Committee Draft ISO/CD 12567-2 : 2000-05-22 **N121Rev**

ISO/TC 163/SC 1 **Secretariat: DIN**

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION · . ORGANISATION INTERNATIONALE DE NORMALISATION

Thermal performance of roof windows and other projecting windows – Determination of thermal transmittance by hot box method

Isolation thermique des fenêtres de toit – Détermination de la transmission thermique par la méthode à la boîte chaude

ICS

Descriptors: Thermal insulation, roof window, test, thermal transmittance, hot box method

ISO CD 12567-2 : 2000-05-22

Contents

Annexes

Foreword

The Committee Draft was prepared by Technical Committee ISO/TC 163, Thermal insulation..

Annexes A and B are normative; annex C and D are for information.

Introduction

The method in this standard is based on ISO/CD 12567. It is designed to provide both standardised tests, which enable product comparison of different products to be made, and specific tests on products for practical application purposes. The former specifies standardised specimen sizes and applied test criteria.

Although it is recognised that the thermal performance of products will vary with heat flow direction, there are at present no agreed measurement procedures that can be used for non-horizontal heat flow through the sample. Furthermore, there are only a few hot boxes that are capable of carrying out such measurements. For these reasons, this measurement procedure is specified with the roof window mounted vertically to facilitate the fair comparison of products.

DRAFT INTERNATIONAL STANDARD ISO/DIS 12567ADDENDUM:1998(E)

Thermal performance of roof windows and other projecting windows – Determination of thermal transmittance by hot box method

1 Scope

This standard specifies a method to measure the thermal transmittance of a roof window and other projecting window systems.

Roof windows can be installed at different angles but for product comparison, they shall be measured in a vertical position.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provosions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 7345, *Thermal insulation – Physical quantities and definitions*

ISO/FDIS 12567, *Thermal performance of windows and doors – Determination of thermal transmittance by hot box method*

3 Definitions

For the purpose of this standard, the definitions given in ISO 7345, ISO/FDIS 12567 and [1] apply, (see annex D).

3.1 Roof windows

Roof windows have the same properties and are used for the same purposes as vertical windows apart from the fact that they are installed in a roof instead of the wall (terminology see prEN 12519).

In this standard the term roof windows covers all fenestration products installed in the roof e.g. skylights, roof lights etc.

3.2 Projecting windows

Projecting windows have the same properties and are used for the same purposes as vertical windows apart from the fact that the outdoor glass layer projects beyond the outside wall surface.

4 Principle

This standard specifies a measurement procedure for roof and other projecting windows mounted vertically in the aperture of the surround panel. The measurement shall be carried out in accordance with the procedure specified in ISO/FDIS 12567 except for the deviations specified below.

For projecting products, where the ratio of the total heat exchange area to projected area ≤ 1.25 (considering the cold side), the procedure laid down in the main standard, ISO/FDIS 12567 has to be used.

5 Apparatus

5.1 Specimen requirements and location

The window system shall be mounted in the surround panel aperture according to the manufacturer's published instructions. If the method of installation in the hot box can not be unambigously determined from the manufacturer's installation instructions, the window shall be installed as shown in figure 1.

Flashings and/or kerb(curb) shall be included as the windows are normally installed (see Figure 1).

5.2 Calibration panels

The calibration panels shall be mounted in the surround panel aperture flush with the cold face as shown in Figure 2.

5.3 Baffle position

The distance between the baffle on the cold face and the plane of the test specimen should not be less than 100 mm, see Figure 3.

6 Procedure

6.1 General

The measurement shall be carried out under the conditions specified in ISO/FDIS 12567 except for the deviations indicated in 6.2 to 6.4.

6.2 Calibration measurements

The notation for determination of the environmental temperature for roof windows according to the procedure in ISO/FDIS 12567 is given in Figure A1.

For the determination of Φ_{edge}, the heat flow rate through the edge zone between calibration panel and surround panel [equation (10)], values for Ψ_{edge}, the linear thermal transmittance of the edge zone, are given in Table B1.

6.3 Specimen measurements

After installation of the test specimen the air velocity on the cold side shall be adjusted to give the same air velocity (with in ±10%) as found with the calibration panel, when setting the total surface thermal resistance, $R_{\text{s,t}}$.

For the determination of Φ_{edge}, the heat flow rate through the edge zone between specimen and surround panel [equation (10)] values for the linear thermal transmittance of the edge zone, Ψ_{edge}, are given in Table B2 (insert mounting) and B3 (kerb mounting).

6.4 Expression of results

The result is expressed as given in clause 6.3 ISO/FDIS 12567. For projecting products, where the ratio of the total heat exchange area to projected area > 1.25 (considering the cold side) no correction will be made for the effect of the density of heat flow rate, q on the total surface resistance $R_{\text{s,t}}$ as specified in clause 6.4.

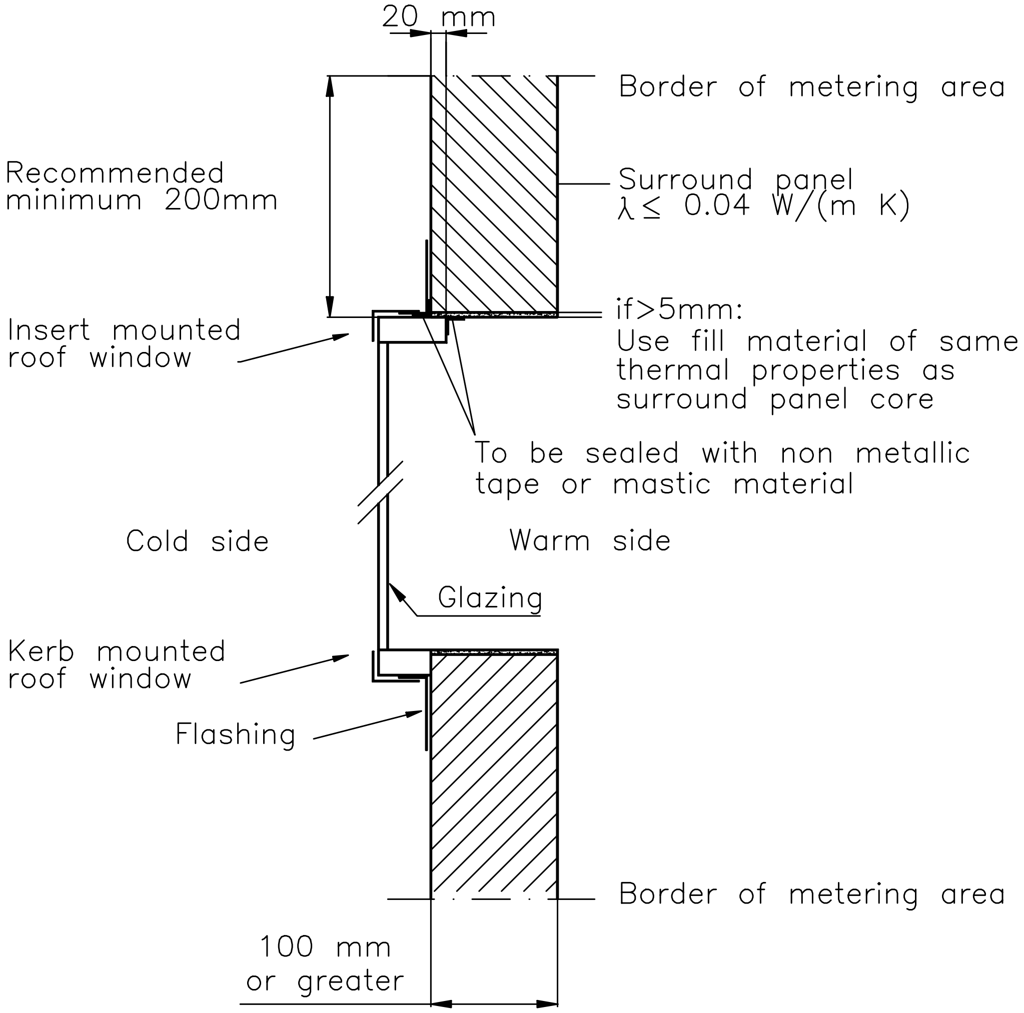
An example of a calibration measurement and roof window test is given in annex C.

7 Test report

The test report shall contain the information specified in ISO/FDIS 12567 and the following shall be stated:

- a) details of how the specimen was installed in the surround panel.
- b) a copy of the manufacturer's published installation instructions.

Dimensions in millimeters

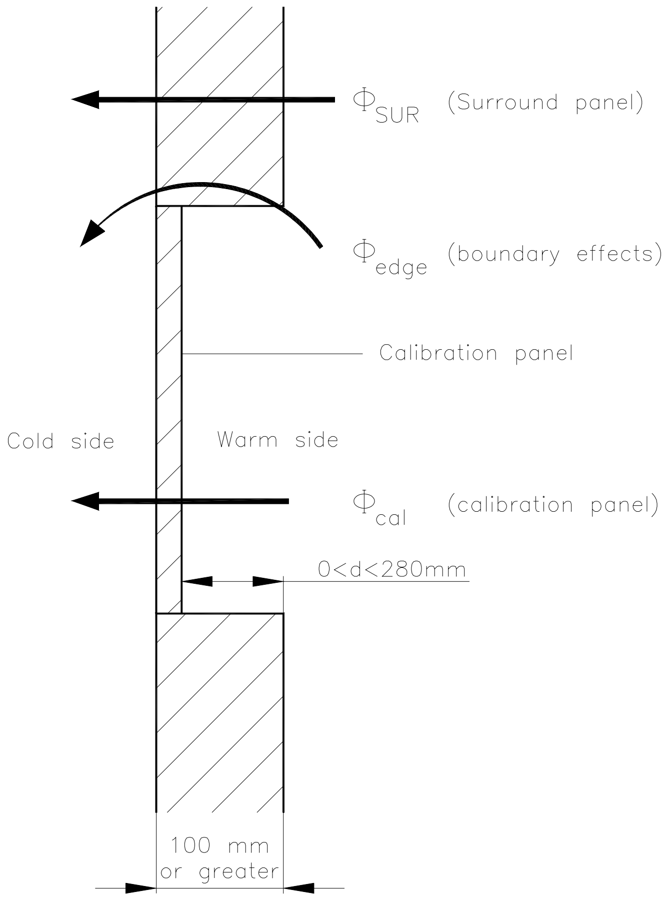


1- border metering area
2- surround panel
3- fill material of same properties as surround panel core
4- sealing with non-metallic tape or mastic material
5- warm side
6- glazing
7- border of metering area
8- kerb mounted roof window
9- cold side
10- insert mounted window

Figure 1 - Roof window system (insert mounted/kerb mounted) in surround panel

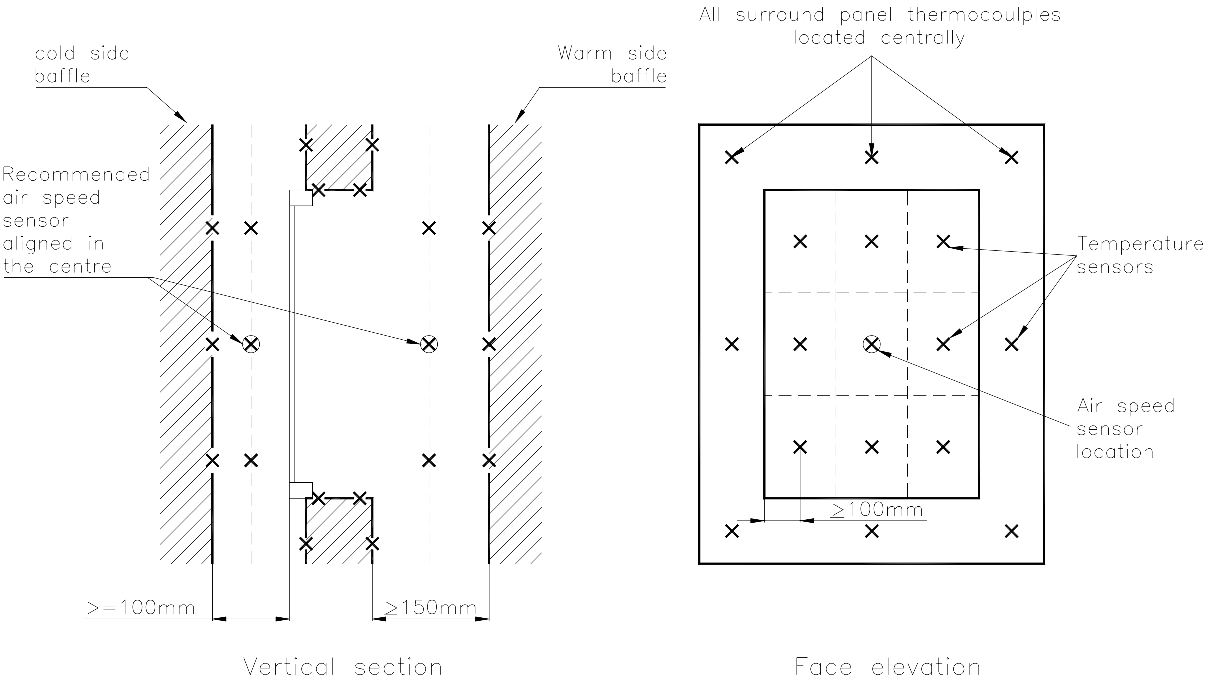
Replaceable piece of surround panel for mounting of the test specimen can be used. On the cold side a hard covering on the surround panel is allowed for mounting up till 50 mm from the edge of the surround panel.

Dimensions in millimeters



1- surround panel
2- boundary effect
3- warm side
4- calibration panel
5- cold side

Figure 2 – Mounting of calibration panel in aperture



1. warm side baffle
2. recommended air speed sensor aligned in the centre
3. cold side baffle
4. all surround panel thermocouples located centrally
5. temperature sensors
6. air speed sensor location

Figure 3 Location of temperature and air speed sensors

Reference in the following is given to ISO/FDIS 12567. If the dimensions of the metering box are such that its perimeter contacts lie closer to the aperture edges than 200 mm, then it is inpropriate to measure the warm surface temperatures of the surround panel. In this instance, it is permissible to use warm side average air temperatures as replacement for surround panel average warm surface temperature to determine $\Delta \theta_{s,sur}$ in the calibrations in 6.2.3 [equation (8)]. If this is done, then the same procedure should be adopted to correct for the surround panel influences in the subsequent measurements [see 6.3, equation (12)].

Annex A
(normative)

Environmental temperature

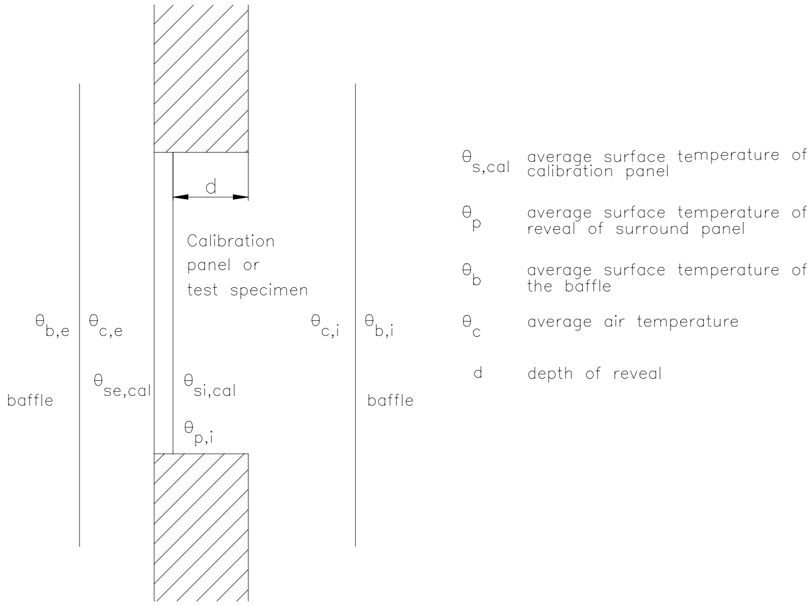


Figure A1 – Notation used for environmental temperature in relation to the calibration panel

A.1 Calibration panel

The mean radiant temperature on both sides of the calibration panel is calculated according to annex A of the main document ISO/FDIS 12567.

A.2 Window specimen

Measure the temperatures of all surfaces in the cold box that exchange radiation with the specimen. When all the individual surfaces temperatures are within 2 K of the mean surface temperature, the mean radiant temperature is calculated as an area weighted mean temperature of all surfaces seen by the specimen. Otherwise a detailed radiation heat exchange calculation procedure has to be used (references see annex F Bibliography of ISO/FDIS 12567).

For the warm side of the specimen, an idealised plane area for radiation heat exchange is assumed (see Figure A.2). The heat exchange is calculated according to annex A of ISO/FDIS 12567.

Table A.1 – View factors for a 1400 mm x 1140 mm aperture

	reveal depth [mm]					
	50	**100**	**150**	**200**	**250**	**300**
f_{cb}	0.926	0.859	0.798	0.742	0.691	0.644
f_{pp}	0.065	0.113	0.155	0.191	0.225	0.256
$f_{cb} = f_{bp}$ (eq. A.11)*	0.074	0.141	0.202	0.258	0.309	0.356
f_{bp} (eq. A.12)*	0.467	0.443	0.423	0.404	0.387	0.372

*Reference is given to ISO/FDIS 12567

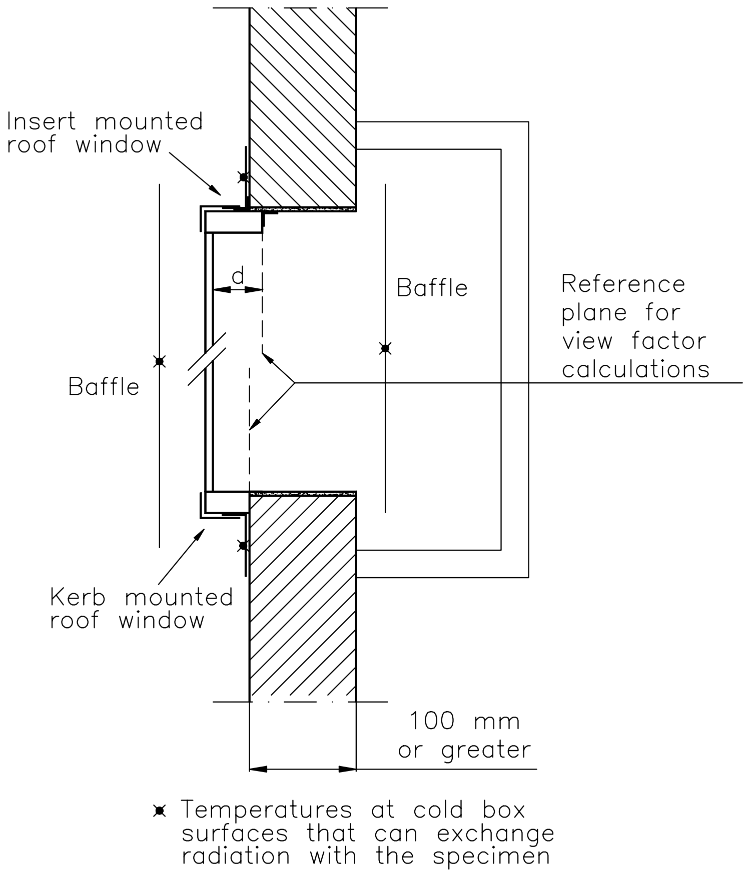


Figure A2 – Notation used for environmental temperatures in relation to the window specimen

Annex B
(normative)

Linear thermal transmittance Ψ of the edge zone

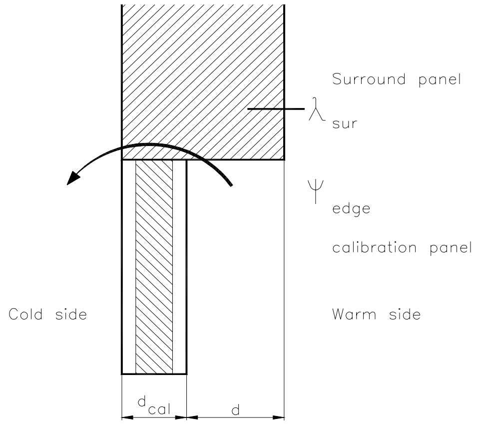


Figure B.1 – Glazed calibration panel with thickness d_{cal}

Table B.1: Linear thermal transmittance for glazed calibration panel

	Ψ_{edge} for d_{cal} = 60 mm W/(m · K)			Ψ_{edge} for d_{cal} =100 mm W/(m · K)		
d mm	λ_{sur} W/(m·K) 0,030	λ_{sur} W/(m·K) 0,035	λ_{sur} W/(m·K) 0,040	λ_{sur} W/(m·K) 0,030	λ_{sur} W/(m·K) 0,035	λ_{sur} W/(m·K) 0,040
0	-	-	-	0.0001	0.0002	0.0002
20	-	-	-	0.0013	0.0015	0.0017
40	0.0046	0.0053	0.0060	0.0030	0.0034	0.0039
60	0.0072	0.0083	0.0094	0.0046	0.0053	0.0059
80	0.0095	0.0110	0.0124	0.0060	0.0071	0.0079
100	0.0117	0.0135	0.0152	0.0074	0.0088	0.0098
120	0.0137	0.0158	0.0177	0.0088	0.0104	0.0116
140	0.0156	0.0180	0.0199	0.0100	0.0120	0.0133
160	0.0173	0.0199	0.0219	0.0112	0.0136	0.0149
180	0.0190	0.0217	0.0237	0.0123	0.0150	0.0165
200	0.0205	0.0234	0.0254	0.0133	0.0164	0.0180
220	0.0219	0.0250	0.0268	0.0143	0.0178	0.0194
240	0.0231	0.0264	0.0282	0.0152	0.0191	0.0208

Ψ- values for intermediate λ_{sur} ,d_{cal} and d values are obtained by linear interpolation.

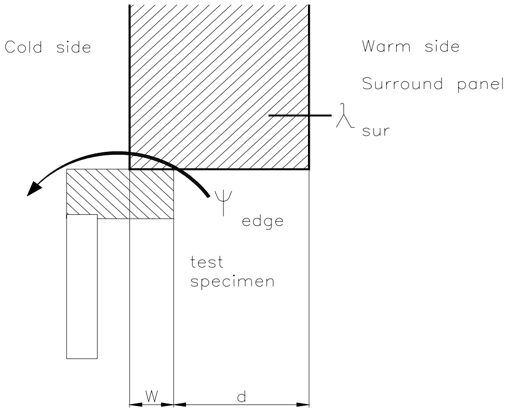


Figure B.2: Insert mounted test specimen with frame width w

Table B.2: Linear thermal transmittance for insert mounted test specimens

w mm	d mm	Ψ_{edge} in W/(m · K) for different λ_{sur} in W/(m·K) 0,030	0,035	0,040
0	100	0.0359	0.0400	0.0441
	150	0.0428	0.0476	0.0525
	200	0.0474	0.0533	0.0589
	250	0.0514	0.0578	0.0640
	300	0.0545	0.0615	0.0682
10	90	0.0267	0.0301	0.0332
	140	0.0334	0.0377	0.0419
	190	0.0383	0.0434	0.0482
	240	0.0422	0.0479	0.0533
	290	0.0454	0.0516	0.0576
20	80	0.0216	0.0248	0.0273
	130	0.0281	0.0318	0.0354
	180	0.0330	0.0375	0.0418
	230	0.0370	0.0420	0.0469
	280	0.0402	0.0458	0.0512
30	70	0.0190	0.0213	0.0235
	120	0.0255	0.0287	0.0319
	170	0.0303	0.0344	0.0382
	220	0.0342	0.0388	0.0433
	270	0.0374	0.0425	0.0476
40	60	0.0171	0.0191	0.0209
	110	0.0236	0.0265	0.0293
	160	0.0284	0.0320	0.0356
	210	0.0323	0.0365	0.0407
	260	0.0355	0.0403	0.0449
50	50	0.0162	0.0180	0.0197
	100	0.0225	0.0252	0.0279
	150	0.0273	0.0308	0.0341
	200	0.0313	0.0353	0.0392
	250	0.0313	0.0353	0.0429
60	40	0.0146	0.0163	0.0178
	90	0.0209	0.0234	0.0258
	140	0.0256	0.0288	0.0320
	190	0.0296	0.0334	0.0371
	240	0.0328	0.0371	0.0413

Ψ- values for intermediate λ_{sur} , d values can be obtained by linear interpolation.

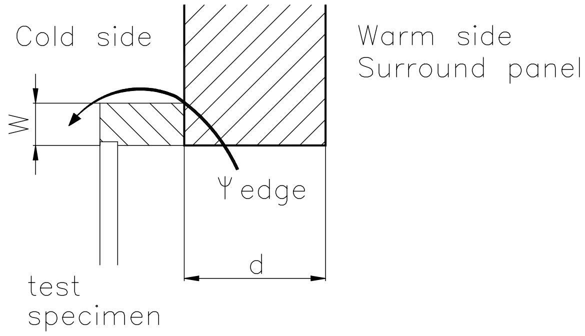


Figure B.3: Kerb mounted test specimen with kerb width w

Table B.3: Linear thermal transmittance for kerb mounted test specimens

w mm	d mm	Ψ_{edge} in W/(m · K) for different λ_{sur} in W/(m·K) 0,030	 0,035	 0,040
10	100	0.0290	0.0324	0.0357
	150	0.0353	0.0398	0.0440
	200	0.0404	0.0456	0.0507
	250	0.0444	0.0503	0.0559
	300	0.0476	0.0539	0.0601
20	100	0.0205	0.0229	0.0251
	150	0.0261	0.0309	0.0348
	200	0.0311	0.0369	0.0418
	250	0.0356	0.0415	0.0468
	300	0.0395	0.0450	0.0503
30	100	0.0140	0.0157	0.0174
	150	0.0218	0.0243	0.0270
	200	0.0271	0.0304	0.0339
	250	0.0307	0.0347	0.0389
	300	0.0332	0.0378	0.0425
40	100	0.0089	0.0101	0.0111
	150	0.0156	0.0183	0.0204
	200	0.0210	0.0245	0.0274
	250	0.0253	0.0292	0.0327
	300	0.0288	0.0327	0.0368
50	100	0.0036	0.0041	0.0051
	150	0.0112	0.0129	0.0145
	200	0.0169	0.0194	0.0218
	250	0.0212	0.0243	0.0273
	300	0.0243	0.0279	0.0316
60	100	0.0007	0.0007	0.0007
	150	0.0086	0.0097	0.0109
	200	0.0143	0.0163	0.0183
	250	0.0184	0.0211	0.0238
	300	0.0215	0.0246	0.0278

Annex C
(informative)

Example of calibration test and measurement of a roof window specimen

C.1 Calibration test with panel size 1.40m x 1.14m

Two calibration panels with total thermal resistance of approximately 0.7 and 1.9 (m²K)/W and total thickness of 28 and 58 mm respectively are used. The panels were build with an insulating core covered on both sides with 4 mm hardened glass. The calibration panels have been installed in a surround panel made of polystyrene, thickness 170 mm. The measured data are summarized in table C.1.

The basic data for the insulating core material has been measured in a hot plate apparatus according to ISO 8301. The measured data are:

Panel 1(d=28 mm): $\lambda_{core} = 0.0276 + 0.00009 \cdot \theta_{me}$

Panel 2(d= 58 mm): $\lambda_{core} = 0.0253 + 0.00005 \cdot \theta_{me}$

where θ_{me} is the mean core temperature.

Table C.1: Calibration panel – measured data

Calibration Panel (measured values)			**Panel 1**			**Panel 2**		
d	Overall thickness	m	0.028			0.058		
A	Area of panel	m²	1.60			1.60		
A_{sur}	Area of surround panel	m²	0.55			0.55		
A_{tot}	Hot box metering area	m	2.15			2.15		
L	Perimeter length	m²	5.08			5.08		
Test number			2	1*	3	5	4	6
Cold temperatures – measured								
θ_{ce}	(air)	°C	10.59	0.28	-13.11	11.61	0.11	-6.66
$\theta_{se,b}$	(surface baffle)	°C	10.71	0.44	-12.89	11.68	0.20	-6.57
$\theta_{se,cal}$	(surface calibration panel)	°C	11.22	1.55	-11.01	11.88	0.65	-5.95
$\theta_{se,sur}$	(surface surround panel)	°C	10.87	0.83	-12.21	11.78	0.46	-6.17
Warm temperatures - measured								
θ_{ci}	(air)	°C	20.00	20.00	20.00	20.00	20.00	20.00
$\theta_{si,b}$	(surface baffle)	°C	19.83	19.73	19.59	19.86	19.79	19.76
$\theta_{si,cal}$	(surface calibration panel)	°C	18.61	17.30	15.56	19.35	18.66	18.29
$\theta_{si,p}$	(surface reveal panel)	°C	19.27	18.67	17.88	19.50	19.05	18.84
$\theta_{si,sur}$	(surface surround panel)	°C	19.73	19.46	19.07	19.61	19.16	18.96
Φ_{in}	(input power to hot box)	W	18.84	39.53	67.62	7.80	18.70	25.36
v_i	(air flow warm side, down)	m/s	-	-	-	-	-	-
v_e	(air flow cold side, up)	m/s	2.1	2.1	2.0	2.1	2.1	2.0

*Test no 1 was used to fix the fan setting on the cold side during calibrations

Table C.2 Linear thermal transmittance and view factors of the calibration panel

Values resulting from mounting instructions				Remarks	Panel 1	Panel 2
total thickness of the calibration panel			mm	-	28	58
total thickness of the surround panel			mm	-	170	170
surround panel reveal depth - warm side			mm	-	142	112
surround panel reveal depth - cold side			mm	-	0	0
ψ_{edge} for λ_{sur} = 0.037 W/(mK)			W/(mK)	table B.1	-	0.0154
- warm side	view factors f		cb_i	annex F*	0.807	0.856
			pp_i	annex F*	0.148	0.115
			cp_i	(eq. A.11)*	0.193	0.144
			bp_i	(eq. A.11)*	0.193	0.144
			pb_i	(eq. A.12)*	0.426	0.442
	radiant factors α		cb_i	(eq. A.8)*	0.661	0.699
			cp_i	(eq. A.9)*	0.171	0.128
- cold side	view factors f		cb_e	annex F*	1	1
			pp_e	annex F*	0	0
			cp_e	(eq. A.11)*	0	0
			bp_e	(eq. A.11)*	0	0
			pb_e	(eq. A.12)*	0.5	0.5
	radiant factors α		cb_e	(eq. A.8)*	0.81	0.81
			cp_e	(eq. A.9)*	0	0

* Reference is given to ISO 12567

Table C.3: Calculation of surround panel thermal resistance R_{sur}

Data element		Remarks	Panel 2 (58 mm)		
$\Delta\theta_c$	K	-	8.39	19.89	26.66
$\Delta\theta_{s,sur}$	K	-	7.83	18.70	25.13
$\theta_{me,sur}$	°C	-	15.70	9.81	6.40
Φ_{in}	W	-	7.80	18.70	25.36
Φ_{cal}	W	eq. (9)*	6.20	14.76	19.72
Φ_{edge}	W	eq. (10)*	0.66	1.56	2.09
Φ_{in} - Φ_{cal} - Φ_{edge}	W	-	0.94	2.39	3.55
R_{sur}	m²K/W	eq. (8)*	4.56 **	4.31 **	3.90 **

* Reference is given to ISO 12567

** Resistance does not decrease with temperature as expected, but this maybe due to other effects related to the edge loss. Since the area of the surround panel is small the influence from R_{sur} on the U-value is small.

Table C.4: Calculation of surface resistances and convective fractions F_C

Data element			Panel 1 (28 mm)			Panel 2 (58 mm)		
$\theta_{me,cal}$	°C	-	14.92	9.43	2.28	15.61	9.66	6.17
$\Delta\theta_{s,cal}$	K	-	7.39	15.75	26.57	7.47	18.01	24.24
R_{cal}	m²K/W	(eq. 3)*	0.703	0.715	0.728	1.924	1.948	1.962
q_{cal}	W/m²	(eq. 2)*	10.52	22.04	36.48	3.88	9.25	12.36
$h_{cb,i}$	W/m²K	(eq. A.6)*	5.67	5.63	5.57	5.69	5.67	5.66
$h_{cb,e}$	W/m²K	(eq. A.6)*	5.20	4.67	4.04	5.25	4.64	4.31
$h_{cp,i}$	W/m²K	(eq. A.7)*	5.65	5.60	5.52	5.68	5.65	5.63
$h_{cp,e}$	W/m²K	(eq. A.7)*	5.21	4.68	4.06	5.25	4.65	4.32
$h_{r,i}$	W/m²K	(eq. A.5)*	4.71	4.67	4.63	4.71	4.69	4.68
$h_{r,e}$	W/m²K	(eq. A.5)*	4.21	3.79	3.27	4.25	3.76	3.49
$\theta_{r,i}$	°C	(eq. A.3)*	19.72	19.51	19.24	19.80	19.67	19.61
$\theta_{r,e}$	°C	(eq. A.3)*	10.71	0.44	-12.89	11.68	0.20	-6.57
$h_{c,i}$	W/m²K	(eq. A.10)*	3.84	4.32	4.38	2.71	3.37	3.62
$h_{c,e}$	W/m²K	(eq. A.10)*	13.40	14.06	14.44	11.23	13.99	14.35
$F_{c,i}$	-	(eq. 6)*	0.45	0.48	0.49	0.37	0.42	0.44
$F_{c,e}$	-	(eq. 6)*	0.76	0.79	0.81	0.73	0.79	0.80
$\theta_{ni,cal}$	°C	(eq. 7)*	19.85	19.75	19.61	19.87	19.81	19.78
$\theta_{ne,cal}$	°C	(eq. 7)*	10.62	0.31	-13.07	11.63	0.13	-6.64
$\Delta\theta_{n,cal}$	K	-	9.23	19.44	32.68	8.24	19.68	26.42
R_{si}	m²K/W	(eq. 4)*	0.117	0.111	0.110	0.135	0.124	0.121
R_{se}	m²K/W	(eq. 5)*	0.057	0.056	0.056	0.065	0.056	0.056
$R_{s,tot}$	m²K/W	(eq. 1)*	**0.174**	**0.167**	**0.166**	**0.199**	**0.180**	**0.177**

* Reference is given to ISO 12567

The results from the calibration measurements are plotted in figure C.1 and C.2. The following regression curves have been derived by least square fits from the data set:

Thermal resistance of the surround panel: $R_{sur} = 3.535 + 0.0678 \cdot \theta_{me,sur}$

Convective fraction: $F_{c,i} = 0.3916 + 0.0032 \cdot q_{sp}$

$F_{c,e} = 0.7515 + 0.0018 \cdot q_{sp}$

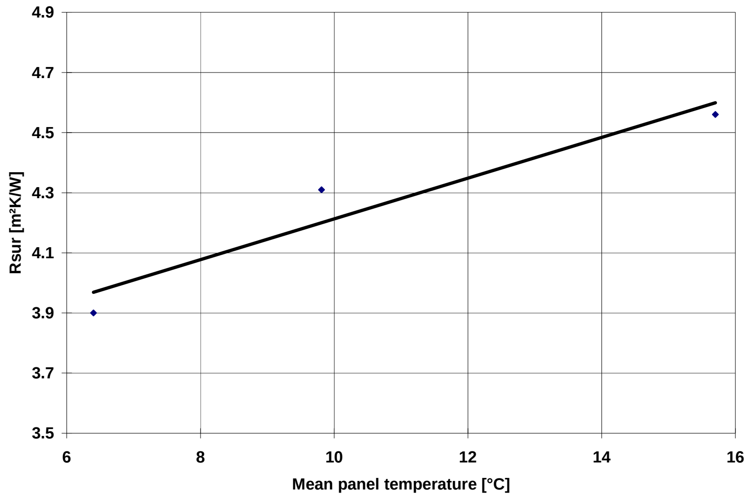


Figure C.1 : Thermal resistance of surround panel

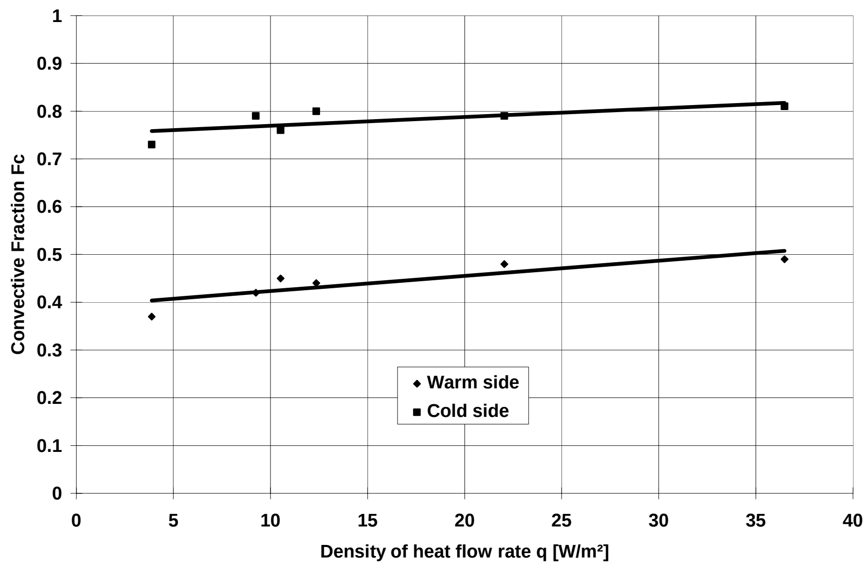


Figure C.2 : Convective fractions

Note: The curves have been derived by least square fits.

C.2 Window specimen measurement

General data of the tested window

Type	Wooden roof window	
Frame	Wood	
Glazing	2 IG unit (4-16-4 mm) with low-e coating in position 3 (ε~0.1) and Argon filling	
Dimensions	Projected window area (1.4 m x 1.14 m)	1.596 m²
	Glass area (1.19 m x 0.96 m)	1.142 m²
	Projected frame area	0.454 m²
	Heat exchange area of the frame	0.962 m²
	Total heat exchange to projected window area	2.104 m²
	Ratio total heat exchange to projected window area	1.32

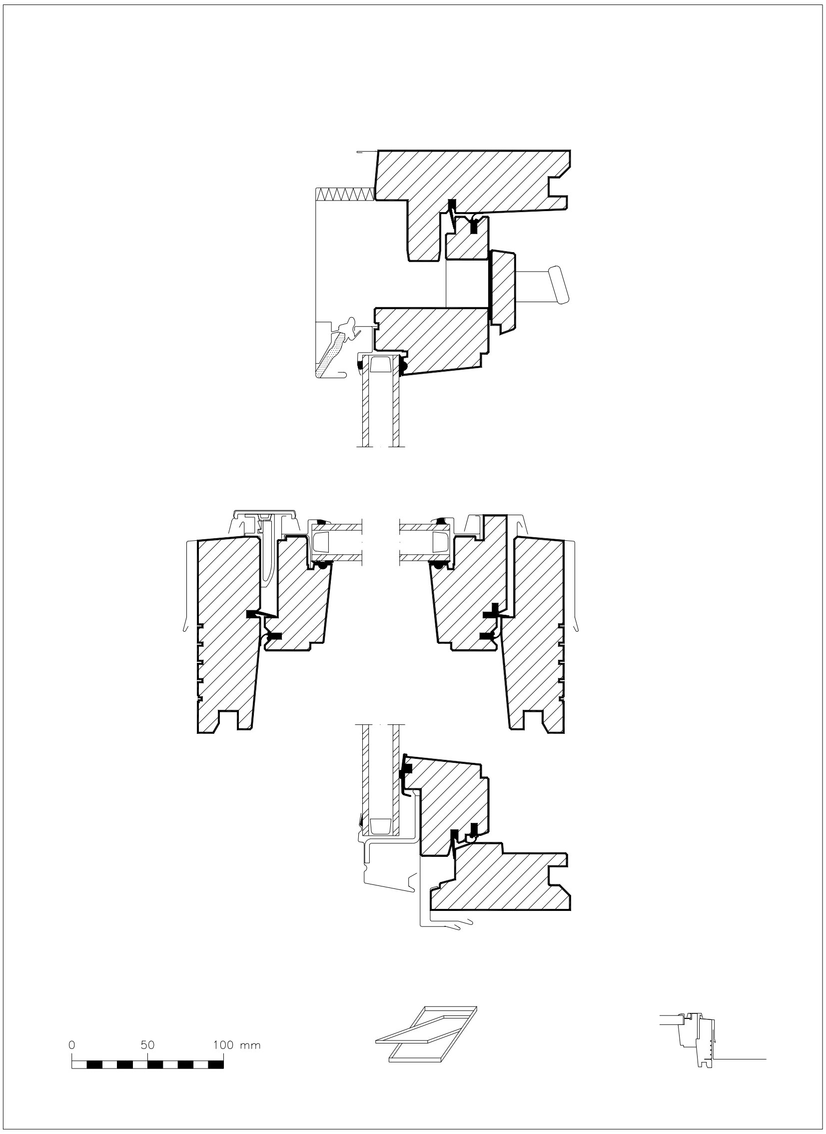


Figure C.4.1 : View of the roof window

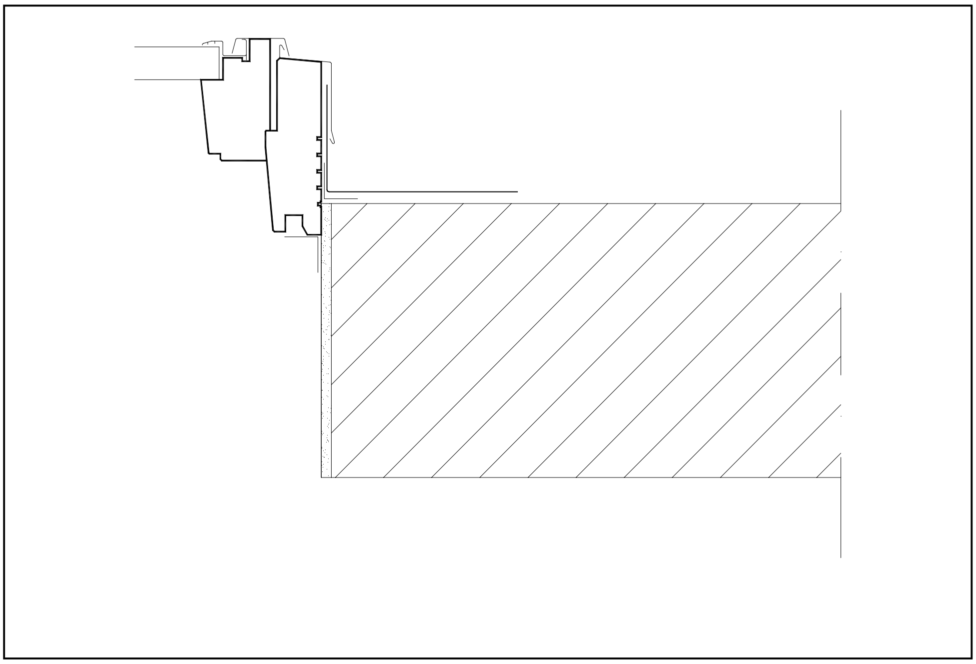


Figure C.4.2: View of the roof window installed in the surround panel

Table C.3 : Window data and measurement results

Data element			Value
w	Frame insertion in surround panel	m	0.02
d	Depth of reveal	m	0.15
A_{sp}	Area of window	m²	1.596
A_{sur}	Area of surround panel	m²	0.549
L	Perimeter length	m	5.08
fcb	Warmside viewfactor	-	0.798
fpp	Warmside viewfactor	-	0.155
fcp	Warmside viewfactor	-	0.202
fbp	Warmside viewfactor	-	0.202
fpb	Warmside viewfactor	-	0.423
αcb	Warmside radiant factor	-	0.653
αcp	Warmside radiant factor	-	0.179

Table C.4: Window measurement results

Data element			Value
Cold temperatures – measured			
θ_{ce}	(air)	°C	-0.13
$\theta_{se,b}$	(baffle)	°C	0.07
$\theta_{se,sur}$	(surround panel temperature)	°C	0.96
Warm temperatures – measured			
θ_{ci}	(air)	°C	20.00
$\theta_{si,b}$	(baffle)	°C	19.77
$\theta_{si.p}$	(reveal temperature)	°C	18.43
$\theta_{si,sur}$	(surround panel temperature)	°C	19.48
Φ_{in}	(input power in hot box)	W	63.93
v_i	(air flow warm, down)	m/s	-
v_e	(air flow cold, up)	m/s	2.1

Note: In accordance to clause 5.2, the fan speed has been adjusted to the speed given at the calibration procedure.

The effective emissivities were assumed to be ε = 0.84 for the glass surface; ε = 0.95 for the baffle surface; ε = 0.92 for the surround panel.

Table C.5: Calculation of the thermal transmittance of the window

Data element			Value	Remarks
$\theta_{me,sur}$	(mean temp. of surround panel)	°C	10.22	-
R_{sur}	(surround panel thermal resistance)	m²K/W	4.193	figure C.1
λ_{sur}	(conductivity of surround panel)	W/mK	0.037	-
ψ_{edge}	for w=20 mm / d=150 mm	W/mK	0.0356	table B.2
$\Delta\theta_{s.sur}$	(temp. difference of surround panel)	K	18.52	-
$\Delta\theta_{c}$	(air temperature difference)	K	20.13	-
Φ_{in}	(input power to hot box)	W	63.93	-
Φ_{sur}	(surround panel heat flow)	W	2.42	(eq. 12)*
Φ_{edge}	(edge zone heat flow)	W	3.64	(eq. 10)*
q_{sp}	(heat flow density of specimen)	W/m²	36.26	(eq. 11)*
F_{ci}	(convective fraction - warm side)	-	0.507	figure C.3
F_{ce}	(convective fraction - cold side)	-	0.817	figure C.3
θ_{ri}	(radiant temperature - warm side)	°C	19.48	(eq. A.3)*
θ_{re}	(radiant temperature - cold side)	°C	0.07	(eq. A.2)*
θ_{ni}	(environmental temp. - warm side)	°C	19.74	(eq. 7)*
θ_{ne}	(environmental temp. - cold side)	°C	-0.09	(eq. 7)*
$\Delta\theta_{n}$	(environmental temp. difference)	K	19.83	-
U_{m}	(measured thermal transmittance)	W/m²K	1.83	(eq. 13)*
ΔU_{m}	(estimated uncertainty of the measurement)	W/m²K	±0.08	-

see ISO/FDIS 12567

Annex D
(informative)

1 prEN 12519 : 1996
Doors and Windows – Terminology – Trilingual version