



Inwido
Fabriksvej 4
9640 Farsø

Order no. 0108/690551
Page 1 of 3
Appendices 2
Initials btl/msvd

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Calculation report – ITC (Initial Type Calculation)



Object: Calculation of energy data for product system

2-lags Træ B (Sokolka)

System description was sent by the customer 16.03.09.

Input data: The calculations have been based on the customer submitted description of the product system (Appendix 2) and the resulting calculated cross section values (page 3).
See report from Danish Technological Institute 0108/690551a_Calculation of energy data for frame/sash cross sections_Energydata.pdf”.

Method: EN 14351-1:2006+A1:2010; EN ISO 10077-1:2006;
EN ISO 10077-2:2012; EN 673:2011, see Appendix 1.

Period: The calculation was carried out on 2016-04-06.

Results: See page 2-3.

Terms: The report may only be extracted with written approval from the Danish Technological Institute.
Results are valid only for the treated subjects.

2016-04-06, Danish Technological Institute, Sustainable Building and Construction

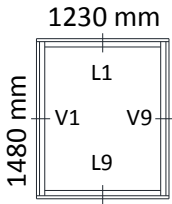
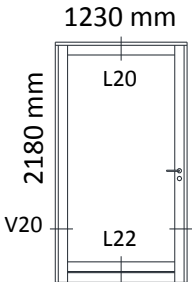
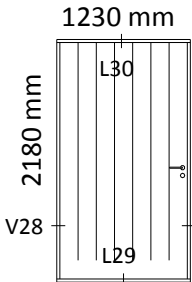
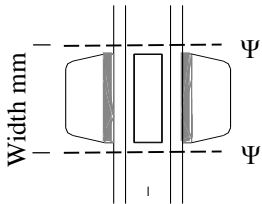
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Energy data for product system (see Appendix 1 – calculation basis)

2-lags Træ B (Sokolka)		Træ	
Name, product system		Material	
Standard B-rude	4-16-4	1.17	0.73
Name, standard pane, hinged	Dimension	U _g -value	g _g -value
Name, standard pane, fixed	Dimension	U _g -value	g _g -value
Chromatech Ultra F	0.40/0.28 / 0.4/0.28	58 mm	
Name, standard spacer, standard pane	λ _k hinged	λ _k fixed	Type and width, standard door leaf
25 mm alu			
Name, standard spacer, standard glazing bar			
Hinged window with standard pane	Framed door with standard pane - outward	Leaf door with standard door leaf-outward	
			
CE	CE	CE	
U _w (W/m ² ·K) =	1.34	U _d (W/m ² ·K) =	1.37
g _w =	0.5548	U _d =	0.79
F _f =	0.76	g _d =	0.4964
Min.t _{oi} (°C) =	12.0	F _f =	0.68
E _{ref} (kWh/m ²) =	-12.1	U _{leaf} =	0.62
E _d (kWh/m ²) =	-26.3		
Standard glazing bar			
			
B _{width} (mm) =	25		
Ψ (W/m·K) =	0.016		
Min.t _{oi} (°C) =	15.1		

Energy data for frame/sash cross section:

2-lags Træ B (Sokolka)

Snit	Bredde [mm]	U_f [W/m ² K]	Ψ [W/mK]	t_{oi} [°C]	10077-1	10077-2
L9	87	1.50	0.044	12.0		X
L1	87	1.42	0.041	12.4		X
V1	87	1.42	0.041	12.4		X
V9	87	1.42	0.041	12.4		X
L29	85	1.56	0.000	-		X
L30	85	1.44	0.000	-		X
V28	85	1.44	0.000	-		X
V29	85	1.44	0.000	-		X
L22	136	1.58	0.045	12.5		X
L20	136	1.48	0.043	12.6		X
V20	136	1.48	0.043	12.6		X
V24	136	1.48	0.043	12.6		X
L5	25	1.17	0.016	15.1		X

*) see appendix 1

Calculations have been performed according to 10077-2, 2nd edition thus:

1. The actual overlap for the pane has been used.
2. Length of the glazing gasket is included in the frame/sash length.
3. Linear thermal transmittance is calculated using the 2-box method in ift-Guideline WA-08engl/1
4. U_f is always indicated to 2 decimal places.

Calculations according to 10077-1

The calculations were performed using Fig. 1. Frame/sash section dimensions are not performed according to EN 10077-1, but according to the formular:

$$t = \frac{t_r \times b_r + t_k \times b_k}{b_r + b_k}$$

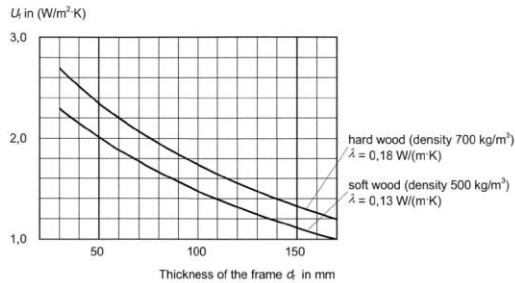
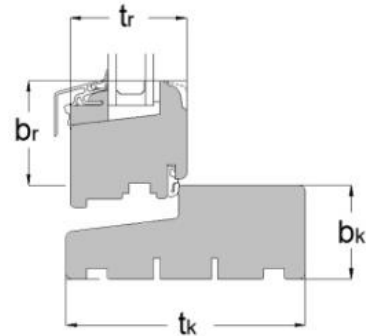


Fig. 1



Calculations according to 10077-2

Calculations of the individual section values were performed using the PC-programme: Flixo ver. 7.0.612.1.

In determining the U-value for frame/sash (U_f) an insulation panel is used with $\lambda_p = 0.035 \text{ W/m K}$, with a dimension corresponding to the specified standard glazing unit and with an overlap in sash corresponding to the submitted drawings.

$$U_f = \frac{U_{\text{tot}}^{\text{panel}} \times \ell_{\text{tot}} - U_p \times \ell_p}{\ell_f} \quad \& \quad \Psi_g = U_{\text{tot}}^{\text{glazing}} \times \ell_{\text{tot}} - U_f \times \ell_f - U_g \times \ell_g$$

- where
- $U_{\text{tot}}^{\text{panel}}$ = thermal transmittance for total construction ($\text{W/m}^2 \text{ K}$)
 - U_p = thermal transmittance for insulation panel ($\text{W/m}^2 \text{ K}$)
 - ℓ_{tot} = construction total length (m)
 - ℓ_f = frame/sash length (m), including glazing gasket
 - ℓ_p = insulation panel length in m (general choice $\ell_p = 0.19 \text{ m}$)
 - Ψ_g = linear thermal transmittance for the spacer of the glazing unit (W/m K)
 - U_f = thermal transmittance for frame/sash section ($\text{W/m}^2 \text{ K}$)
 - U_g = thermal transmittance of the central area of the glazing ($\text{W/m}^2 \text{ K}$)
 - ℓ_g = length of glazing unit in m (general choice $\ell_g = 0.19 \text{ m}$).

Linear thermal transmittance is determined using the "box method" described in ift-Guideline WA-08engl/1. For the glazing bar $U_f = U_g$

Formulas for determination of E_{ref} and E_w , U_w and t_{oi}

The energy performance E_{ref} for the hinged reference glazing unit size 1.23 m x 1.48 m is calculated using the formula:

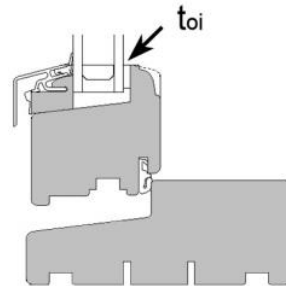
$$E_{\text{ref}} = 196.4 \times F_f \times g_g - 90.36 \times U_w \text{ kWh/m}^2 \text{ year}$$

The energy performance E_w of an arbitrary window is calculated using the formula:

$$E_w = 196.4 \times F_f \times g_g - 90.36 \times U_w \text{ kWh/m}^2 \text{ year}$$

The U-value U_w for a window is calculated using the formula: $U_w = \frac{A_g \times U_g + A_f \times U_f + \sum \ell \times \Psi}{A_w} \text{ W/m}^2 \cdot \text{K}$

- A_g = glazing area (m^2)
 - U_g = U-value of glazing ($\text{W/m}^2 \cdot \text{K}$)
 - g_g = solar energy transmittance of glazing (-)
 - g_w = $F_f \times g_g$ (-)
 - A_f = frame/sash area (m^2)
 - A_w = $A_g + A_f$ (m^2)
 - U_f = U-value of frame/sash ($\text{W/m}^2 \cdot \text{K}$)
 - Ψ = linear thermal transmittance ($\text{W/m} \cdot \text{K}$)
 - ℓ = linear thermal transmittance length (m)
- $$F_f = \frac{A_g}{A_w} = \text{glassshare}$$



Lowest surface temperature on window sash ($\text{min.}t_{\text{oi}}$) is determined at the glazing edge (see figure above) in a cross sectional calculation according to EN 10077-2, see results and comments on page 3. The surface temperature may in special cases (e.g. at alu sills in doors and lock cases) be lower elsewhere in the calculated cross section.

Oplysnings-skema til energiberegninger



TEKNOLOGISK
INSTITUT

2-lags Træ B (Sokolka)		Træ	
Navn på produktsystem		Materiale	
Standard B-rude	4-16-4	1,17	0,73 0,82
Navn på standardrude i oplukkelig ramme	Opbygning af rude	Ug-værdi*	gg-værdi LTg-værdi
Standard B-rude	4-16-4	1,17	0,73 0,82
Navn på standardrude i fast karm	Opbygning af rude	Ug-værdi*	gg-værdi LTg-værdi
Chromatech Ultra F	Wienersprosse Alu	25mm	
Navn på afstandsprofil i standardrude	Navn på afstandsprofil i standardsporse	Bredde på standardsporse i mm	
58mm plade	58mm		
Navn på standarddørplade	Tykkelse på standarddørplade i mm		
Sæt kryds ved åbningsretning og for beregningsmetode*			
Oplukkeligt vindue med standardrude 	Rammedør med standardrude 	Pladedør med standarddørplade 	
Indadgående vindue <input type="checkbox"/>	Indadgående dør <input type="checkbox"/>	Indadgående dør <input type="checkbox"/>	
Udadgående vindue <input checked="" type="checkbox"/>	Udadgående dør <input checked="" type="checkbox"/>	Udadgående dør <input checked="" type="checkbox"/>	
EN 10077-1: <input type="checkbox"/>	EN 10077-1: <input type="checkbox"/>	EN 10077-1: <input type="checkbox"/>	
EN 10077-2: <input checked="" type="checkbox"/>	EN 10077-2: <input checked="" type="checkbox"/>	EN 10077-2: <input checked="" type="checkbox"/>	
Standardsporse 	Fast karm med standardrude 	Skydedør med standardrude 	
EN 10077-1: <input type="checkbox"/>	EN 10077-1: <input type="checkbox"/>	EN 10077-1: <input type="checkbox"/>	
EN 10077-2: <input checked="" type="checkbox"/>	EN 10077-2: <input type="checkbox"/>	EN 10077-2: <input type="checkbox"/>	
Inwido		29294769	
Firmanavn		Tlf.	
Fabriksvej 4	9640	Farsø	
Adresse		Postnr.	By
09.03.2016	Charlotte Boeris		
Dato	Navn/Underskrift		

* Ug-værdi skal skrives med 2 decimaler

EN 10077-1 = Forenklet beregningsmetode – EN 10077-2 = Avanceret beregningsmetode

Vedlæg alle relevante tegninger samt datablade på ruder, afstandsprofiler og pladedør, tegninger mærkes iht. skitserne.

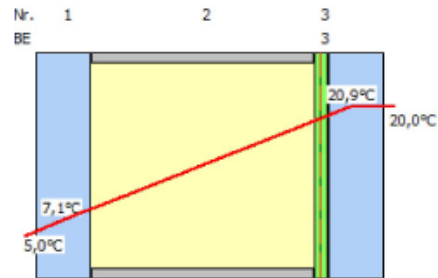
Calculation SommerGlobal

Project 2015_02_09 Position 02

Layer composition (outside to inside)

Number	BE	Denomination	mm
1		EUROFLOAT	4,00
2		90% Argon	16,00
3	3	Silverstar E*	
4		EUROFLOAT	4,00
* Userdefined			24,00

Rw (C;Ctr) dB = npd



Transmission, Reflexion, Absorbtion

$\rho_v = 0,1296$ (Light reflection factor outside)
 $\rho'_v = 0,1300$ (Light reflection factor inside)
 $\rho_e = 0,1838$ (direct radiation reflection factor)
 α_e 1 = 0,0804; 2 = 0,0910 (direct radiation absorption factor)
 $R_a = 97,96$ (general color rendering index)

$T_{UV} = 0,3051$ (ultraviolet transmittance)
 $T_v = 0,8194$ (Light transmission factor)
 $T_e = 0,6448$ (direct radiation transmission factor)

EN 410

SC = 0,8342 (Shading Coefficient, g/0,87)
 b-Faktor = 0,91 (VDI 2078, g/0,80)

$q_i = 0,0809$ (secondary heat inside)
 $g = 0,7258$ (Total energy transmission)

EN 673 Installation angle = 90° vertikal

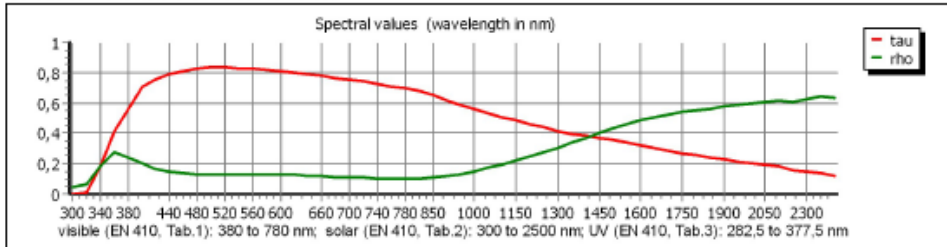
$U_Q = 1,168 \text{ W/m}^2\text{K}$ (Heat transfer coefficient)

EN 13363-2 $T_e = 5,00 \text{ °C}$ $T_i = 20,00 \text{ °C}$

$g_{th} = 0,0468$ (Thermal radiation factor)
 $g_c = 0,0354$ (Convection factor)
 $g_v = 0,0000$ (Ventilation)

$E_s = 300,00 \text{ W/m}^2$ System = 1,50 m
 $h_{c,e} = 18 \text{ W/m}^2\text{K}$ $h_{c,i} = 3,6 \text{ W/m}^2\text{K}$
 $q_i = 0,0822$ (secondary heat inside)
 $g = 0,7270$ (Total energy transmission)

Benutzerdefinierte Materialien werden verwendet.



Fluctuations of light and radiation technical values for the chemical composition of glass and manufacturing process possible. Function values take into account the permitted tolerances according to the product standards. The calculation-result does not give information about the technical practicability of this construction.

We point out that the calculations were created on the basis of the manufacturers' spectral data. The company Sommer Informatik GmbH assumes no liability for the integrity of the manufacturers' data. For the declaration of performance the manufacturers' data placed at the disposal has to be confirmed separately.

ift-certified It. validation report no. 410 42167 (status as of 11/2009)

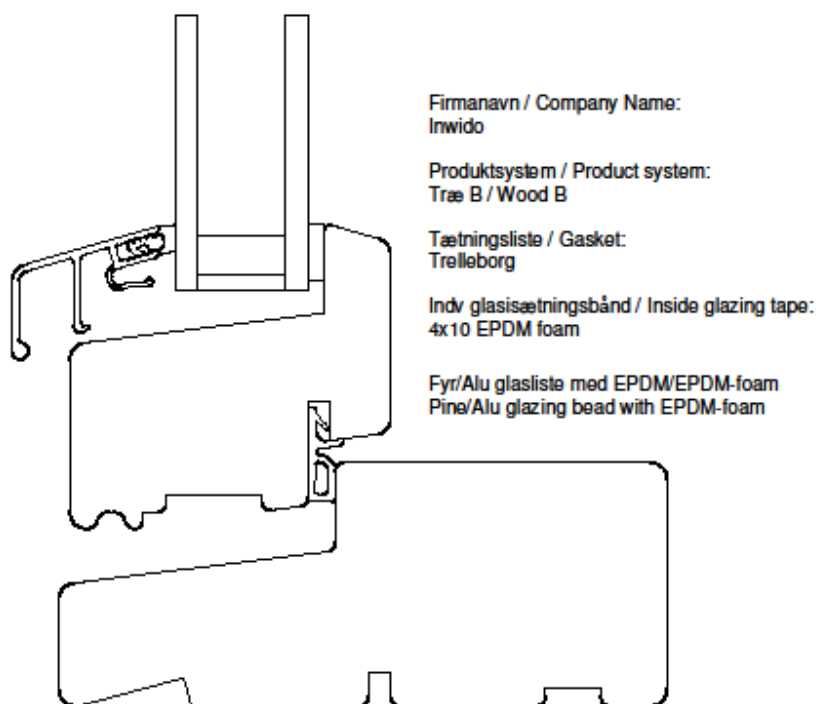
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 SommerGlobal 6.1025

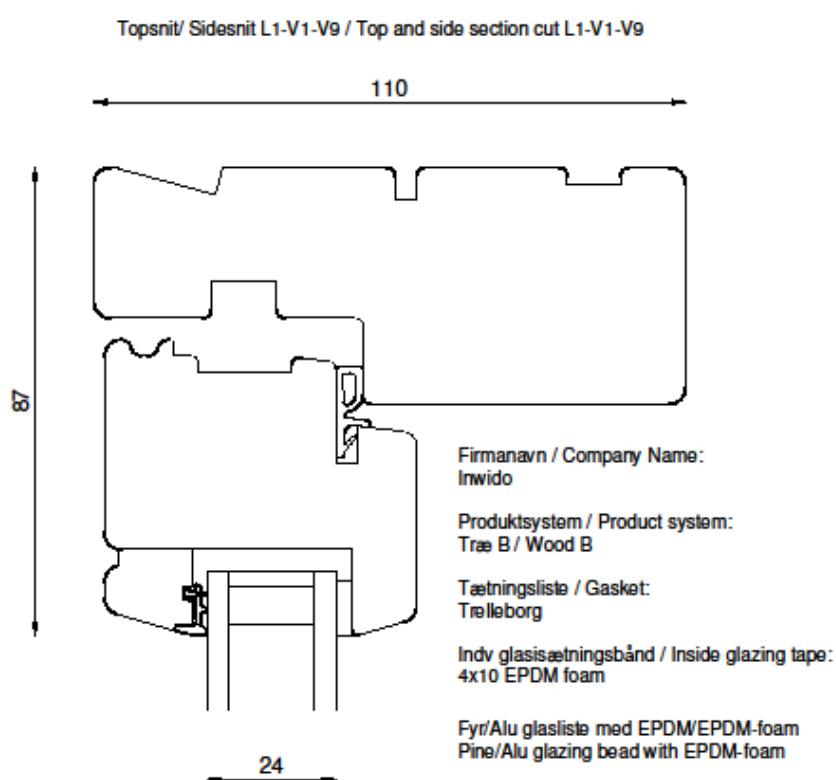
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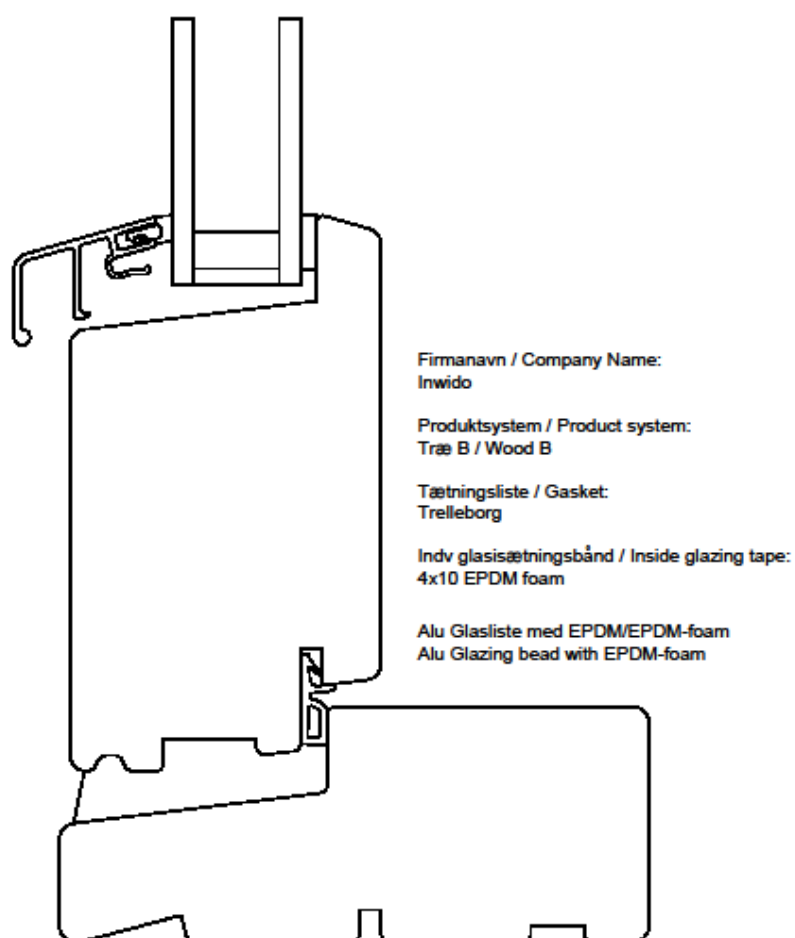
1 / 1

Bundsnit L9 / Bottom section cut L9

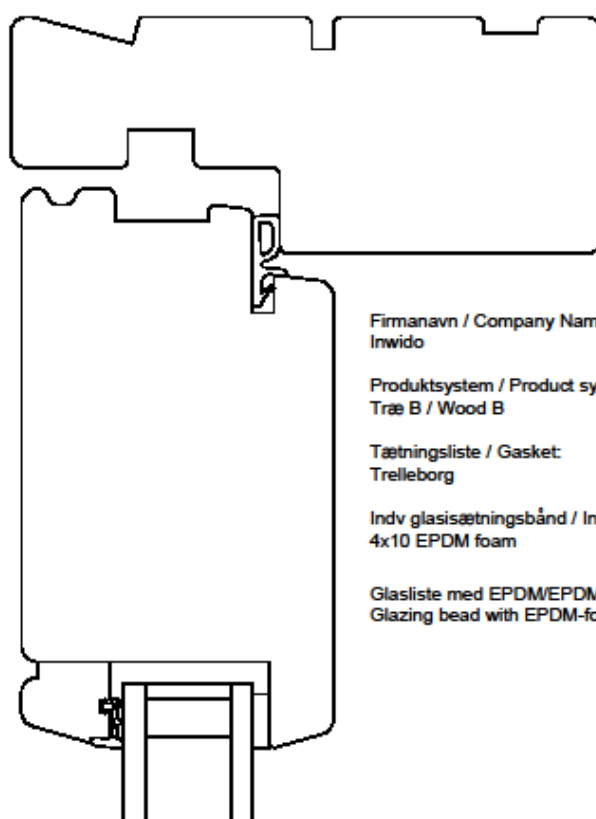




Bundsniit L22 / Bottom section cut L22



Top-Sidesnit L20-V20-V24 / Top-Side section cut L20-V20-V24



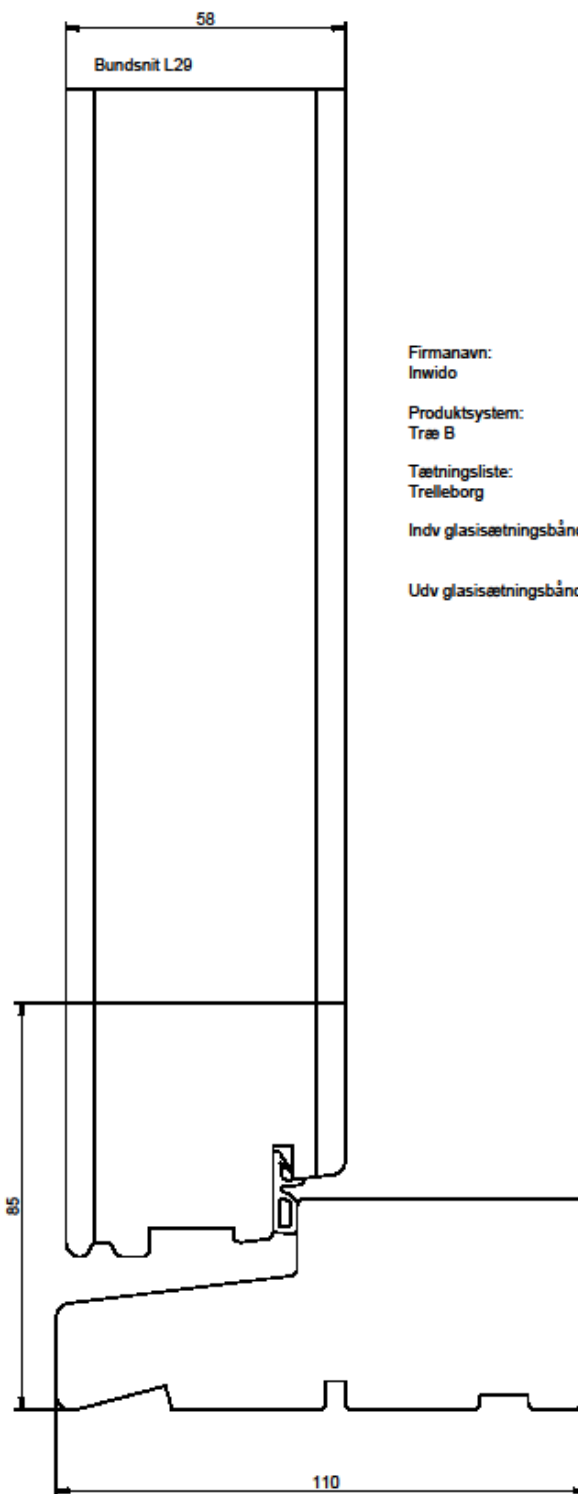
Firmanavn / Company Name:
Inwido

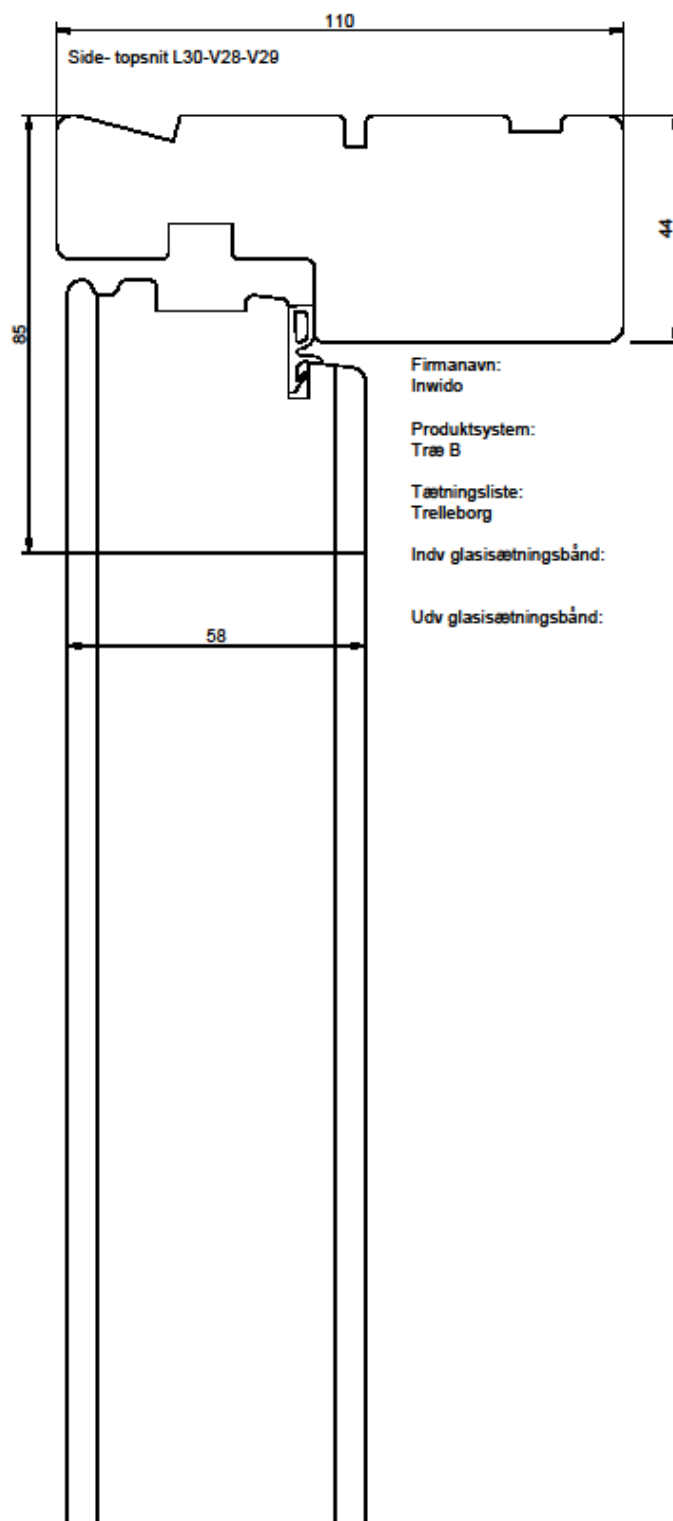
Produktsystem / Product system:
Træ B / Wood B

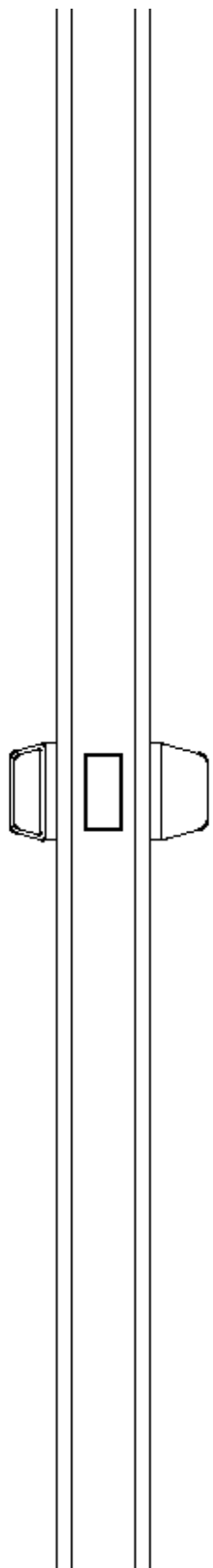
Tætningsliste / Gasket:
Trelleborg

Indv glasisætningsbånd / Inside glazing tape:
4x10 EPDM foam

Glasliste med EPDM/EPDM-foam
Glazing bead with EPDM-foam







Firmanavn:

Inwido

Produktsystem:

Tre B samt Tre/Alu 2-lags B med B rude

Tætningsliste:

-

Incl. montagebånd

EPDM Foam

Udv. montagebånd

EPDM Foam

Snit L3

The general conditions pertaining to assignments accepted by Danish Technological Institute shall apply in full to the technical testing and calibration at Danish Technological Institute and to the completion of test reports and calibration certificates within the relevant field.

DTI vouches for that employees performing tests for use with harmonized standards under notification No. 1235, pursuant to EU Regulation 305/2011, Article 43, meet all the requirements of capability, integrity and impartiality. See next page.

**Construction Product Regulation (CPR) – EU 305/2011 – Article 43:
Requirements for notified bodies.**

1. For the purposes of notification, a notified body shall meet the requirements set out in paragraphs 2 to 11.

party tasks in the process of assessment and verification of constancy of performance;
2. A notified body shall be established under national law and have legal personality.

(b) the necessary description of procedures according to which the assessment of performance is carried out, ensuring the transparency and the ability of reproduction of these procedures; it shall have appropriate policies and procedures in place that distinguish between the tasks it carries out as a notified body and other activities;
3. A notified body shall be a third-party body independent from the organisation or the construction product it assesses.

(c) the necessary procedures to perform its activities which take due account of the size of an undertaking, the sector in which it operates, its structure, the degree of complexity of the product technology in question and the mass or serial nature of the production process.

A notified body shall have the means necessary to perform the technical and administrative tasks connected with the activities for which it is notified in an appropriate manner and shall have access to all necessary equipment or facilities.
4. A notified body, its top-level management and the personnel responsible for carrying out the third party tasks in the process of assessment and verification of constancy of performance shall not be the designer, manufacturer, supplier, installer, purchaser, owner, user or maintainer of the construction products which it assesses, nor the authorised representative of any of those parties. This shall not preclude the use of assessed products that are necessary for the operations of the notified body or the use of products for personal purposes.

7. The personnel responsible for carrying out the activities in relation to which the body has been notified, shall have the following:

 - (a) sound technical and vocational training covering all the third party tasks in the process of assessment and verification of constancy of performance within the relevant scope for which the body has been notified;
 - (b) satisfactory knowledge of the requirements of the assessments and verifications they carry out and adequate authority to carry out such operations;
 - (c) appropriate knowledge and understanding of the applicable harmonised standards and of the relevant provisions of the Regulation;
 - (d) the ability required to draw up the certificates, records and reports to demonstrate that the assessments and the verifications have been carried out.

8. The impartiality of the notified body, its top-level management and assessment personnel shall be guaranteed.

The remuneration of the notified body's top-level management and assessment personnel shall not depend on the number of assessments carried out or on the results of such assessments.
5. A notified body and its personnel shall carry out the third party tasks in the process of assessment and verification of constancy of performance with the highest degree of professional integrity and requisite technical competence in the specific field and must be free from all pressures and inducements, particularly financial, which might influence their judgement or the results of their assessment and/or verification activities, especially from persons or groups of persons with an interest in the results of those activities.

9. A notified body shall take out liability insurance unless liability is assumed by the Member State in accordance with national law, or the Member State itself is directly responsible for the assessment and/or the verification performed.
6. A notified body shall be capable of carrying out all the third party tasks in the process of assessment and verification of constancy of performance assigned to it in accordance with Annex V in relation to which it has been notified, whether those tasks are carried out by the notified body itself or on its behalf and under its responsibility.

10. The personnel of the notified body shall be bound to observe professional secrecy with regard to all information gained in carrying out its tasks under Annex V, except in relation to the competent administrative authorities of the Member State in which its activities are carried out. Proprietary rights shall be protected.

11. A notified body shall participate in, or ensure that its assessment personnel is informed of, the relevant standardisation activities and the activities of the notified body coordination group established under this Regulation and shall apply as general guidance the administrative decisions and documents produced as a work result of that group.

(a) the necessary personnel with technical knowledge and sufficient and appropriate experience to perform the third