

Determination of the sound insulation of a door with floor seal

Determination of the resulting weighted sound reduction index R_w of a door in combination with the joint sound reduction index R_{ST} of a floor seal

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Introduction

The practice from acoustic measurements of doors in laboratories and in field shows, that the quality of the sealing is very important for the sound insulation of doors. The use of unsuited sealings can reduce the sound reduction index very strongly; in the worst case reduction down to 20 dB for the weighted sound reduction index has been observed.

Within the research project „Konstruktionsgrundlagen von schalldämmenden Wohnungseingangstüren und Bürotüren aus Holz und Holzwerkstoffen“, which was carried out by ift, a procedure was developed to judge the acoustic behaviour of sealing. The goal is a statement of the joint sound reduction index R_{ST} , which is determined according to ift guideline SC 01/2 from September 2002.

The characteristic of this test procedure is the relation to the length of the joint and not to the area of a test object, as it is usual for the test on the sound reduction index R . In a special test arrangement the joint sound reduction index R_{ST} can be determined. In a second step the sound reduction of a door with sealing can be calculated or read of a diagram. Basic parameters are the sound insulation of the door leaf and the joint sound reduction index of the sealing.

Procedure

The joint sound reduction index is comparable to the sound reduction index of an element which has a defined area of 1 m^2 related to a joint of 1 m length. The sound is exclusively transmitted via the joint with seal.

If the seal is combined with a building component (e.g. doors with a surface S and the sound reduction index R) and assuming the building component's surface $S \gg$ than the surface of the seal $S (= b \cdot l, b =$ width of joint), then the equation for the resulting sound reduction index is:

$$R_{\text{res}} = -10 \log \left(10^{\frac{R}{10}} + \frac{l}{S} \cdot 10^{\frac{R_{ST}}{10}} \right) \text{ dB}$$

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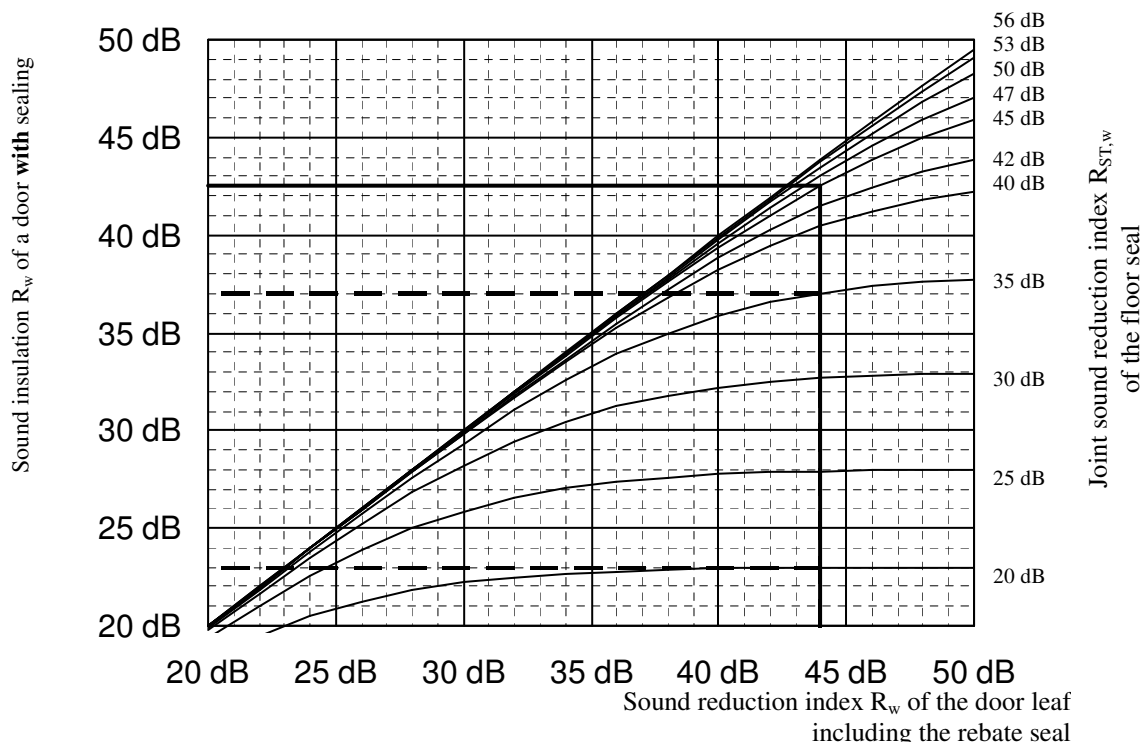


Diagram 1 Determination of the sound insulation of a door

Diagram 1 shows a graphic method to determine the sound reduction index R_w of a door using the sound reduction index R_w of a door leaf (including the sound transmission through the frame rebate seal) and the sound reduction index $R_{ST,w}$ of the floor seal. The calculation of resulting weighted sound reduction indices as shown in the diagram is based on a surface of $S = 2 \text{ m}^2$ for the door leaf and a joint length of $l = 1 \text{ m}$.

Procedure:

The sound reduction index of the floor seal can be certified by a test according to **ift** guideline SC-01-2. The resulting sound reduction index can be determined from Diagram 1 with the sound reduction index of the door leaf.

Example:

Sound reduction index of the door leaf (incl. rebate seal)	R_w	=	44 dB
Joint sound reduction index of the floor seal	$R_{ST,w}$	=	45 dB
Resulting sound reduction index of the door	R_w	=	42 dB

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Usually the joint sound reduction index is tested for an ideal working floor seal. Following characteristics can reduce the joint sound insulation.

- The adjustment of closing pressure of the sealing and the door leaf,
- The length of the sealing profile
- Position and quality of the groove
- Type and quality of the floor
- Rough floors
- Distortion of the sealing profile because of the closing move of the door
- In edges of rooms the sound pressure level can be 3 dB higher, compared to the situation of testing.
This can cause a reduction of the joint sound reduction index

Given a floor seal which is not properly working the joint sound reduction is typically reduced to following values (related to a height of the floor joint (air gap) of 7 mm)

Characteristic	$R_{ST,w}$ in dB
Rough floors, short sealing profile	35 to 45
Adjustment not sufficient (Light shines through)	30 to 40
Carpet floor	25 to 30
Door without floor seal	approx. 20

For clarification diagram 1 shows values for not sufficiently adjusted floor seals ($R_{ST,w} = 35$ dB) and a door without floor seal ($R_{ST,w} = 20$ dB).

Values:

Sound reduction index of the door leaf (incl. rebate seal)	R_w	= 44 dB
with not sufficiently adjusted floor seal	R_w	= 37 dB
without floor seal	R_w	= 23 dB

Literature

[1] Report „Konstruktionsmerkmale für Schalldämmende Wohnungseingangstüren und Bürotüren aus Holz und Holzwerkstoffen“, ift Rosenheim, 1996