Evidence of Performance

Air permeability, Watertightness

Test Report
No. 15-003209-PR01

(PB-F05-02-en-01)

Client	Lattonedil DE GmbH Innovativring 24 91550 Dinkelsbühl Germany
Product	Sandwich panel for facades
Designation	ISOPAR® Elegant 60 mm core thickness, Type IPE060 – concealed fixing device
Performance-relevant product details	Material: sheet steel internal and external, with insulating core made of polyisocyanurate rigid foam PIR WLS 023
Overall dimensions (WxH)	2,120 mm x 3,620 mm
Special features	The bottom, top and lateral connections were not object of testing

Results

Air permeability of building components according to EN 12114:2000-03

Positive pressure:
Linear reference leakage Q_{10} = 0.05 m³/(h m)

Negative pressure:
Linear reference leakage Q_{10} = 0.02 m³/(h m)

Determination of the resistance of external wall systems to driving rain under pulsating air pressure in accordance with EN 12865: 2001-03

Limit of watertightness acc. to Procedure A
Up to incl. 600 Pa

ift Rosenheim
19.02.2016

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Construction Product Testing

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Basis

Test standard/s:
EN 12114:2000-03
EN 12865:2001-03
Equivalent national versions (e. g. DIN EN)
Test report 15-003209-PR01 (PB-F05-02-de-01) dated 14.01.2016

Representation

Instructions for use

This test report serves to demonstrate the above mentioned characteristics of sandwich panels for facades.

Validity

The data and results given refer solely to the tested and described specimen. Classification remains valid as long as the product and the above basis remain unchanged. This test/evaluation does not allow any statement to be made on any further characteristics regarding performance and quality of the construction presented, in particular the effects of weathering and ageing were not taken into account.

Notes on publication

The **ift**-Guidance Sheet "Advertising with ift test documents" applies. The cover sheet can be used as an abstract.

The report contains a total of 14 pages.

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1 Object

1.1 Description of test specimen

Product	sandwich panel for facades
Manufacturer	Lattonedil DE GmbH, 91550 Dinkelsbühl - Germany
Date of manufacture	November 2015
System	ISOPAR® Elegant 60 mm core thickness, Type IPE060 – concealed fixing device
Overall panel dimensions (W x H)	2,120 mm x 3,620 mm
Number of joints	2
Joint length	external: 2,500 mm, internal: 2,400 mm
Core thickness	60 mm
Total thickness	60 mm
Material	*internal:* sheet steel 0.5 mm, 280 MPa, galvanised strip 275 g/m^2 with 25 μm polyester coating *centre:* insulating core made of polyisocyanurate rigid foam PIR WLS 023, approx. 95% closed cell, connected to sheet steel face layers over the entire surface. *external:* sheet steel 0.6 mm, ≥ 280 MPa or ≥ 320 MPa, galvanised strip 275 g/m^2 with 25 μm polyester coating
Cladding width	each panel 1,000 mm
Fixing to frame construction	using fixing screws EJOT BSST78-16

The description is based on information provided by the client and inspection of the test specimen at the **ift** (item designations / numbers as well as material specifications were provided by the client unless stated *"**ift**-checked"*).

Test specimen representations are documented in the Annex "Representation of product/test specimen". The design details were examined solely on the basis of the characteristics / performance to be classified. The drawings are based on unchanged documentation provided by the client unless stated otherwise; the photographs were taken by the ift Rosenheim unless stated otherwise.

1.2 Sampling

The below sampling data were provided to the ift:

Sampling by:	Lattonedil DE GmbH, 91550 Dinkelsbühl - Germany
Date:	
Verification:	A sampling report has not been provided to the **ift**.
Delivered on:	23.11.2015
ift specimen No.:	15-003209-PK01 / WE: 40333-001

2 Procedure

2.1 Basis *) referring to method/s

Testing

EN 12114 : 2000-03 - Thermal performance of buildings - Air permeability of building components and building elements - Laboratory test method

EN 12865:2001-03
Hygrothermal performance of building components and building elements - Determination of the resistance of external wall systems to driving rain under pulsating air pressure

*) and the equivalent national versions, e.g. DIN EN

2.2 Brief description of procedure

EN 12114 : 2000-03 - Thermal performance of buildings - Air permeability of building components and building elements - Laboratory test method

Air permeability is tested on the visible face in accordance with EN 12114 at positive and negative pressures, in steps up to a maximum test pressure differential of 1,000 Pa. The test specimen is exposed to three pressure pulses Δp_{max} + 10 %. This is followed by measurement of airflow rate at the following test pressure differentials [Pa].
10, 18, 32, 56, 100, 178, 316, 562, 1000

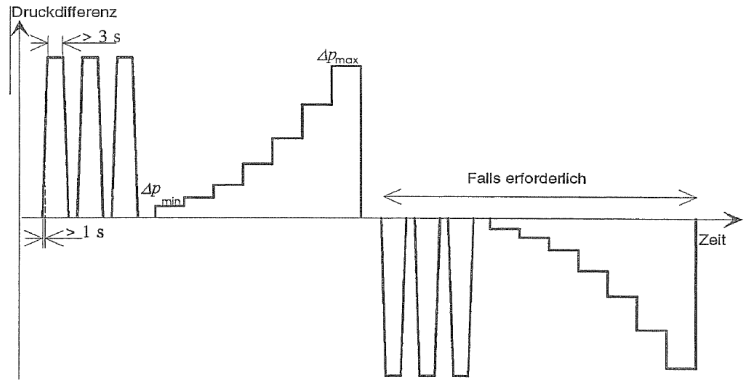


Illustration Test sequence for air permeability

Determination of the resistance of external wall systems to driving rain under pulsating air pressure in accordance with EN 12865: 2001-03

Test apparatus

The driving rain test apparatus shall include:

a) chamber with an adjustable opening to which the test specimen is fitted;

b) means of providing a controlled differential air pressure across the test specimen with a control uncertainty of ± 5 %;

NOTE 1 The control should be able to keep the pulsating pressure difference within the above mentioned accuracy even when the air permeability varies during the test due to the water film on the surface and the water absorbed by the test specimen.

c) device able to apply rapid controlled changes of the differential air pressure operating between defined limits (see clause 6.2 and Figure 1 for the sequence of a typical pressure pulse);

d) spraying system applying a continuous film of water all over the surface of the test specimen;

The applied amount of water consists of two parts:
- run-off water, 1,2 l/(m·min), evenly distributed at the top of the test specimen;
- driving rain, 1,5 l/(m² ·min), evenly distributed over the external surface of the test specimen.

NOTE 2 A spraying device, usually calibrated in litres per minute, which complies with this requirement is shown in annex A.

The distribution of driving rain can be controlled using driving rain gauges mounted on a panel. The height and width of the gauges shall not exceed 200 mm. The deviation from nominal values shall not exceed 0,3 l/(m·min) for run off water and 0,5 l/(m²·min) for driving rain.

e) devices to measure the amount of supplied water to an accuracy of ± 10 %;

f) means of measuring the differential air pressure between the two faces of the test specimen to an accuracy of ± 5 %;

g) a supply of water which is clean enough to ensure that all nozzles spray correctly;

NOTE 3 It may be necessary to use demineralized or deionised water to prevent clogging of nozzles.

h) scale or any weighing device able to determine the mass of the test specimen to an accuracy of at least ± 0,1 %.

Illustration Test apparatus

Test procedure

Fit the test specimen to the opening of the apparatus. Spray water on the specimen at the specified rate and, after an initial period with no pressure difference, apply the pulsating air pressure difference steps and the time intervals according to Table 1. Each pressure pulse consists of four stages: a rising pressure stage of (3 ± 1) s, a maximum pressure stage of (5 ± 1) s, a falling pressure stage of (2 ±1) s and a zero pressure stage of (5 ± 1) s. The total duration of a pulse shall be (15 ± 2) s. The test procedure is shown also graphically in Figure 1. Two test procedures are defined, procedure A for qualitative short time testing and procedure B for quantitative testing where water absorbed by the test specimen or penetrating the test specimen during the test has to be determined.

Table 1 - Test procedures

	Procedure A		Procedure B	
Pressure difference Pa	**Time interval** min	**Total time at end of steps** min	**Time interval** min	**Total time at end of steps** min
0	20	20	60	60
0 to 150	10	30	60	120
0 to 300	10	40	60	180
0 to 450	10	50	60	240
0 to 600	10	60	60	300
600 + i · 150 i= 1,2,3,…n	10	60 + i · 10	60	300 + i · 60

Record the temperature of the spraying water before and after the test, the air temperature and the relative humidity of the laboratory during the test.

Observe the surface of the test specimen and note the time, the maximum air pressure difference when water penetration occurs and the location of the penetration areas.

Illustration Test procedure

2.3 Test sequence

No.	Type of test	Standard
1	Air permeability of building components	EN 12114
2	Determination of the resistance of external wall systems to driving rain under pulsating air pressure	EN 12865

3 Detailed results

Test record air permeability of linear joints

Project No.	15-003209-PR01	**Task No.**	15-003209
Client	Lattonedil DE GmbH		
Basis of test	EN 12114:2000-03 Thermal performance of buildings - Air permeability of building components and building elements - Laboratory test method		
Test equipment	Pst/020920 - AWW-Test rig Window test rig 1		
Test specimen	Panel in surrounding frame, dimensions of panel external 2 m x 2.5 m		
Test specimen No.	40333-001		
Date of test	23.11.2015		
Testing personnel in charge	Peter Marquardt		
Test engineer	Peter Marquardt		

Information on test configuration / Test method

Test method There are no deviations from the test method according to the standard/basis.

Ambient conditions Temperature 18,3 °C Air humidity 35,8 % Air pressure 967 hPa

The ambient conditions are in accordance with the standard requirements.

Testing

Test according to DIN EN 12114

	Width	x	Height		
Dimensions of test specimen	2120	x	3620	in mm	Overall dimensions
	Number		Length		
Joint length	2	x	2400	in mm	

Joint length	4,80	m
Area	7,67	m²

p_{min} selected:	10	Pa
p_{max} selected:	1000	Pa

Pressure pulses	0	1	2	3	4	5	6	7	8

PRESSURE

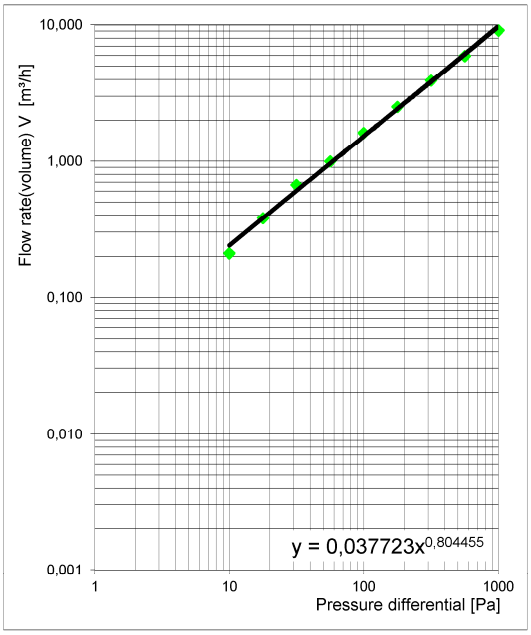
Flow rate (volume) 1	Zero measurement (joints covered)								
Pa	10	18	32	56	100	178	316	562	1000
V in m³/h	-0,11	-0,05	0,02	0,15	0,30	0,56	0,88	1,38	2,12

Flow rate (volume) 2	Joints not covered								
Pa	10	18	32	56	100	178	316	562	1000
V in m³/h	0,10	0,33	0,69	1,15	1,91	3,07	4,82	7,33	11,24

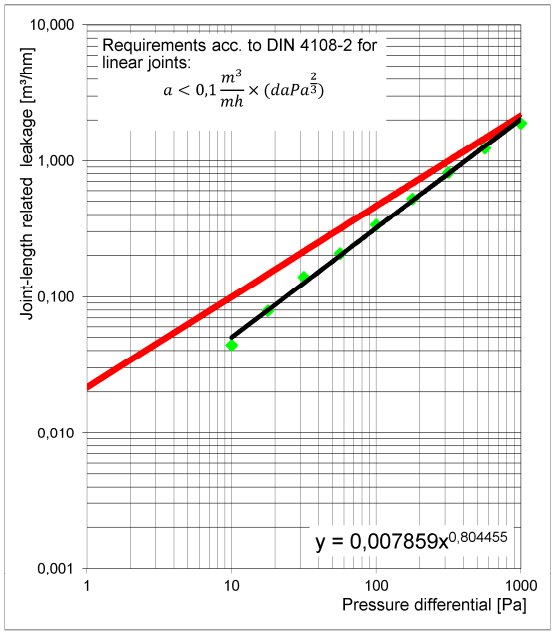
Joint length 4,80 m

Flow rate (volume) 2 - 1	Leakage of joint								
Pa	10	18	32	56	100	178	316	562	1000
V in m³/h	0,2110	0,3800	0,6710	0,9980	1,6180	2,5140	3,9400	5,9580	9,1160
Joint length-related in m³/hm	0,0440	0,0792	0,1398	0,2079	0,3371	0,5238	0,8208	1,2413	1,8992

V: corrected air flow rate under reference conditions through test device (20 °C / 50 % rel. humidity / 1013 hPa air pressure)



Graph 1 Flow rate (volume) V



Graph 2 Joint-length related leakage Q

Results leakage of linear joints

Characteristic values	Results			
	Value	95%-95% confidence interval		Unit
Air flow coefficient C [1)2)]	0,0377	±	0,0072	m³/(h Pa^n)
Leakage exponent n [2)]	0,8045	±	0,039	--
Equivalent leakage area A_L [3)]	16,35	±	3,11	mm²
[1)] Air flow rate of test specimen at 1 Pa pressure differential [2)] C and n n acc. to empirical leakage equation V = C x Δp^n [3)] at 10 Pa pressure differential				
Linear reference leakage at 10 Pa Q_{10}	0,0501			m³/(h m)
Linear reference leakage at 100 Pa Q_{100}	0,3194			m³/(h m)

The linear joint is practically airtight as set out in DIN 4108-2, Clause 7, requirement a < 0.1 m³/hm x (daPa$^{2/3}$)

OPTIONAL NEGATIVE PRESSURE

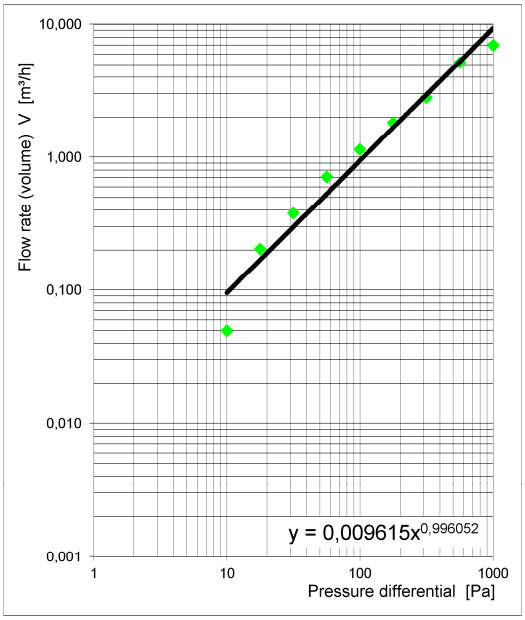
Flow rate (volume) 1	Zero measurement (joints covered)								
Pa	10	18	32	56	100	178	316	562	1000
V in m³/h	0,19	0,23	0,34	0,43	0,60	0,84	1,28	1,66	2,56

Flow rate (volume) 2	Joints not covered								
Pa	10	18	32	56	100	178	316	562	1000
V in m³/h	0,24	0,44	0,72	1,15	1,75	2,67	4,11	6,85	9,56

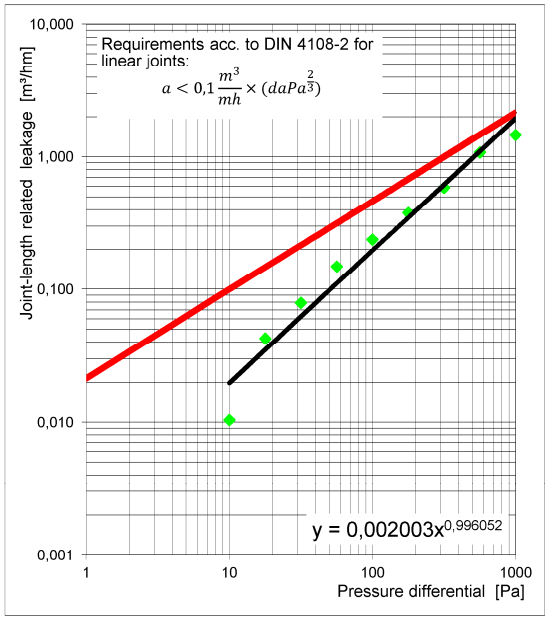
Joint length 4,80 m

Flow rate (volume) 2 - 1	Leakage of joints								
Pa	10	18	32	56	100	178	316	562	1000
V in m³/h	0,0500	0,2050	0,3810	0,7140	1,1440	1,8230	2,8250	5,1860	6,9990
joint length-related in m³/hm	0,0104	0,0427	0,0794	0,1488	0,2383	0,3798	0,5885	1,0804	1,4581

V: corrected air flow rate under reference conditions through test device (20 °C / 50 % rel. humidity / 1013 hPa air pressure)



Graph 1 Flow rate (volume) V



Graph 2 Joint-length related leakage Q

Results Leakage of linear joints

Characteristic values	Results Value	95% confidence interval	Unit
Air flow coefficient C [1)2)]	0,0096	± 0,0080	m³/(h Pa^n)
Leakage exponent n [2)]	0,9961	± 0,17	--
Equivalent leakage area A_L [3)]	6,48	± 5,43	mm²
[1)] Air flow rate of test specimen at 1 Pa pressure differential [2)] C and n acc. to empirical leakage equation V = C x Δp^n [3)] at 10 Pa pressure differential			
Linear reference leakage at 10 Pa Q_{10}	0,0198		m³/(h m)
Linear reference leakage at 100 Pa Q_{100}	0,1967		m³/(h m)

The linear joint is practically airtight as set out in DIN 4108-2, Clause 7, requirement a < 0.1 m³/hm x (daPa$^{2/3}$).

Determination of the resistance of external wall systems to driving rain under pulsating air pressure - Test as per EN 12865

Project No.	15-003209-PR01	**Task No**	15-003209
Client	Lattonedil DE GmbH		
Basis of test	EN 12865:2001-03 Hygrothermal performance of building components and building elements - Determination of the resistance of external wall systems to driving rain under pulsating air pressure		
Test equipment	Pst/020920 - AWW test rig window test rig 1 TM/022478 - Digital Thermometer GTH 215PT100 W/020539 - Crane scale HUM3000K1000		
Building component identification	Panel in surrounding frame, dimensions panel external 2 m x 2,5 m		
Test specimen No.	40333-001		
Date of test	23.11.2015		
Testing personnel in charge	Peter Marquardt		
Test engineer	Peter Marquardt		

Information on test configuration / Test method

Test method

standard/basis.
The reading accuracy of the crane scale is 1 kg.

Ambient conditions

Temperature	18,3 °C	Air humidity	35,8 %	Air pressure	967 hPa
Water temperature	12,1 °C	before	11,9 °C	after	

The ambient conditions are in accordance with the standard requirements.

Test specimen

Number		1	
Weight before test	m_0	326	kg
Weight after test	m_1	326	kg
Water absorption	w_A	0,0	kg / m²

Dimensions of test specimen 2000 mm x 2500 mm Overall dimensions panel
Area of test specimen 5 m²

Testing

Watertightness 450 l / h bei $\frac{1,5\ l}{(m^2 \cdot \min)}$

Run-off water 144 l / h bei $\frac{1,2\ l}{(m \cdot \min)}$

Spray method Method A

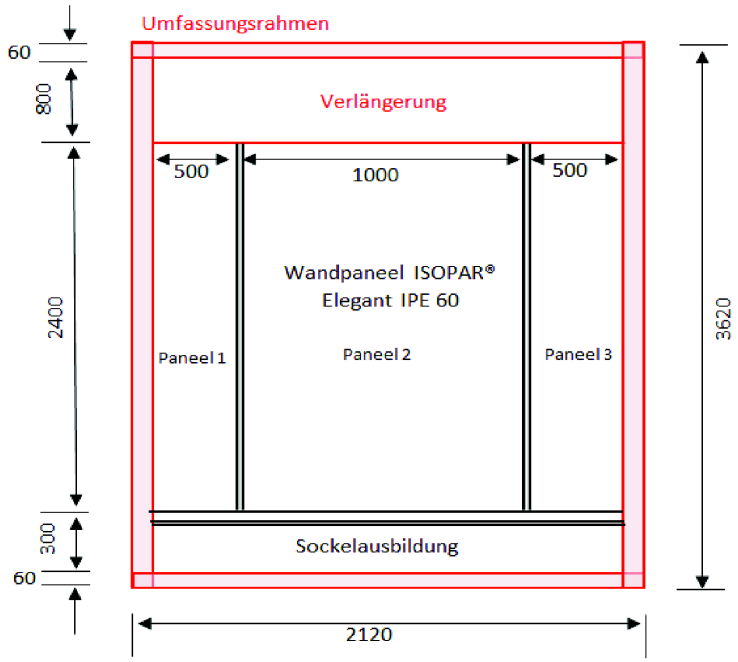
Table: Testing

Pressure in Pa	Time intervall in min	Total time at end of steps in min	Observation
0	20	20	no visible water penetration
0 to 150	10	30	no visible water penetration
0 to 300	10	40	no visible water penetration
0 to 450	10	50	no visible water penetration
0 to 600	10	60	no visible water penetration
0 to 750	10	70	Water penetration on left-hand bottom joint, internal
0 to 900	10	80	
0 to 1050	10	90	
0 to 1200	10	100	
0 to 1350	10	110	

No water penetration detected at up to 600 Pa

Darstellung Produkt / Probekörper

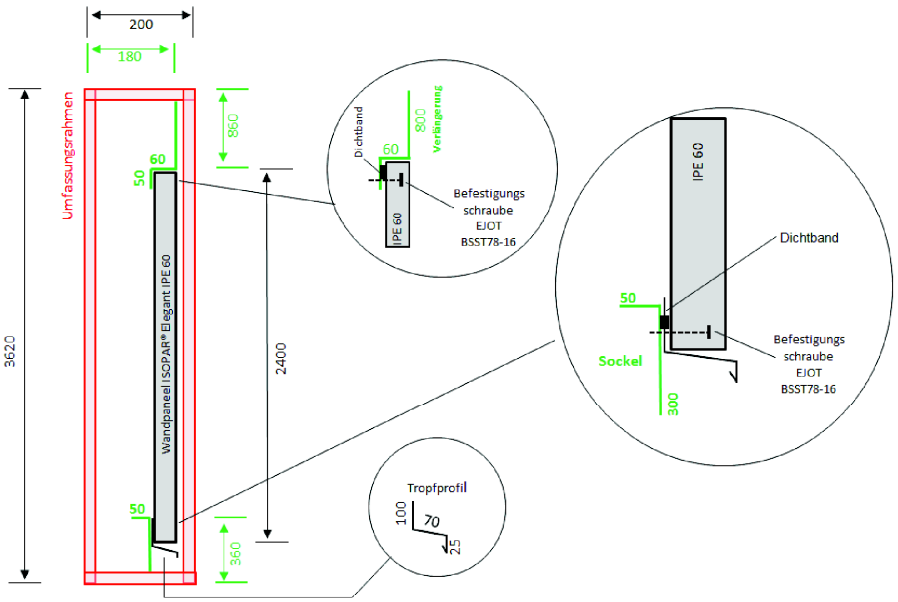
Draufsicht



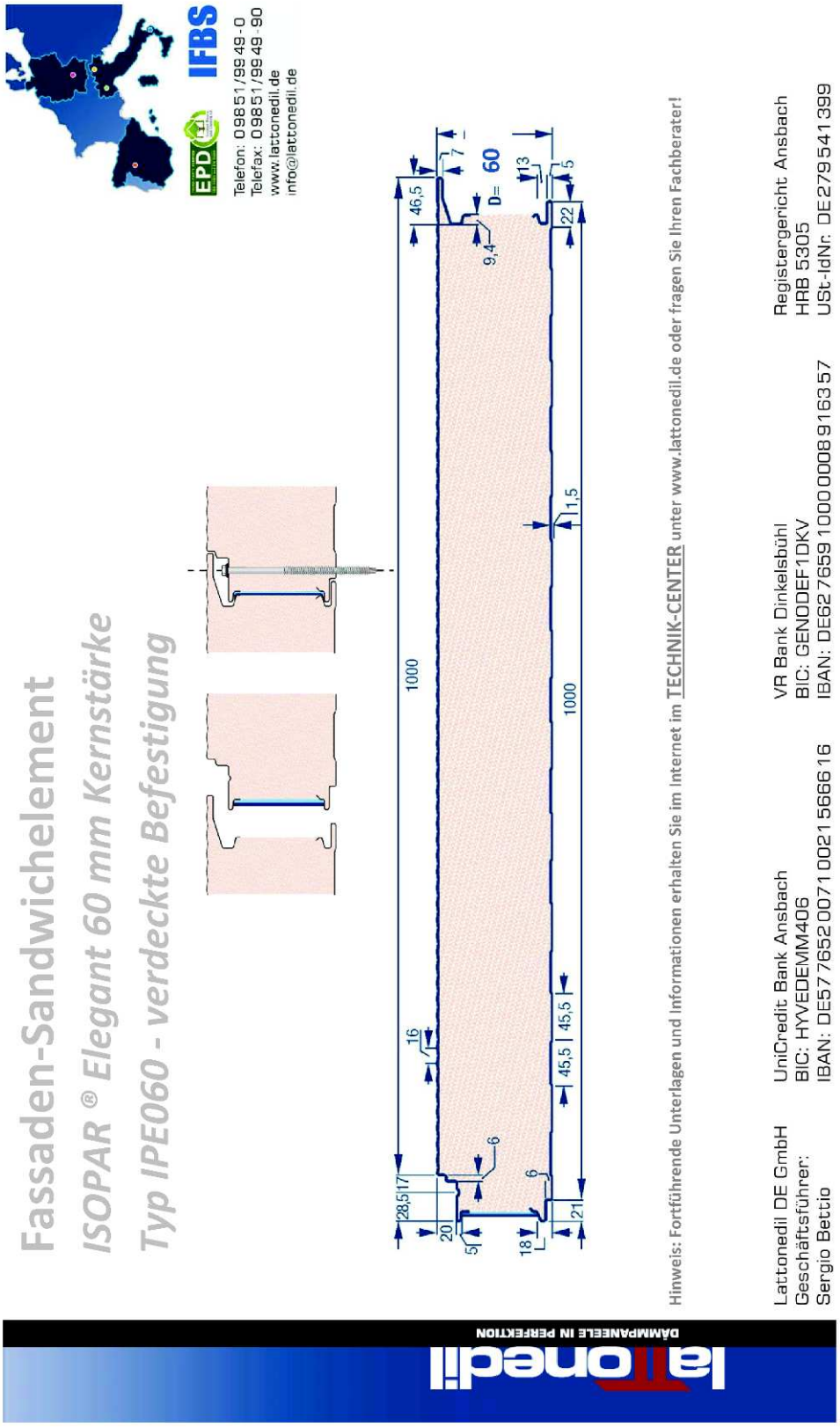
Drawing 1 Test specimen

Darstellung Produkt / Probekörper

Schnittzeichnung



Drawing 2 Vertical section
The bottom, top and lateral connections were not object of testing



Drawing 3 Detail: Sandwich panel for facades

Photo 1
Test specimen, seen from outside

Photo 2
Test specimen, seen from inside

Photo 3
Test specimen on test rig – joint covered or sealed for zero measurement

Photo 4
Test specimen on test rig – joint not covered

Photo 5
Water penetration during pressure increase to 750 Pa at left-hand bottom joint