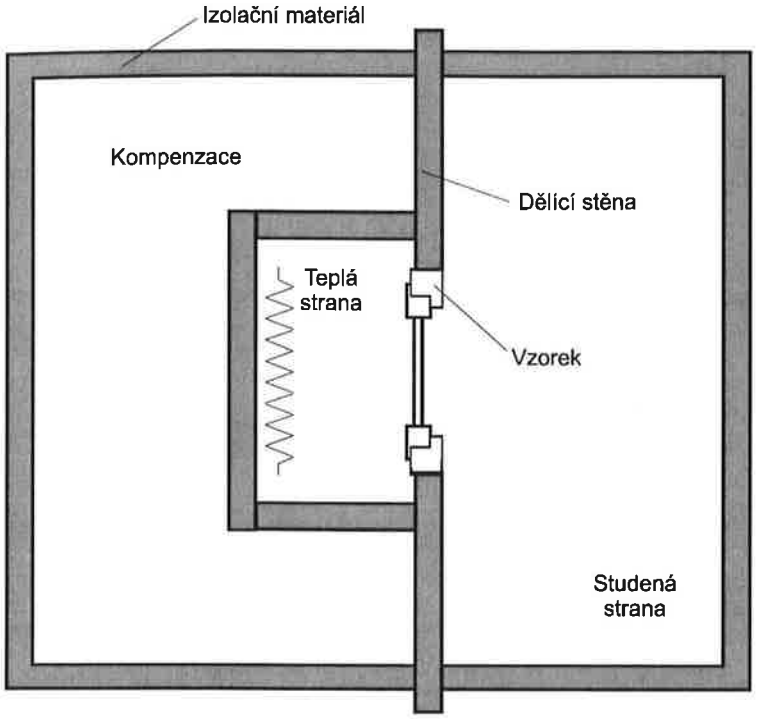
Thermal resistance of surround panel in $m^2 \cdot K/W$:

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

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 $\Psi_{edge} = 0,01202$ W/(m·K); the frame thickness $w = 82$ 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

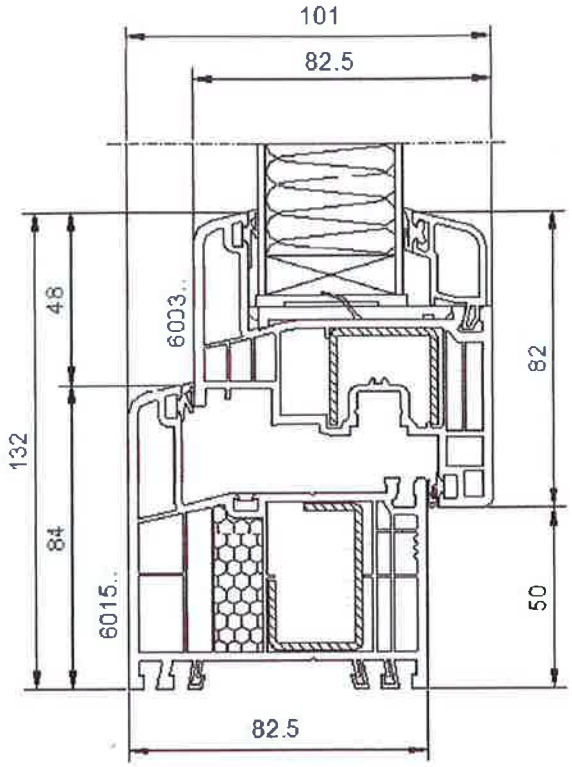
Serial No.	Parameter title	Technical regulation Requirement	Testing method	Test specimen No.	Test result Requirement conformity
1.	Thermal transmittance U_f [W/(m^2.K)]	ČSN 73 0540 - Part 2; recommended thermal transmittance $U_{rec,20}$ = 1,3 W/(m^2.K)	ČSN EN 12412-2	014/14	0,97 Conformity
		recommended thermal transmittance for passive buildings $U_{pas,20}$ = (0,90 – 0,70) W/(m^2.K)		015/14	0,89 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 u_U = ± 3,0 %.

Responsible for the test: Petr Pokorný
Report elaborated by: Ing. Nizar Al-Hajjar

Annex No. 1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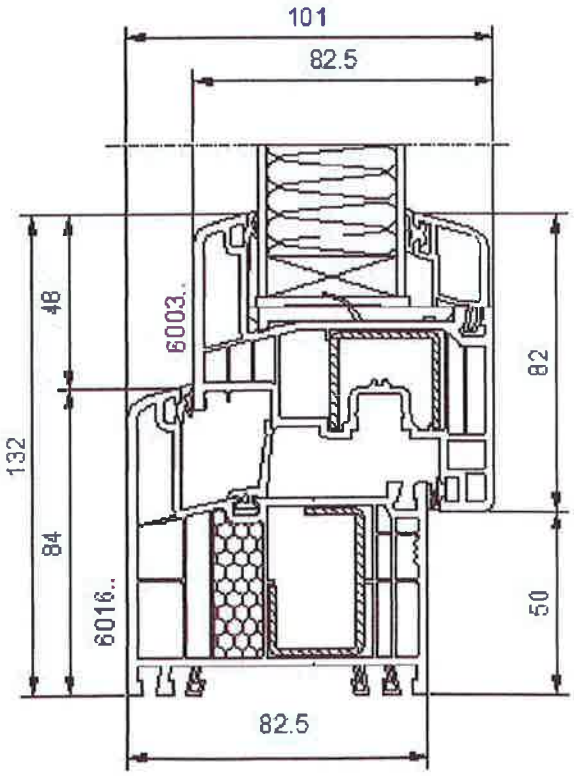
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