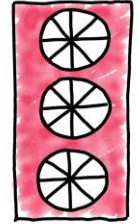


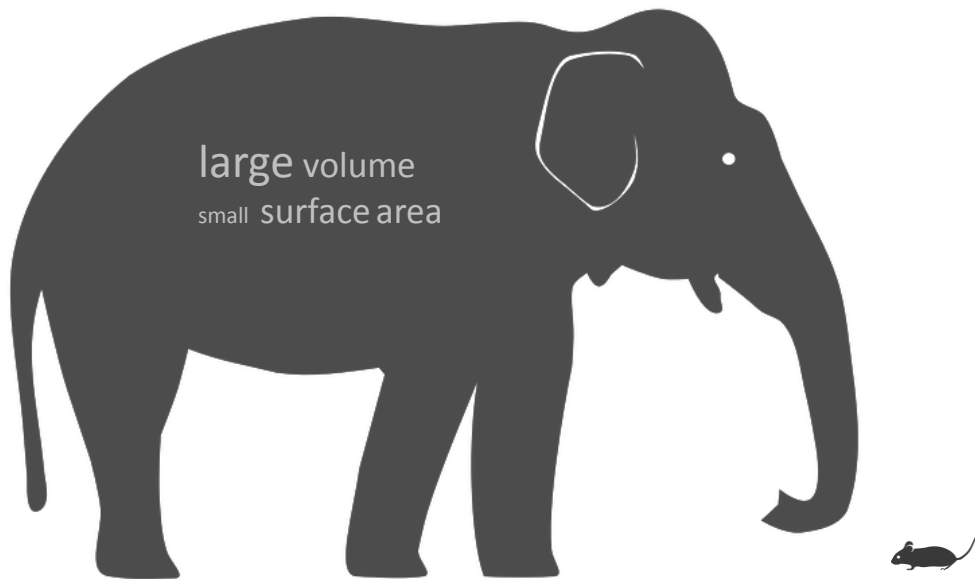
# BlowerDoor Final Measurement in Large Buildings



© BlowerDoor GmbH

## What are big buildings?

- According to DIN EN 13829 (Chap. 5.3.4): Buildings with an internal volume of  $> 4,000 \text{ m}^3$  are considered large buildings
- According to ISO 9972 (NA. 8.3): Buildings with a length and a width of at least 30 m and a height of at least 15 m each
- According to DIN 4108-7 (Chap. 4): Buildings with an internal volume of 1,500 or more



Large buildings easily achieve **low air change rates** due to their **small surface-area-to-volume ratio**.

In order to achieve a good quality of the building envelope, it makes sense to also make demands on the **air permeability of the building envelope**.

## Examples of large buildings

- Apartment buildings
- Administration building
- Manufacturing plants
- Storehouses
- Malls
- Residential care homes/  
nursing homes
- hospitals
- swimming pools
- sports halls
- schools
- large residential  
buildings



*Residential high-rise  
building: 30.000 m<sup>3</sup>*



*Logistics hall: 40.000 m<sup>3</sup>*



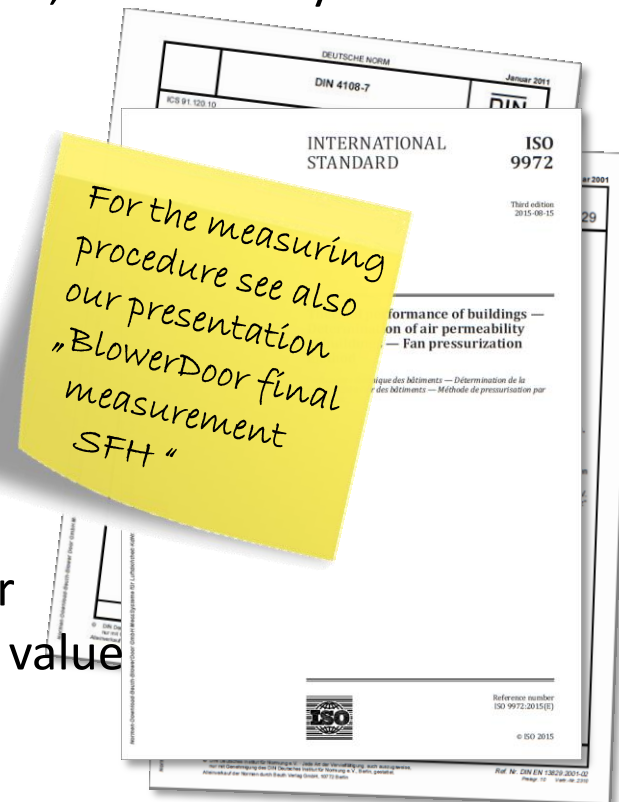
*School: 70.000 m<sup>3</sup>*

## Purpose of measurement

The BlowerDoor final measurement takes place at the end of the construction process. Its purpose is mainly to **prove compliance with limit values** (e.g. air permeability) for a regulation, a standard, or a subsidy programme, etc.

**As with the measurement of smaller buildings, the measurement also includes:**

- **Leakage detection and documentation** for plausibility control of the measurement result
- **Depressurization and pressurization measurement series** depending on the standard or requirement for **determining the characteristic value** (e.g. the air change rate) for comparison with the required limit value
- **Test report** conforming to standards

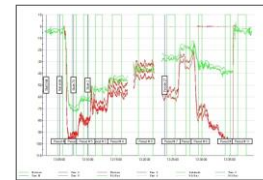




# Requirements and peculiarity for the air permeability measurement of large buildings

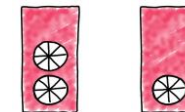


- Measurement with multiple BlowerDoor fans and use of the TECLOG software



- More complex building preparation and leakage detection than for small buildings

- Mounting situation/location of the measuring system



- Special features when measuring the baseline

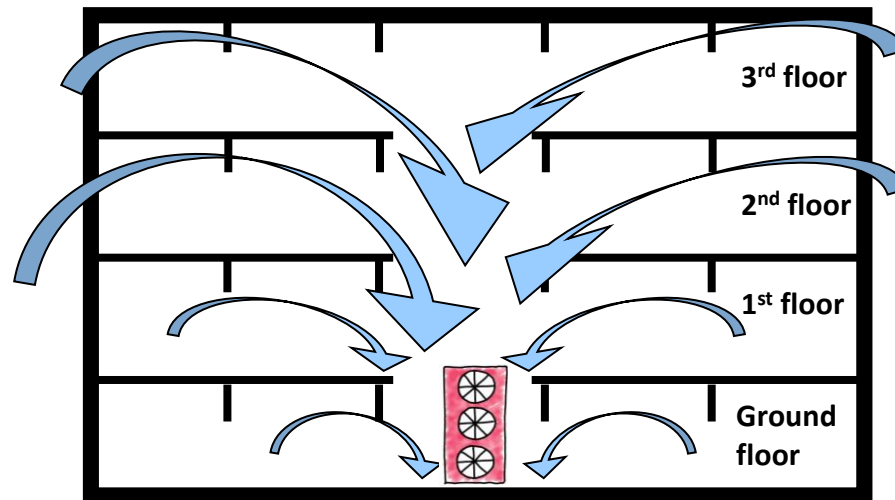
- Wind 

- Thermal lift 

## Controlling the measuring devices and recording the measurement series with the TECLOG software

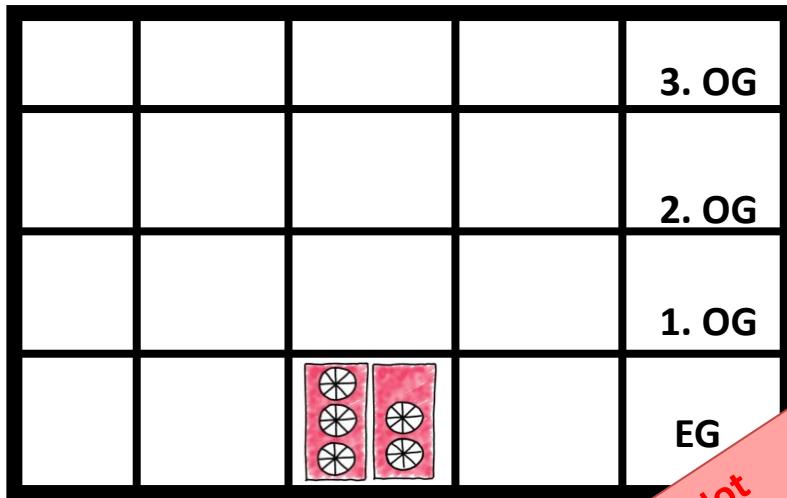


## Central position of measuring system



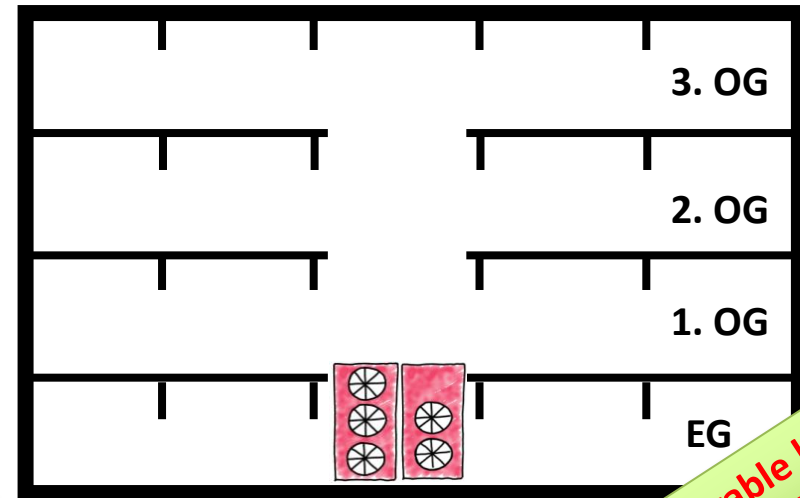
Install the measuring system as centrally as possible (e.g. in the main staircase), so that air reflow paths to the measuring devices are available from all sides of the building envelope.

## „Single-zone building“



Multi-zone building

**Not  
measurable!**



Single-zone building

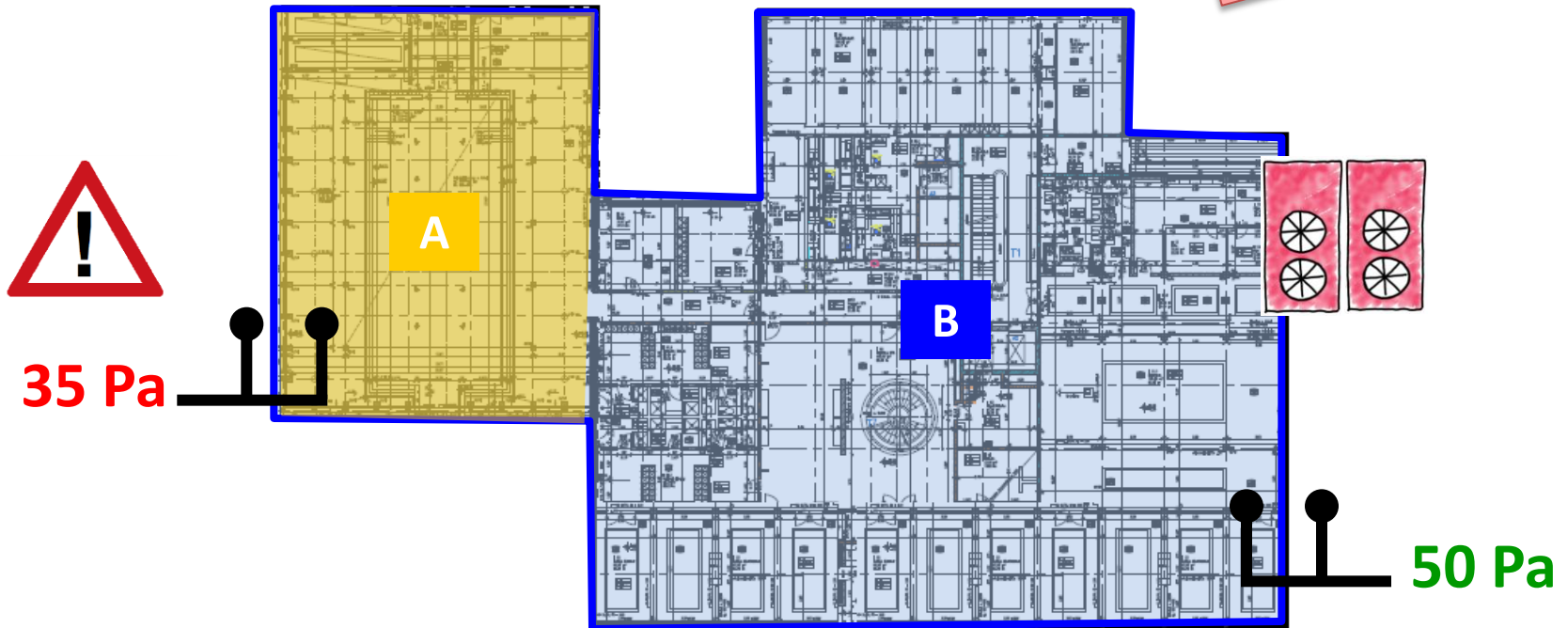
**Measurable by  
opening the  
interior doors**

The entire building must be able to be measured as a single Zone!  
In multi-zone buildings such as office buildings or schools,  
a single-zone building can be created by opening all interior doors.



If the pressure decrease in the building ist too high ...

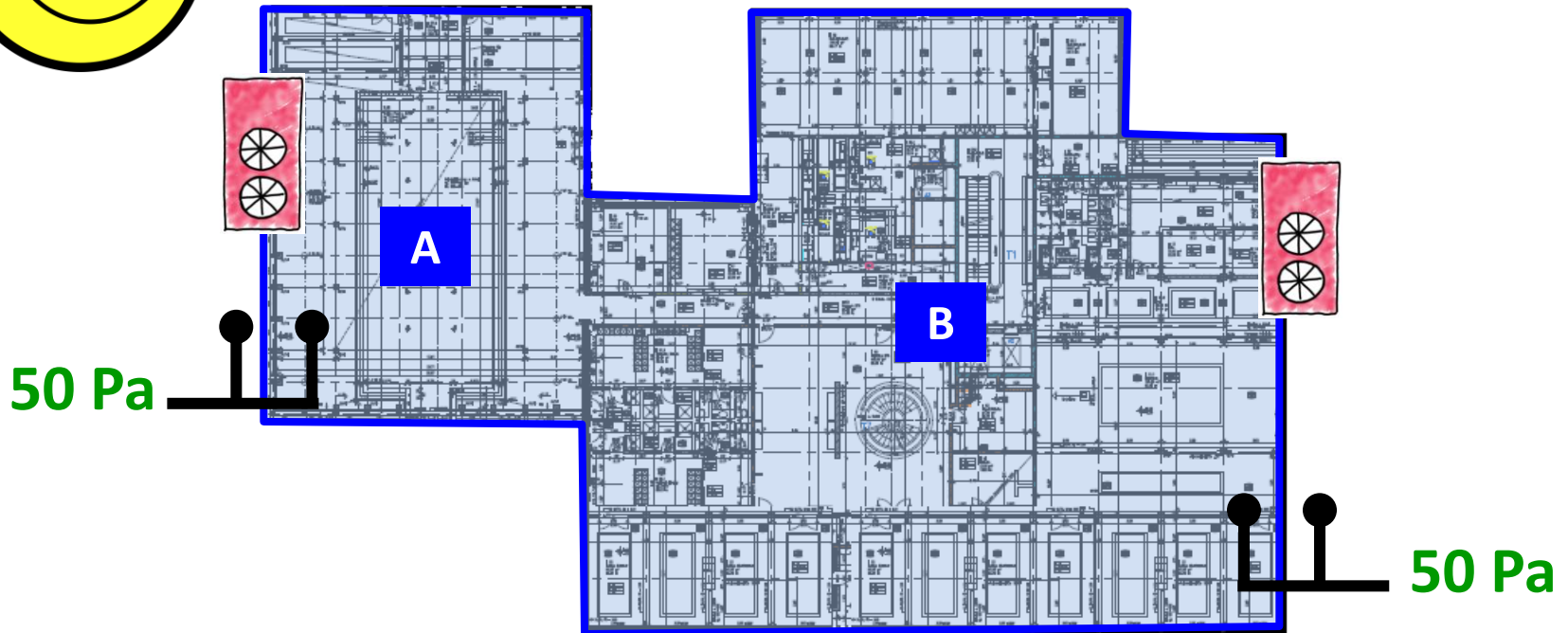
Measurement  
NOT  
feasible!



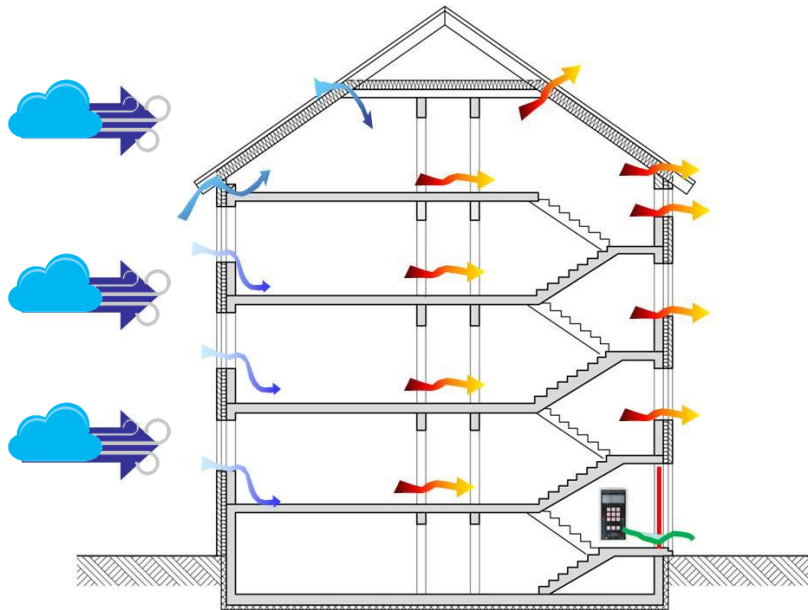
... then the measuring devices need to be separated!



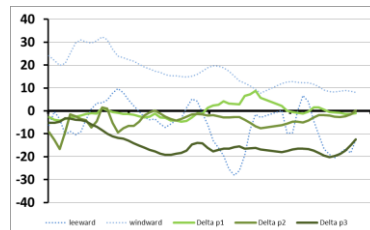
Measurement  
realizable!



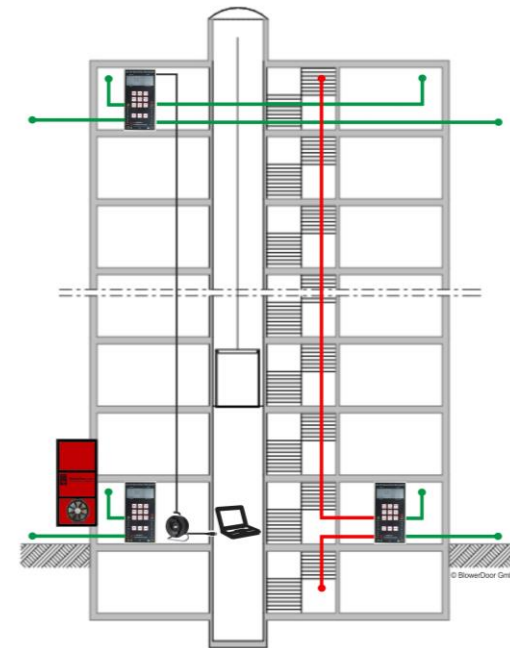
# Wind on the building



Wind on the building causes **different pressure differences on the sides of the building**

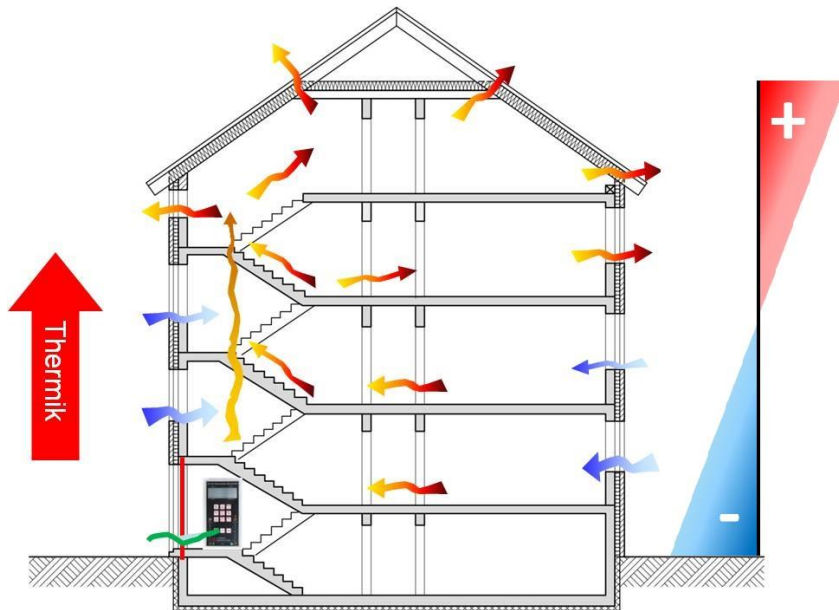


**4 measuring points for building pressure!**



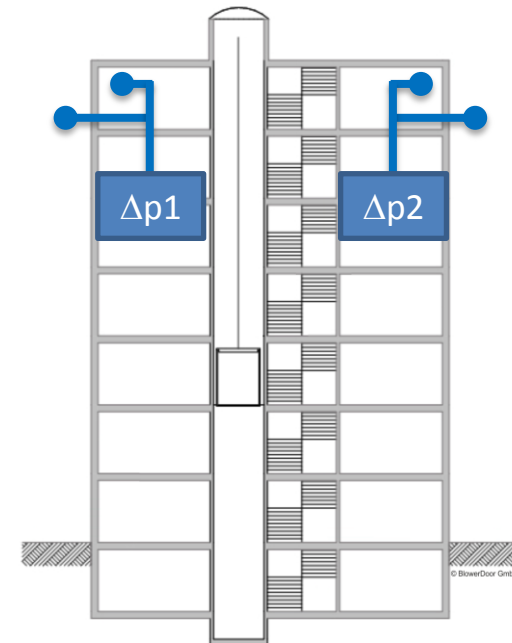
To avoid large differences in building pressure, pressures on all sides of the building are measured and averaged in TECLOG software.

## Thermics in high buildings leads to high natural pressure diff.



Even small temperature differences between inside and outside produce large natural pressure differences.

## Control measuring points on the top floor



Control measuring points on the top floor are provided for monitoring the pressure differences in high buildings due to thermal effects.



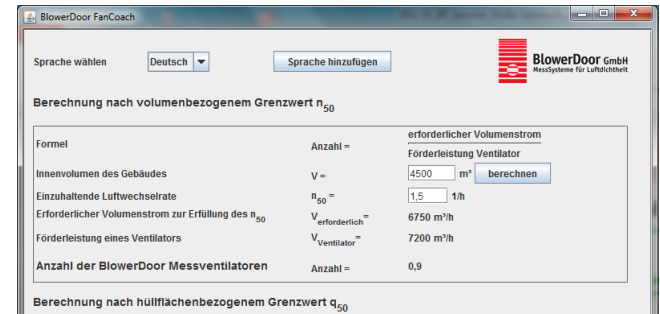
## Literature and Links

- Brennan, T.; Nelson, G.; Olsen, C.: Repeatability of Whole-Building Airtightness Measurements – Midrise Residential Case Study, in: Workshop on Building and Ductwork Airtightness Design, Implementation, Control and Durability – Feedback from Practice and Perspectives, 2013
- Rolfsmeier, Stefanie; Simons, Paul: Luftdichtheitsmessung in einem großen und hohen Passivhaus bei Wind und Thermik, in: Reader 21<sup>st</sup> International Passive House Conference, 2017
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- Simons, Paul; Rolfsmeier, Stefanie: Postulat for Airtightness Limits in Large Buildings, in: Reader 7<sup>th</sup> International BUILDAIR Symposium, 2012
- Simons, Paul; Rolfsmeier, Stefanie: Pressure distribution and reflow paths, in: Reader 5th International Symposium on Building and Ductwork Air-tightness, 2010
- BlowerDoor GmbH: Manual BlowerDoor MultipleFan, 2018
- EN 13829
- EN ISO 9972
- Training BlowerDoor MultipleFan: <https://www.blowerdoor.com/en/training/blowerdoor-multiplefan/>



## Recommended equipment

The data on the air tightness requirement and its reference value form the basis for estimating the number of measuring instruments required.



BlowerDoor FanCoach

Sprache wählen: Deutsch | Sprache hinzufügen

Berechnung nach volumenbezogenem Grenzwert  $n_{50}$

Formel	Anzahl =	erforderlicher Volumenstrom
Innenvolumen des Gebäudes	V =	Förderleistung Ventilator
Einzuhaltende Luftwechselrate	$n_{50} =$	4500 m <sup>3</sup>   berechnen
Erforderlicher Volumenstrom zur Erfüllung des $n_{50}$	$V_{erforderlich} =$	1,5 1/h
Förderleistung eines Ventilators	$V_{Ventilator} =$	6750 m <sup>3</sup> /h
Anzahl der BlowerDoor Messventilatoren	Anzahl =	7200 m <sup>3</sup> /h
		0,9

Berechnung nach hülfflächenbezogenem Grenzwert  $q_{50}$

*BlowerDoor FanCoach*



- BlowerDoor FanCoach for estimation of the required measuring fans
- BlowerDoor MultipleFan measuring system with several fans and pressure gauges
- Laptop computer with TECLOG software
- Devices for leakage detection
- Ladder, pallet truck, etc.

