

CERTIFICATE

Airtightness measurement

according to DIN EN 13829 (2001)

The building / object:

has been measured on 29.09.2021.

The following air change rate for the volume-related leakage flow is achieved:

$n_{50} = 0,65 \text{ 1/h}$

Note: The measurement result does not exclude (hidden) defects in the construction.

Place / date

Signature (stamp)

Measurement of air permeability - Object data

according to DIN EN 13829 (2001)

Wöhler
Marcus Fitze
Hauptstraße
33100 Paderborn

Customer

Company	Wöhler
Name	Marcus Fitze
Street	Hauptstraße
Postcode / city	33100 Paderborn

Type of order

Test standard	DIN EN 13829
Test procedure	A
Type of measurement	Multi-point test
Requirement	

Information on the test object

Building volume V	250,00 m ³ +/- 3 %
Floor area AF	---
Envelope area AE	---
Building height h	---
Installation height	---

Environmental conditions

Inside temperature	23,1 °C
Outside temperature	23,3 °C
Barometric pressure	984,49 hPa
Wind speed	0 Bft
Relative air humidity	41,9 %

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Inspected building areas

Installation location of the device

Used measurement devices

Device	Type	Serialnumber	Calibration date
WoehlerBC600	Blower Check	840 (EN)	29.09.2021

Type of heating, ventilation and air conditioning system

Ventilation system

Other devices

Airtightness measurement - Negative pressure measurement

according to DIN EN 13829 (2001)

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Negative pressure measurement

Zero flow pressure differences before measurement series

$\Delta p_{0,1} = 0,0 \text{ Pa}$	$\Delta p_{0,1+} = 0,0 \text{ Pa}$	$\Delta p_{0,1-} = 0,0 \text{ Pa}$
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Multi-point test

Step	Target pressure	Actual pressure	Flow
1	-10,0 Pa	-9,9 Pa	-40,1 m³/h
2	-18,4 Pa	-18,4 Pa	-71,2 m³/h
3	-26,8 Pa	-26,9 Pa	-89,3 m³/h
4	-35,2 Pa	-35,2 Pa	-107,2 m³/h
5	-43,6 Pa	-43,7 Pa	-121,6 m³/h
6	-52,0 Pa	-52,1 Pa	-135,5 m³/h

Zero flow pressure differences after measurement series

$\Delta p_{0,2} = 0,0 \text{ Pa}$	$\Delta p_{0,2+} = 0,0 \text{ Pa}$	$\Delta p_{0,2-} = 0,0 \text{ Pa}$
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Leakage curve parameters		Confidence interval (95%)			
Flow coefficient Cenv:	8,1 m³/(h*Pa^n)	min.	5,8	max.	11,5
Leakage coefficient CL:	8,0 m³/(h*Pa^n)	min.	5,7	max.	11,3
Flow exponent n:	0,72	min.	0,62	max.	0,82

Airtightness measurement - Positive pressure measurement

according to DIN EN 13829 (2001)

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Positive pressure measurement

Zero flow pressure differences before measurement series

$\Delta p_{0,1} = 0,0 \text{ Pa}$	$\Delta p_{0,1+} = 0,0 \text{ Pa}$	$\Delta p_{0,1-} = 0,0 \text{ Pa}$
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Multi-point test

Step	Target pressure	Actual pressure	Flow
1	10,0 Pa	10,0 Pa	86,4 m³/h
2	18,4 Pa	18,3 Pa	115,8 m³/h
3	26,8 Pa	26,9 Pa	141,0 m³/h
4	35,2 Pa	35,3 Pa	160,8 m³/h
5	43,6 Pa	43,6 Pa	180,5 m³/h
6	52,0 Pa	52,1 Pa	199,7 m³/h

Zero flow pressure differences after measurement series

$\Delta p_{0,2} = 0,0 \text{ Pa}$	$\Delta p_{0,2+} = 0,0 \text{ Pa}$	$\Delta p_{0,2-} = 0,0 \text{ Pa}$
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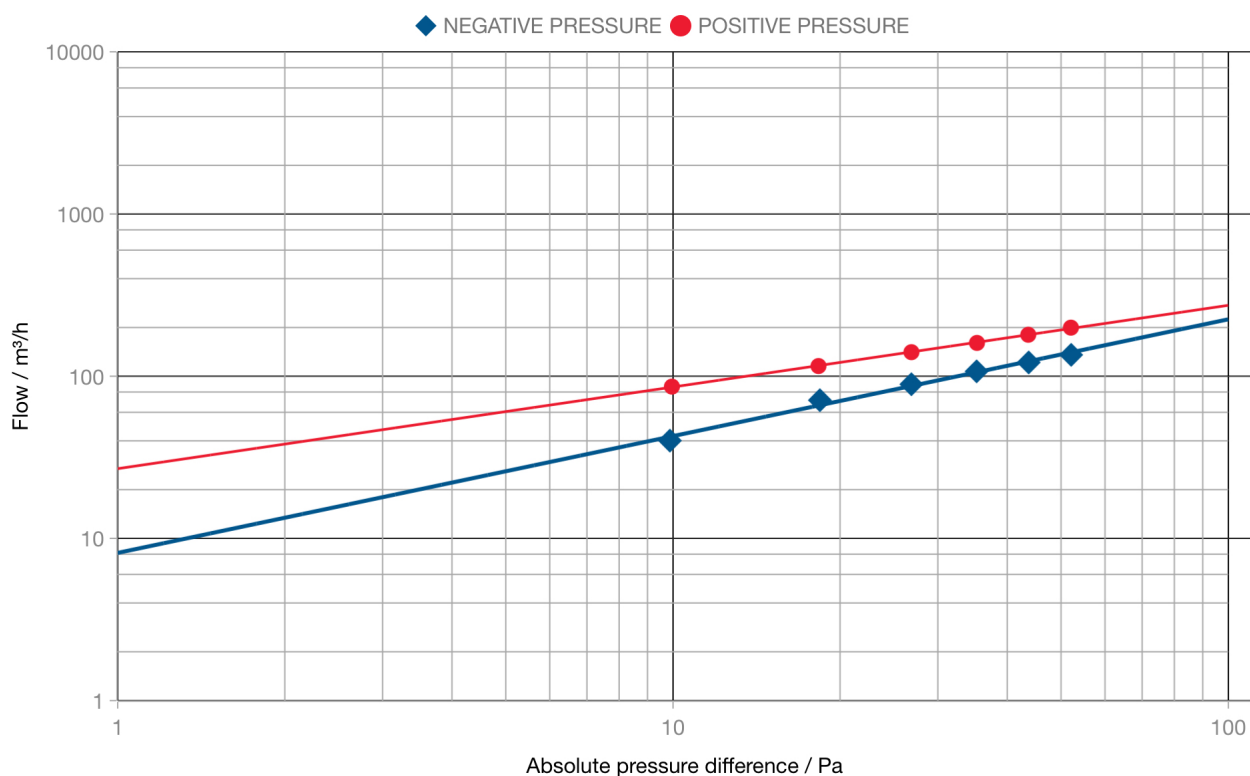
Leakage curve parameters		Confidence interval (95%)			
Flow coefficient Cenv:	26,9 m³/(h*Pa ⁿ)	min.	25,3	max.	28,6
Leakage coefficient CL:	26,4 m³/(h*Pa ⁿ)	min.	24,8	max.	28,0
Flow exponent n:	0,50	min.	0,49	max.	0,52

Measurement of air permeability - Leakage curve and measurement results

according to DIN EN 13829 (2001)

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Leakage curve



Measurement results

Derived values

		Average value	Negative pressure	Positive pressure
V50	m³/h	161,8 +/- 5 %	134,6 +/- 5 %	189,0 +/- 5 %
n50	1/h	0,65 +/- 6 %	0,54 +/- 6 %	0,76 +/- 6 %
q50	m³/(h*m²)			
w50	m³/(h*m²)			
ELA10	cm²	43,04	28,79	57,29
ELAE10				
ELAF10				
r²		0,994	0,990	0,999

Measurement of air permeability - Building preparation

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No.	Component / opening / installation etc.	Action	Comment
1	External doors/windows/roof windows		
2	Inside doors		
3	Windows in non-heated areas		
4	Flaps/valves/hatches to aside areas within the system limit of attic level		
5	Flaps/valves/hatches outside of the system limit (e.g. garage, storage rooms, asides)		
6	Door to non-heated basement/staircase		
7	Key holes		
8	Installations in suspended ceilings		
9	Duct ventilation valves in heated areas		
10	Pipes/ducts to non-heated areas		
11	Strap openings of shutters		
12	Laundry shafts to non-heated areas		
13	Letterbox flaps/slots/cat flaps		
14	Centralized vacuum cleaner		
15	Ventilation of elevator shafts, smoke subtract		
16	Tumble dryer in heated area with outgoing air		
17	Lids of shafts with pumps/installations in the heated building section		
18	Gaps of lowerable floors in storage rooms		
19	Room air supplied heaters for solid fuel, oil and gas (stove, oven, fire place, water heater)		
20	Opening for air supply or exhaust air hood		
21	Opening supply air in the heating room / fuel storage within the system		
22	Back heating opening of chimneys in heated areas		
23	Outdoor air outlets (ALD) free ventilation incl. rebate ventilators		
24	Exhaust air cooker hood (kitchen)		
25	Single ventilators, exhaust openings, ... (DIN 18017-3 or BaRL)		
26	Single ventilators, exhaust openings, ... (DIN 1946-6)		
27	Supply air ventilations for ventilation of single rooms		
28	Air diffusers for domestic ventilation DIN1946-6, HVAC systems in non-residential construction		
29			
30			
31			
32			

Measurement of air permeability - Zero flow pressure difference according to DIN EN 13829 (2001)

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Zero flow pressure difference, Negative pressure and Positive pressure

Step	Before test	After test	Step	Before test	After test
1	0,0 Pa	0,0 Pa	16	0,0 Pa	0,0 Pa
2	0,0 Pa	0,0 Pa	17	0,0 Pa	0,0 Pa
3	0,0 Pa	0,0 Pa	18	0,0 Pa	0,0 Pa
4	0,0 Pa	0,0 Pa	19	0,0 Pa	0,0 Pa
5	0,0 Pa	0,0 Pa	20	0,0 Pa	0,0 Pa
6	0,0 Pa	0,0 Pa	21	0,0 Pa	0,0 Pa
7	0,0 Pa	0,0 Pa	22	0,0 Pa	0,0 Pa
8	0,0 Pa	0,0 Pa	23	0,0 Pa	0,0 Pa
9	0,0 Pa	0,0 Pa	24	0,0 Pa	0,0 Pa
10	0,0 Pa	0,0 Pa	25	0,0 Pa	0,0 Pa
11	0,0 Pa	0,0 Pa	26	0,0 Pa	0,0 Pa
12	0,0 Pa	0,0 Pa	27	0,0 Pa	0,0 Pa
13	0,0 Pa	0,0 Pa	28	0,0 Pa	0,0 Pa
14	0,0 Pa	0,0 Pa	29	0,0 Pa	0,0 Pa
15	0,0 Pa	0,0 Pa	30	0,0 Pa	0,0 Pa
Positive, negative and total averages					
Before test			After test		
$\Delta p_{0,1+} = 0,0 \text{ Pa}$			$\Delta p_{0,2+} = 0,0 \text{ Pa}$		
$\Delta p_{0,1-} = 0,0 \text{ Pa}$			$\Delta p_{0,2-} = 0,0 \text{ Pa}$		
$\Delta p_{0,1} = 0,0 \text{ Pa}$			$\Delta p_{0,2} = 0,0 \text{ Pa}$		

Measurement of air permeability - Comments

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Multi-point test - comments
