Institut pro testování a certifikaci, a. s.
Divize CSI – Centrum stavebního inženýrství
pracoviště Zlín, K Cihelně 304, 764 32 Zlín - Louky
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. 067/20

Determination of thermal transmittance according to ČSN EN ISO 12567-1

Order No.: **063 057**

Number of pages: **13**
Number of copies: **3**
Copy No.: **1**

Customer: **PLONMAR Sp. Z o.o.**
Stanislawa Duboisa 5
07-300 Ostrów Mazowiecka, Polsko

NIP: **PL5321992226**

Manufacturer: **PLONMAR Sp. Z o.o.**
Aleja Wojska Polskiego 27A
18-300 Zambrów, Polsko

Test subject:
- **Aluminium fixed light window MORAD AC 62 type**
- **Aluminium fixed light window MORAD AC 62 type + Window base profile "Podwalina" NX – GR – 60**
- **Aluminium fixed light window MORAD AC 62 type + Window base profile "Podwalina" NX – GR – H150**
- **Aluminium fixed light window MORAD AC 62 type + Window base profile "Podwalina" NX – BL –60**
- **Aluminium fixed light window MORAD AC 62 type + Window base profile "Podwalina" NX – BL – H150**

Test result: **See the table in the chapter 8**

Date of receiving specimens: 24. 2. 2020
Date of test performing: 24. 2. – 29. 2. 2020
Test performed by: Laboratory building thermal engineering

Technical Head of Laboratory: Ing. Nizar Al-Hajjar .....

Head of Testing laboratory No. 1007.1: Ing. Petra Hrdinová .....

Date: 3. 3. 2020

1. Test purpose

On the basis of the client order of the day 18th of February 2020 and the contract No. 063 057, testing laboratory of physical properties of materials, structures and buildings – Testing laboratory No. 1007.1, CSI a.s., Praha, workplace in Zlin, carried out for client PLONMAR Sp. Z o.o., Stanislawa Duboisa 5, 07-300 Ostrów Mazowiecka, Poland, the test of thermal transmittance of Aluminium fixed light window MORAD AC 62 type and the combination of this window with four variants of window base profiles, according to ČSN EN ISO 12567-1. 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_{st}, in W/(m^2.K) according to ČSN EN ISO 12567-1" Thermal performance of windows and doors – Determination of thermal transmittance by hot box method – Part 1: Complete windows and doors". From the measured value U_m is determined the standardized thermal transmittance value U_{st}, in W/(m^2.K):

$$U_m = \frac{q_{sp}}{\Delta\theta_n} \quad (1)$$

$$U_{st} = \left[U_m^{-1} - R_{s,t} + R_{(s,t),st}\right]^{-1} \quad (2)$$

where $\Delta\theta_n$ is the difference between environmental temperatures on each side of the test specimen, in K;
q_{sp} heat flow density through the test specimen, in W/m^2;
$R_{s,t}$ total surface thermal resistance on warm and cold side during the measurement, in m^2·K/W;
$R_{(s,t),st}$ standardized total surface thermal resistance on warm and cold side, its value according to ČSN 73 0540-3 is 0.17 m^2.K/W.

3. Description of testing products

– Specimen No. 035/20 (fixed light window MORAD AC 62 type)
– Specimen No. 035-1/20 (fixed light window MORAD AC 62 type + window base profile „Podwalina" NX – GR – 60)
– Specimen No. 035-2/20 (fixed light window MORAD AC 62 type + window base profile „Podwalina" NX – GR – H150)
– Specimen No. 035-3/20 (fixed light window MORAD AC 62 type + window base profile „Podwalina" NX – BL – 60)
– Specimen No. 035-4/20 (fixed light window MORAD AC 62 type + window base profile „Podwalina" NX – BL – H150)

The performance of the specimens	Aluminium single fixed light window with insulating sandwich panel of 1230 mm x 1380 mm size + four variants of window base profiles „Podwaliny" of 1230 mm x 100 mm size in thicknesses and performance – (see annexes 2 to 5)
Frame	3-chamber Aluminium profile with PVC thermal break in the central chamber
Infill insulation	Insulating sandwich panel of 24 mm thickness and consist of: 1,5 mm PVC – 21 mm thermal insulation XPS – 1,5 mm PVC
Sealing	Insulating sandwich panel is sealed from both sides by rubber gasket
Frame drainage	2 outlet holes ø 8 mm

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 client are given in the annexes 1 and 5.

The selected photos of the specimen variants are given in the annexes No. 6 to 8.

Size in mm:	Window:	1 230 x 1 380
	Window with window base profile:	1 230 x 1 480
	Window base profile “Podwalina”:	1 230 x 100

Condition of samples upon receipt: without apparent deficiencies.

4. TESTING REGULATIONS USED AND TESTING EQUIPMENT

4.1 Regulations

Thermal transmittance coefficient

- ČSN EN ISO 12567-1	Testing standard

4.2 Used apparatus and equipment

- Vertical chamber	Z 07 3008
- 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 1142

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: 21,5 °C
Average relative humidity in the laboratory: 42,0 %

Table of measured values

Measured quantity		Physical unit	Measurement results Test specimen No. 035/20
Inside air temperature	θ_{ni}	°C	20,42
Outer air temperature	θ_{ne}	°C	-0,21
Input power to hot box	Φ_{in}	W	46,987
Surround panel heat flow	Φ_{sur}	W	2,056
Edge zone heat flow	Φ_{edge}	W	2,041
Test specimen heat flow	Φ_{sp}	W	42,889
Total surface thermal resistance (measured)	$R_{s,t}$	m^2.K/W	0,176
Measured thermal transmittance	U_m	W/(m^2.K)	1,225
Standardized thermal transmittance	U_{st}	W/(m^2.K)	1,234
Time of measuring in stable state		hours	8
Design test specimen area	A_{sp}	m^2	1,6974
Frame relative area – warm side / out side	A_f/A_{sp}	%	21,1 / 21,1

Linear thermal transmittance Ψ_{edge} = 0,01896 W/(m.K), window frame thickness w = 62 mm.

Table of measured values

Measured quantity		Physical unit	Measurement results Test specimen	
			No. 035-1/20	No. 035-2/20
Inside air temperature	θ_{ni}	°C	20,40	20,33
Outer air temperature	θ_{ne}	°C	-0,30	-0,32
Input power to hot box	Φ_{in}	W	49,948	47,298
Surround panel heat flow	Φ_{sur}	W	1,698	1,728
Edge zone heat flow	Φ_{edge}	W	2,126	1,919
Test specimen heat flow	Φ_{sp}	W	46,124	43,651
Total measured surface thermal resistance	$R_{s,t}$	m^2.K/W	0,162	0,182
Measured thermal transmittance	U_m	W/(m^2.K)	1,224	1,161
Standardized thermal transmittance	U_{st}	W/(m^2.K)	1,211	1,178
Time of measuring in stable state		hours	8	
Design test specimen area	A_{sp}	m^2	1,8204	
Frame relative area – warm side / out side A_f/A_{sp}		%	19,6 / 19,6	

Linear thermal transmittance Ψ_{edge} = 0,01894 W/(m.K), window frame thickness w = 62 mm for the specimen No. 035-1/20.

Linear thermal transmittance Ψ_{edge} = 0,01895 W/(m.K) for three sides of the specimen perimeter, window frame thickness w = 62 mm and linear thermal transmittance Ψ_{edge} = 0,01099 W/(m.K) for lower side of the specimen perimetre, frame thickness “Podwalina” w = 110 mm for the specimen No. 035-2/20.

Table of measured values

Measured quantity		Physical unit	Measurement results Test specimen	
			No. 035-3/20	No. 035-4/20
Inside air temperature	θ_{ni}	°C	20,44	20,31
Outer air temperature	θ_{ne}	°C	-0,41	-0,24
Input power to hot box	Φ_{in}	W	48,448	45,944
Surround panel heat flow	Φ_{sur}	W	1,712	1,712
Edge zone heat flow	Φ_{edge}	W	2,141	1,887
Test specimen heat flow	Φ_{sp}	W	44,595	42,345
Total measured surface thermal resistance	$R_{s,t}$	m^2.K/W	0,174	0,182
Measured thermal transmittance	U_m	W/(m^2.K)	1,175	1,132
Standardized thermal transmittance	U_{st}	W/(m^2.K)	1,181	1,148
Time of measuring in stable state		hours	8	
Design test specimen area	A_{sp}	m^2	1,8204	
Frame relative area – warm side / out side A_f/A_{sp}		%	19,6 / 19,6	

Linear thermal transmittance Ψ_{edge} = 0,01894 W/(m.K), window frame thickness w = 62 mm for the specimen No. 035-3/20.

Linear thermal transmittance Ψ_{edge} = 0,01895 W/(m.K) for three sides of the specimen perimeter, window frame thickness w = 62 mm and linear thermal transmittance Ψ_{edge} = 0,01010 W/(m.K) for lower side of the specimen perimetre, frame thickness “Podwalina” w = 120 mm for the specimen No. 035-4/20.

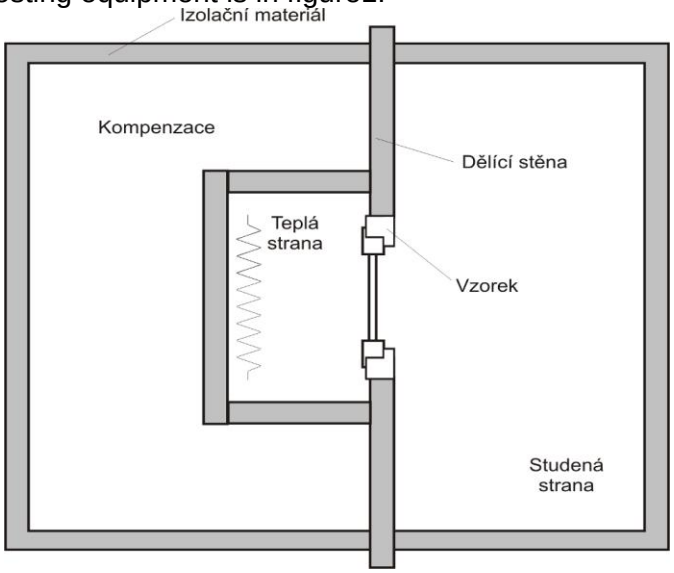
Air speed in the cold side 1,8 m/s; direction of air flow cold side – up
Air speed in the warm side 0,1-0,2 m/s; direction of air flow warm side – up
Hot box area A_{HB} = 2,4649 m^2.

The thermal resistance of testing 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 the testing surround panel in W/(m.K);
d_{sur} the thickness of the testing surround panel, its value is 0,250 m;
$\theta_{me,sur}$ mean temperature of both surfaces of the testing surround panel in °C.

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

Figure 1 - Testing equipment scheme

8. Evaluation

Serial No.	Parameter title	Testing method	Test specimen No.	Test result Requirement conformity
1.	Thermal transmittance $U_{st} = U_w$ [W/(m^2.K)]	ČSN EN ISO 12567-1	035/20	1,23
			035-1/20	1,21
			035-2/20	1,18
			035-3/20	1,18
			035-4/20	1,15

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

Technical specification

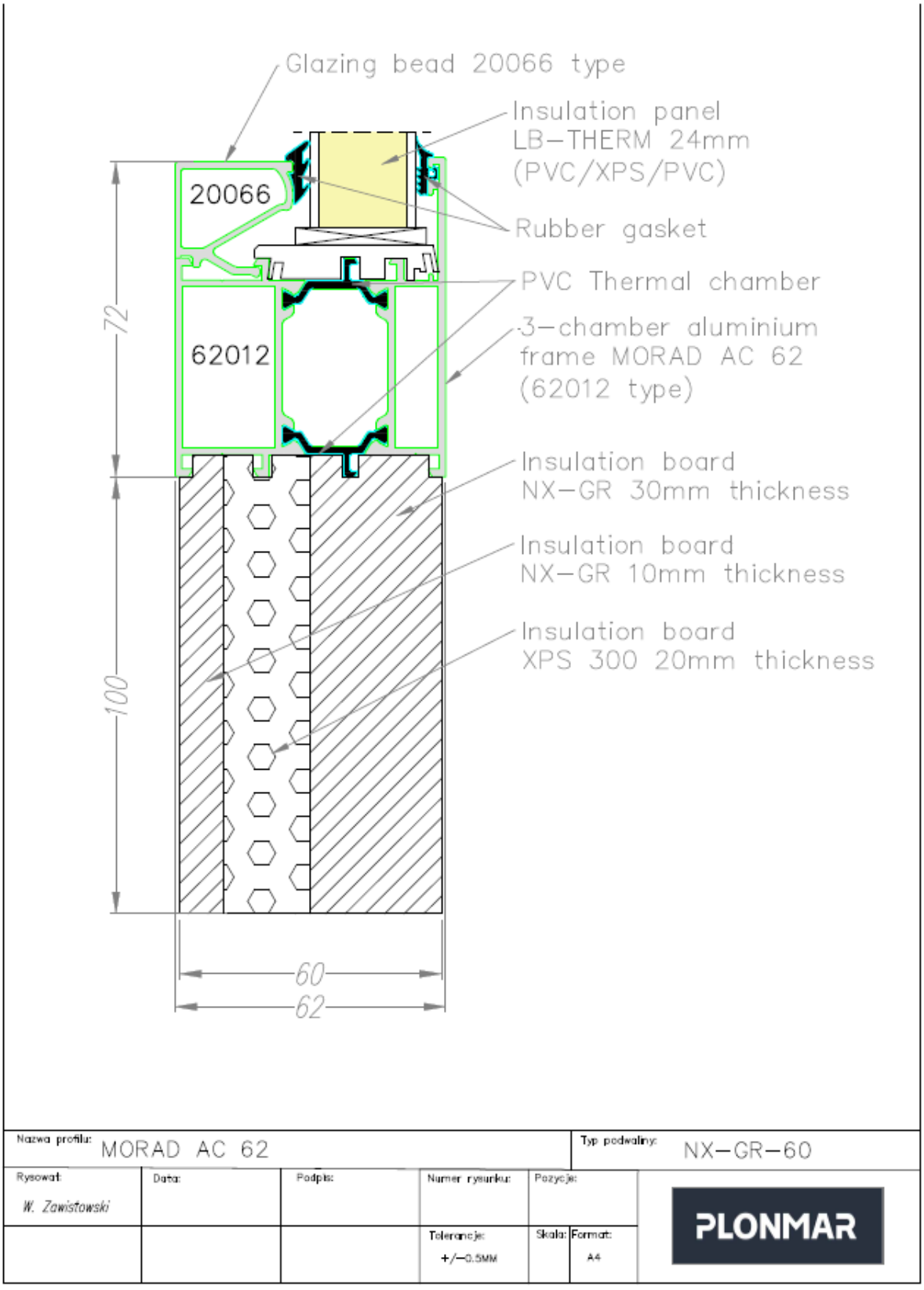
Specifikace zkoušeného výrobku - kovové otvorové výplně
(vyplnit pro každý vzorek zvlášť)

1. Výkres zkoušeného výrobku:
- **nárys** obsahuje rozměry rámu a křídel (pevně zasklených částí), schematické znázornění umístění prvků kování a způsob otevírání
- **řezy** konstrukcí (svislý spodními rámy vč. těsnění a zasklení), u klapačky vodorovný, u dveří vodorovný a svislý s prahem, hlavní rozměry profilů, označení všech použitých profilů, provedení odvodnění a zavzdušnění u rámu i křídel (rozměry, umístění a počet otvorů)

2 Výrobce okna: ALULINE s.c., ul. PJP II 30/50, 18-300 Zambrow, Poland		
3 Název okenního (dveřního) systému / typ konstrukce (okno, dveře, balk.dv):: Aluminium window MORAD AC 62 type		
4 Specifikace komponent a jejich výroben; uveďte materiál a označení od výrobce		
- hlavní profily **výrobce, dodavatel:** MORAD Poland	**označení** : rám, +rozměr vzorku **B** x **H**: 3-chamber Aluminium frame with thermal PVC break in the central chamber (1,23x1,38) m	**označení** : křídlo, +rozměr křídla(-el) **b** x **h**: -
- přerušení tepelného mostu: MORAD Poland	**výrobce, dodavatel, označení** + tl. Mm PVC material in the central chamber	**výrobce, dodavatel, označení** + tl. mm
- další profily **výrobce, dodavatel:**	**označení** : štulp + krytky, sloupky a poutce, příčle, prahové profily, křídlové okapnice Glazing bead 20066	
- těsnění spáry **výrobce, dodavatel:**	**označení** vnitřní, provedení v rozích* -	**označení** středové, provedení v rozích* -
	označení vnější, provedení v rozích* -	**označení** prahové těsnění (stírací na křídle)
- těsnění zasklení **výrobce, dodavatel:**	**označení** zasklení vnější, provedení v rozích* Rubber gasket	**označení** zasklívací lišty a těsnícího profilu* Glazing bead 20066 with Gum gasket
izolační sklo **výrobce, dodavatel:**	**označení** a složení skla, výplní Insulating sandwich panel: LB-Therm 24 mm; PVC 1,5 mm – XPS 21 mm – PVC 1,5 mm	
5 Odvodnění a dekomprese křídla(zasklívací drážky): (např. dole 3 otvory 5x30 mm do profilu, 2 otvory 5x28 mm s krytkou z profilu; nahoře 2x přerušen vnější těsnící profil v délce vždy 50 mm) -		
6 Odvodnění a dekomprese rámu (spáry): 2 outlet holes of 8 mm diameter		
7 Kování (**označení** typu a výrobce):		
Uzávěry (pravé, levé křídlo, jiné): počet obvodových bodů, způsob ovládání, pomocné přítlaky, spec.body -		
Závěsy (pravé, levé křídlo, jiné): druh (otevíravé, otev.+sklápěcí) -		
8 Provedení spojů rámů a další upřesňující poznámky: -		
9 Datum vydání:		01/06

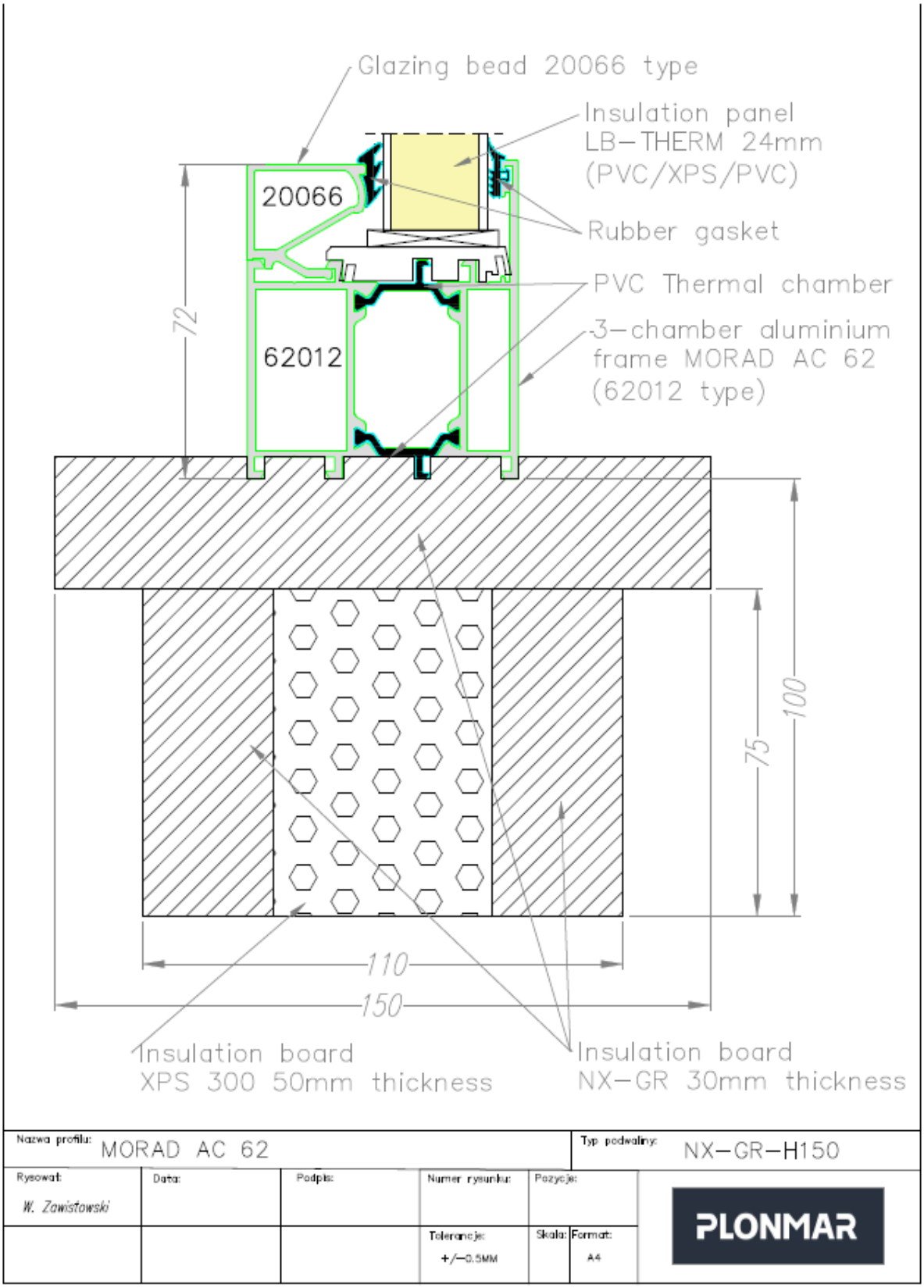
Annex No. 2

Aluminium fixed light window MORAD AC 62 + window base profile „Podwalina“ NX – GR – 60



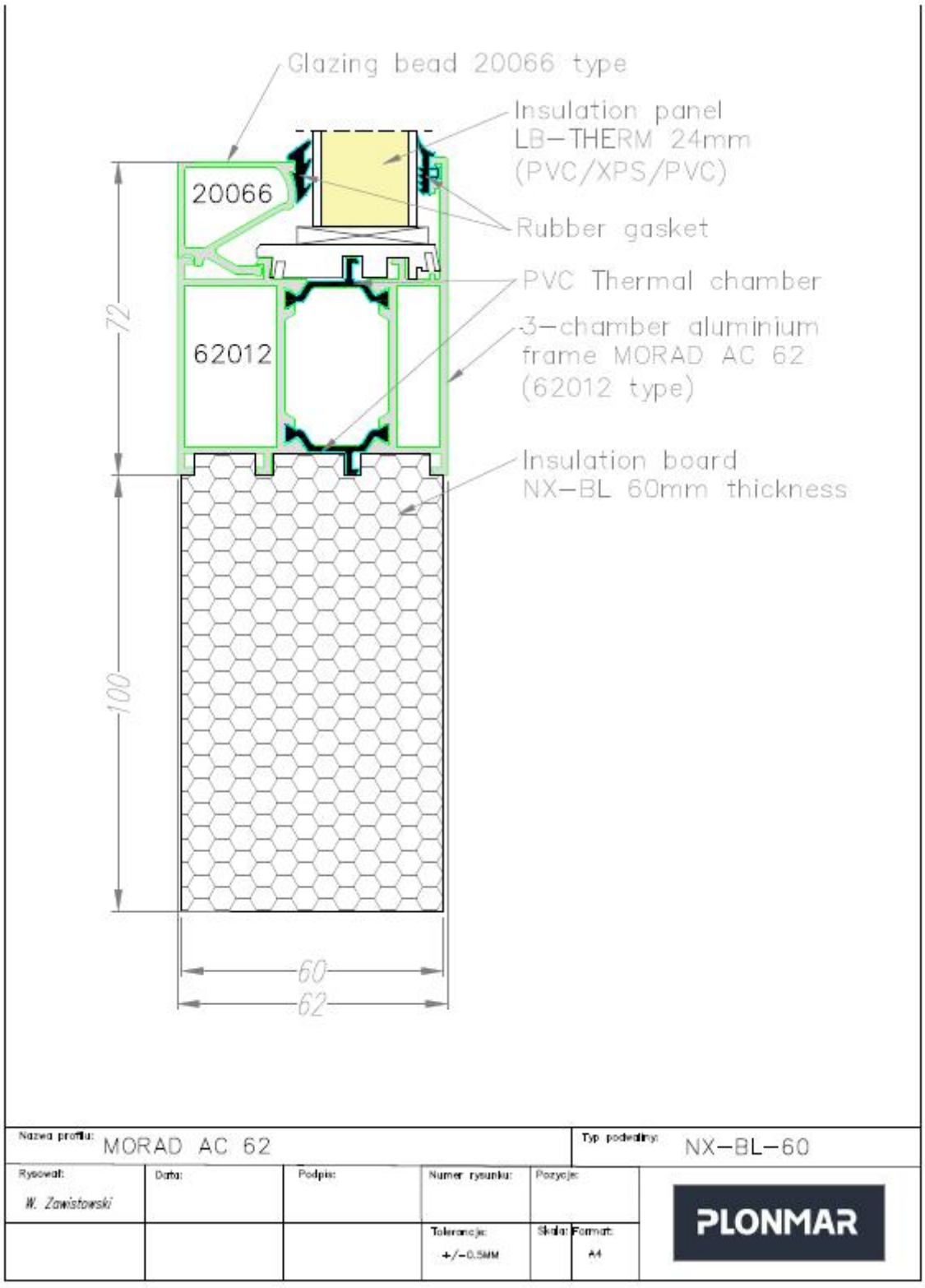
Annex No. 3

Aluminium fixed light window MORAD AC 62 + window base profile „Podwalina“ NX – GR – H150



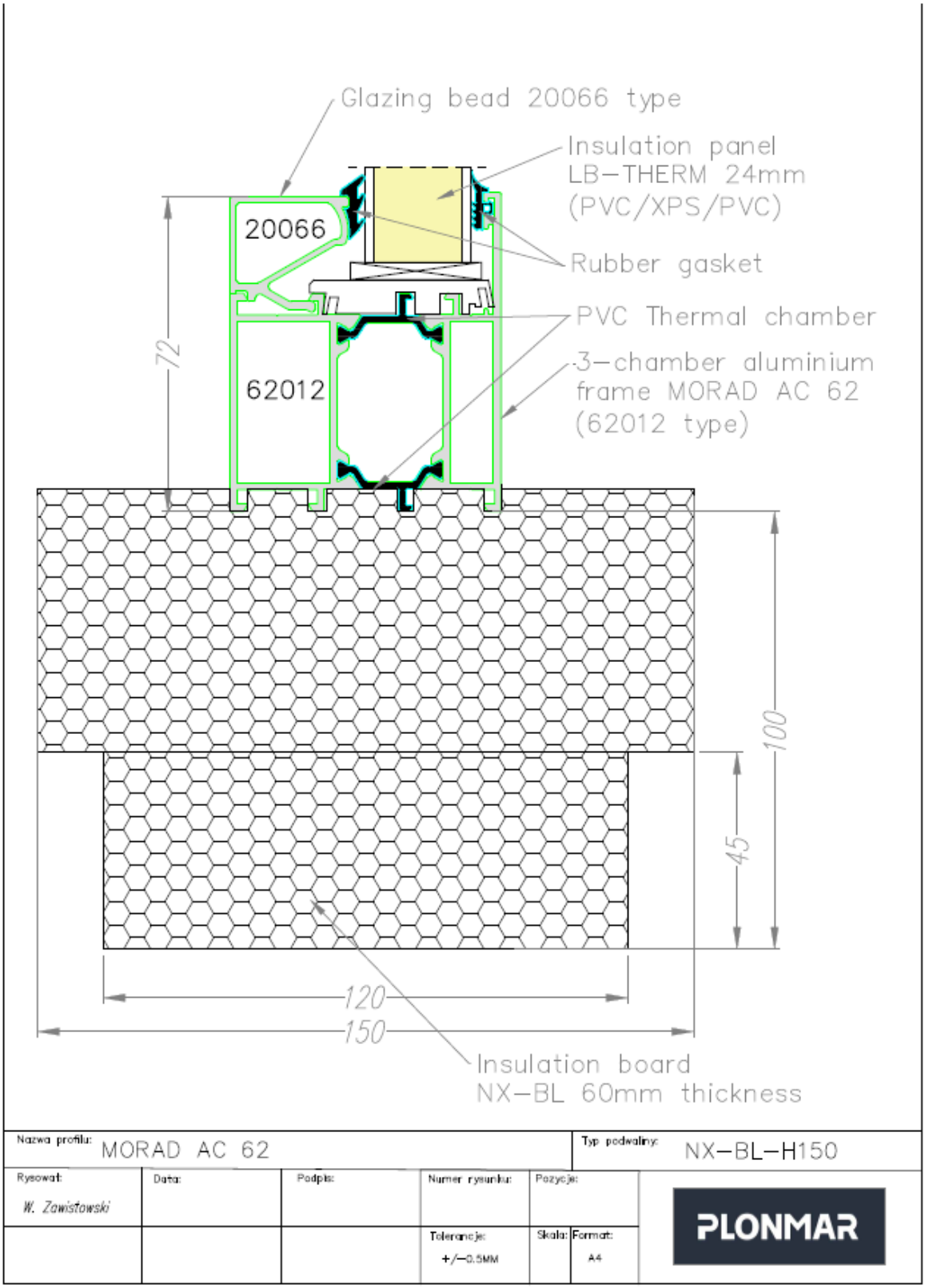
Annex No. 4

Aluminium fixed light window MORAD AC 62 + window base profile „Podwalina“ NX – BL – 60



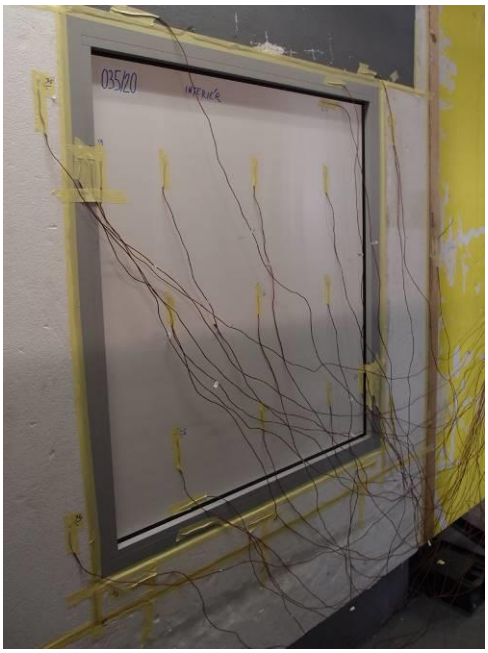
Annex No. 5

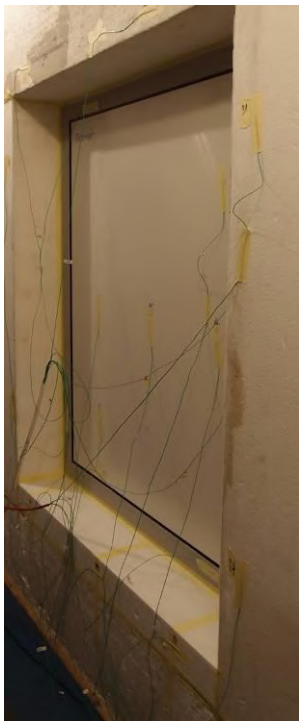
Aluminium fixed light window MORAD AC 62 + window base profile „Podwalina“
NX – BL – 60



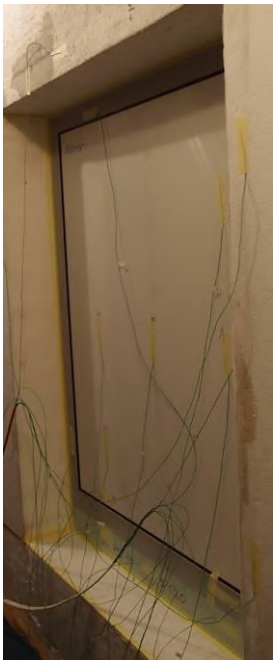
Annex No. 6

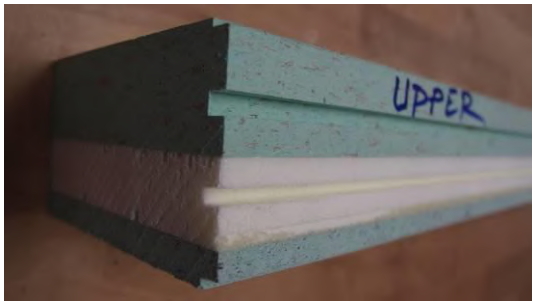
Specimen No. 035/20





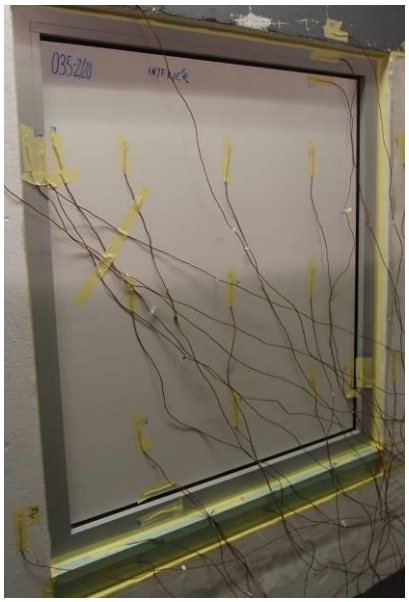
Specimen No. 035-1/20





Annex No. 7

Specimen No. 035-2/20



Specimen No. 035-3/20

Annex No. 8

Specimen No. 035-4/20

Test report end