

## Test Report

No. 1387-001-12 of 23.04.2012

**Airborne Sound Insulation in Laboratory,  
All-Glass Sliding System SF 20**

**Customer:** SUNFLEX Aluminium Systeme GmbH  
Im Ruttenberge 12  
57482 Wenden

**Test item:** All-Glass Sliding System  
Make SUNFLEX, Type SF 20

**Task:** Determination of the Airborne Sound Insulation acc. to  
DIN EN ISO 10140-2 in the Test Stand

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## **1. Test and General Information**

### **1.1 Test**

SUNFLEX Aluminium Systeme GmbH, Wenden, manufactures and sells, among others, All-Glass Sliding Systems, which can be used as balcony glazing, winter garden glazing or dwelling space expansions and alike. The system to be tested, type SF 20, is a bottom loaded/running system with weathered ceiling and bottom tracks, in which the all-glass sliding panels (glazing: ESG, thickness 10 mm) with ball bearing rollers could be opened in horizontal direction. The system with 4 sliding panels without panel frame was equipped with lateral vertical frame profile and was tested with and without vertical gap sealing via aluminium profile with brush gaskets.

The System SF 20 was installed in the test stand and tested in respect for airborne sound insulation. For this purpose, the construction had to be installed in the test opening with the dimensions width x height = 4.400 mm x 1.600 mm with suppressed flanking transmission acc. to DIN EN ISO 10140-5.

The measured sound reduction index of the test item, manufactured by the Customer, is determined by functional conditions acc. to DIN EN ISO 10140-2.

### **1.2 Manufacturer of the Test Arrangement**

SUNFLEX Aluminium Systeme GmbH  
Im Ruttenberge 12  
57482 Wenden

### **1.3 Customer of the Test**

SUNFLEX Aluminium Systeme GmbH  
Im Ruttenberge 12  
57482 Wenden

## 1.4 Measuring Standards

The measurements were established according to the following standards and directives:

- DIN EN ISO 10140-1 „Acoustics – Laboratory measurement of sound insulation of building elements – Part 1: Application rules for specific products“  
(ISO 10140-1:2010); German version EN ISO 10140-1:2010
- DIN EN ISO 10140-2 „Acoustics – Laboratory measurement of sound insulation of building elements – Part 2: Measurement of airborne sound insulation“  
(ISO 10140-2:2010); German version EN ISO 10140-2:2010
- DIN EN ISO 10140-4 „Acoustics – Laboratory measurement of sound insulation of building elements – Part 4: Measurement procedures and requirements“  
(ISO 10140-4:2010); German version EN ISO 10140-4:2010
- DIN EN ISO 10140-5 „Acoustics – Laboratory measurement of sound insulation of building elements – Part 5: Requirements for test facilities and equipment“  
(ISO 10140-5:2010); German version EN ISO 10140-5:2010
- DIN EN ISO 717-1 „Acoustics – Rating of sound insulation in buildings and of building elements – Part 1: Airborne sound insulation“  
(ISO 717-1:1996 + AM1:2006); German version EN ISO 717-1:1996 + A1:2006

## 2. Test Item Setup and Test Arrangement

### 2.1 Laboratory

The specified element was installed by the fitters of the manufacturer for the determination of the airborne sound insulation in the test stand belonging to the institute with suppressed flanking transmission according to

DIN EN ISO 10140-5.

The maximum sound reduction index  $R'_{\max}$  of the test stand with installation of a lightweight wall Type A acc. to DIN EN ISO 10140-5, Appendix A.2.2.1.1 is:

|                         |      |      |      |      |      |      |      |      |      |      |      |
|-------------------------|------|------|------|------|------|------|------|------|------|------|------|
| $f_{\text{Terz}}$ in Hz | 50   | 63   | 80   | 100  | 125  | 160  | 200  | 250  | 315  | 400  | 500  |
| $R'_{\max}$ in dB       | 29,2 | 40,8 | 34,6 | 44,1 | 44,3 | 49,6 | 55,7 | 59,6 | 61,6 | 63,8 | 68,1 |

|                         |      |      |      |      |      |      |      |      |      |      |
|-------------------------|------|------|------|------|------|------|------|------|------|------|
| $f_{\text{Terz}}$ in Hz | 630  | 800  | 1000 | 1250 | 1600 | 2000 | 2500 | 3150 | 4000 | 5000 |
| $R'_{\max}$ in dB       | 70,6 | 72,0 | 75,1 | 74,6 | 73,2 | 73,3 | 78,7 | 83,0 | 86,2 | 90,5 |

The weighted sound reduction index is:

$$R'_{w, \max} = 68 \text{ dB.}$$

The surrounding wall of the All-Glass Sliding System was installed by skilled personnel of the testing institute. In order to achieve an adequate high sound insulation, the wall panels, approx.  $d = 500$  mm overall wall thickness, were installed with separate metal stands on both sides of the joint.

## 2.2 Test Setup

The tested element was an All-Glass Sliding System with 4 all-glass panels without panel frame, which can be opened in horizontal direction. The single panels are fitted with a system of integrated followers – to open automatically the adjacent panel when moving one panel – and are driven in a bottom track using adjustable ball bearing rollers. The lateral wall connection is made with a vertical frame profile. The system was built up with and without vertical gap sealing via aluminium profile with brush gaskets.

The dimensions of the complete element is approx. width x height = 4.400 mm x 1.600 mm. The surface area is approx.  $S = 7,0 \text{ m}^2$ .

The glazing units indicate the following design features:

Assembly: ESG, d = 10 mm

The following constructional systems were tested:

### Measurement 1:

All-Glass Sliding System SF 20, Design with lateral vertical frame profile (Wall connection), without panel frame, with vertical gap sealing via aluminium profile with brush gaskets.

### Measurement 2:

All-Glass Sliding System SF 20, Design with lateral vertical frame profile (Wall connection), without panel frame, with vertical gap sealing.

The detailed setup of the construction is evident from the drawings of the manufacturer, Annexes 1 thru 9.

The joints between the ceiling rail and the floor rail and the test opening were sealed with silicon mass.

Annexes 10 and 11 include a photo documentation of the setup in the Laboratory. Annex 12 shows a principle diagram of the test arrangement.

### 3. Measurement and Measurement Implementation

The measurement of the weighted sound reduction index  $R_w$  in dB of the All-Glass Sliding System was carried out in accordance with the specifications of the standard

- DIN EN ISO 10140-2  
„Laboratory measurement of sound insulation of building elements“  
Part 2: „Measurement of airborne sound insulation“

The setup of the measurement, as well as a measurement description, is evident from Annex 13 of this Test Report.

### 4. Measurement Results

The weighted sound reduction indexes of the setups tested on 17.04.2012 being installed in functional condition, without influence of the flanking components were determined as follows:

| Measurement | Test Item                                                                                                | Sound Reduction Index $R_w$ in dB |
|-------------|----------------------------------------------------------------------------------------------------------|-----------------------------------|
| 1           | All-Glass Sliding System SF 20, with vertical gap sealing, setup see section 2.2 and Annexes 1 thru 9    | 17                                |
| 2           | All-Glass Sliding System SF 20, without vertical gap sealing, setup see section 2.2 and Annexes 1 thru 9 | 12                                |

The frequency dependent curve progressions of the sound reduction index are evident from Annexes 14 and 15.

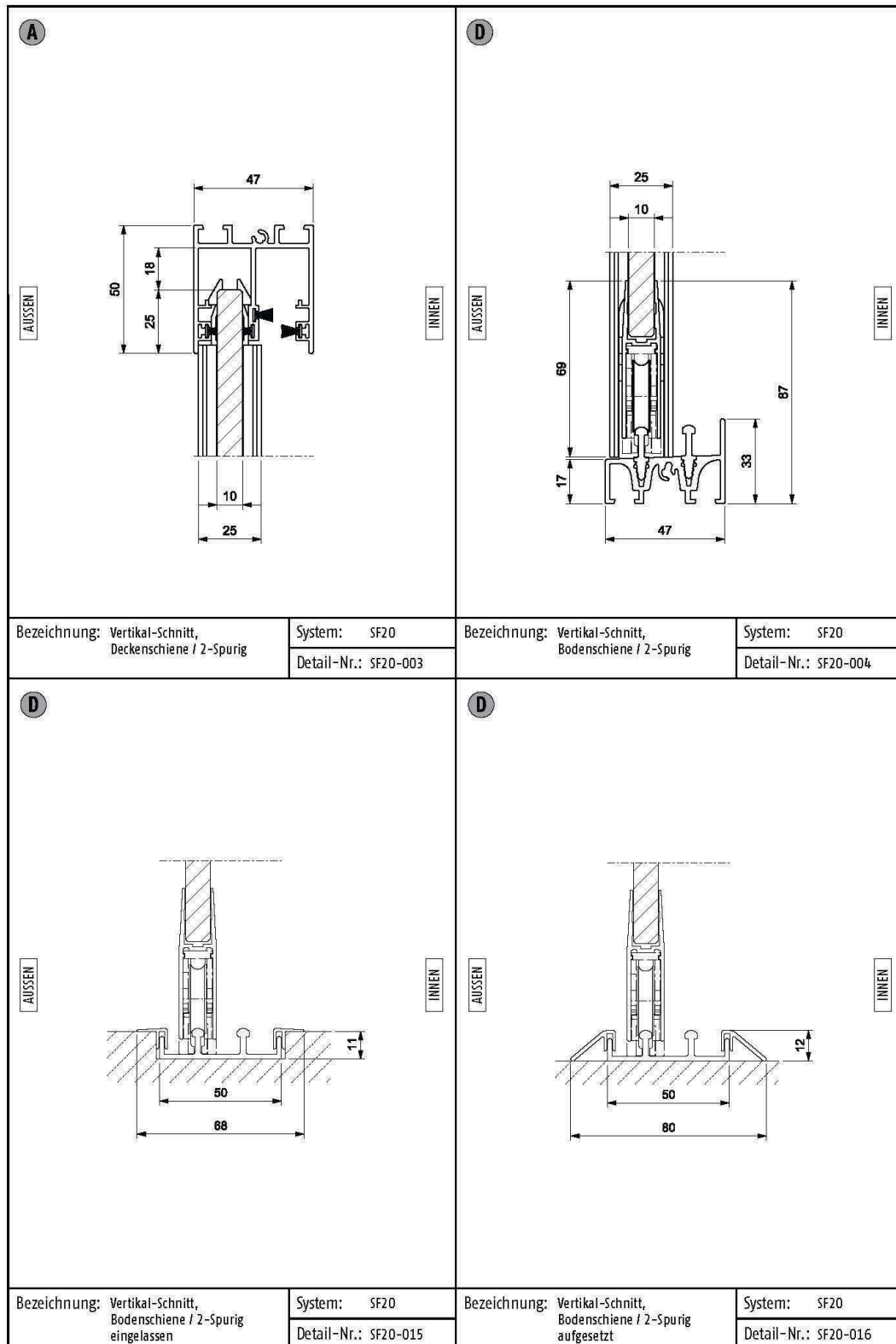
The measurement results show test stand values. In case of plane application a derivative margin of 2 dB should be taken into account.

Mülheim an der Ruhr, 23.04.2012



Stefan Grill

Schiebe-System SF20

**SUNFLEX**

Technische Änderungen und Irrtümer vorbehalten.

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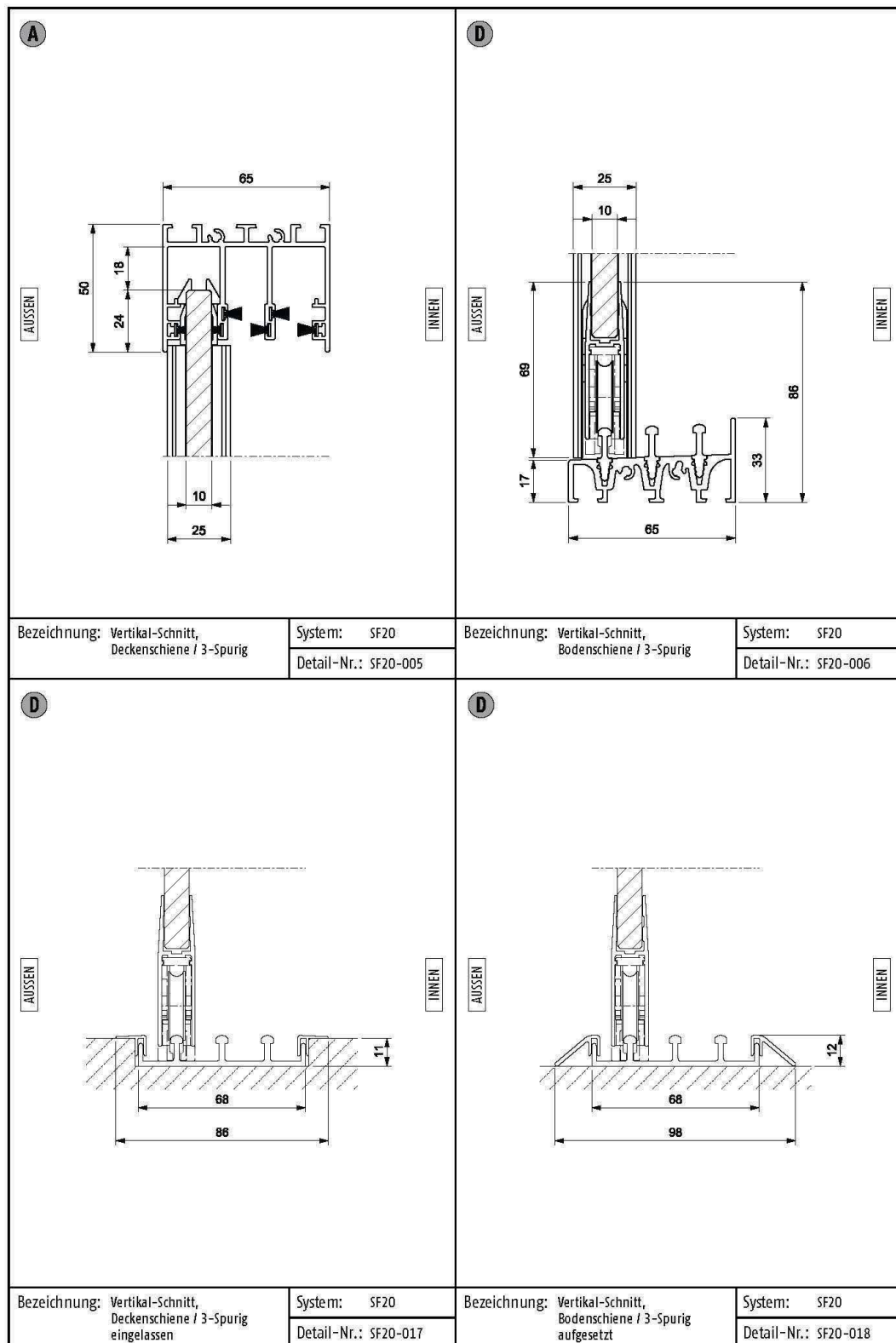
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45478 Mülheim an der Ruhr, den 23.04.2012

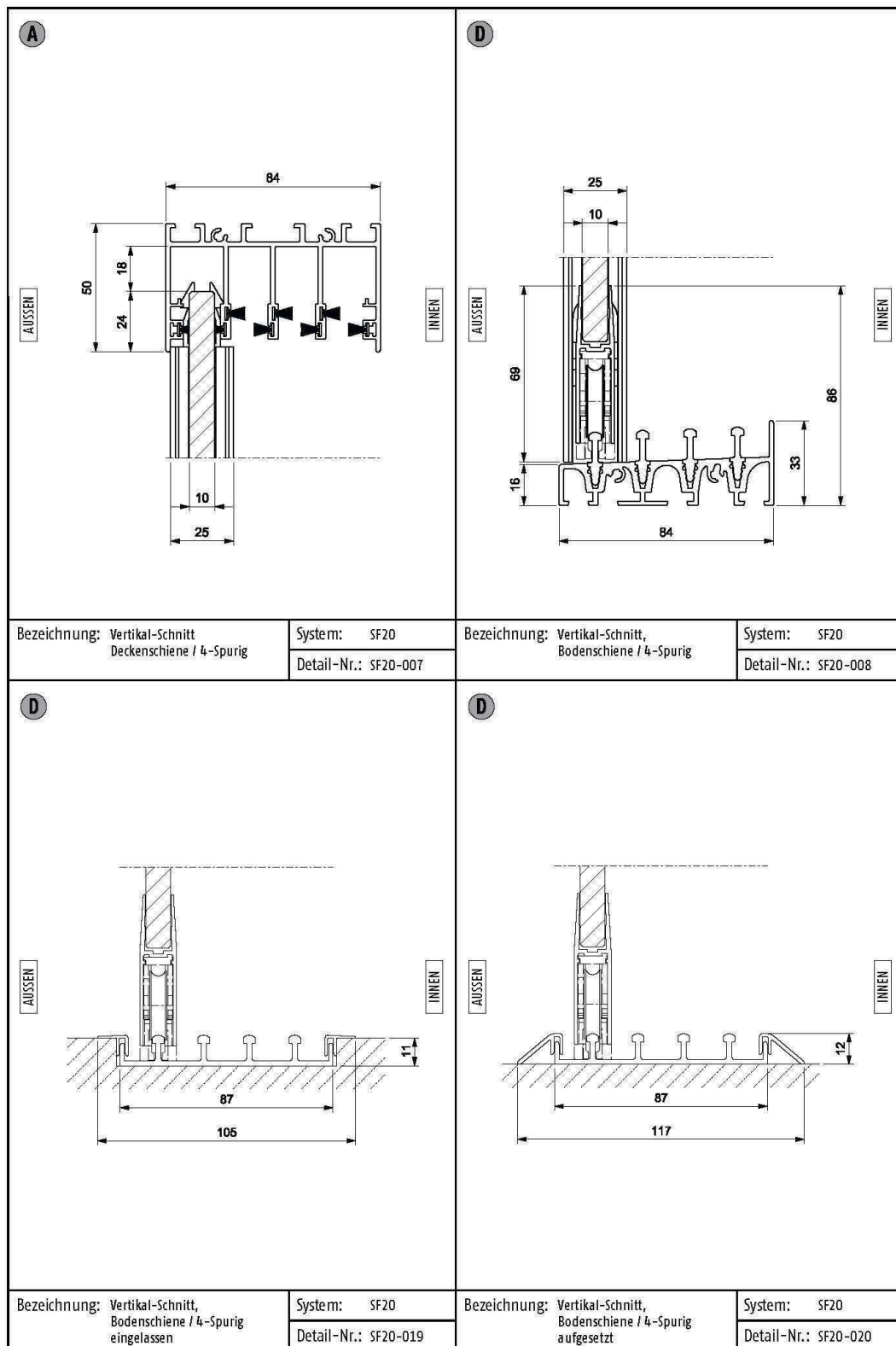
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## Schiebe-System SF 20



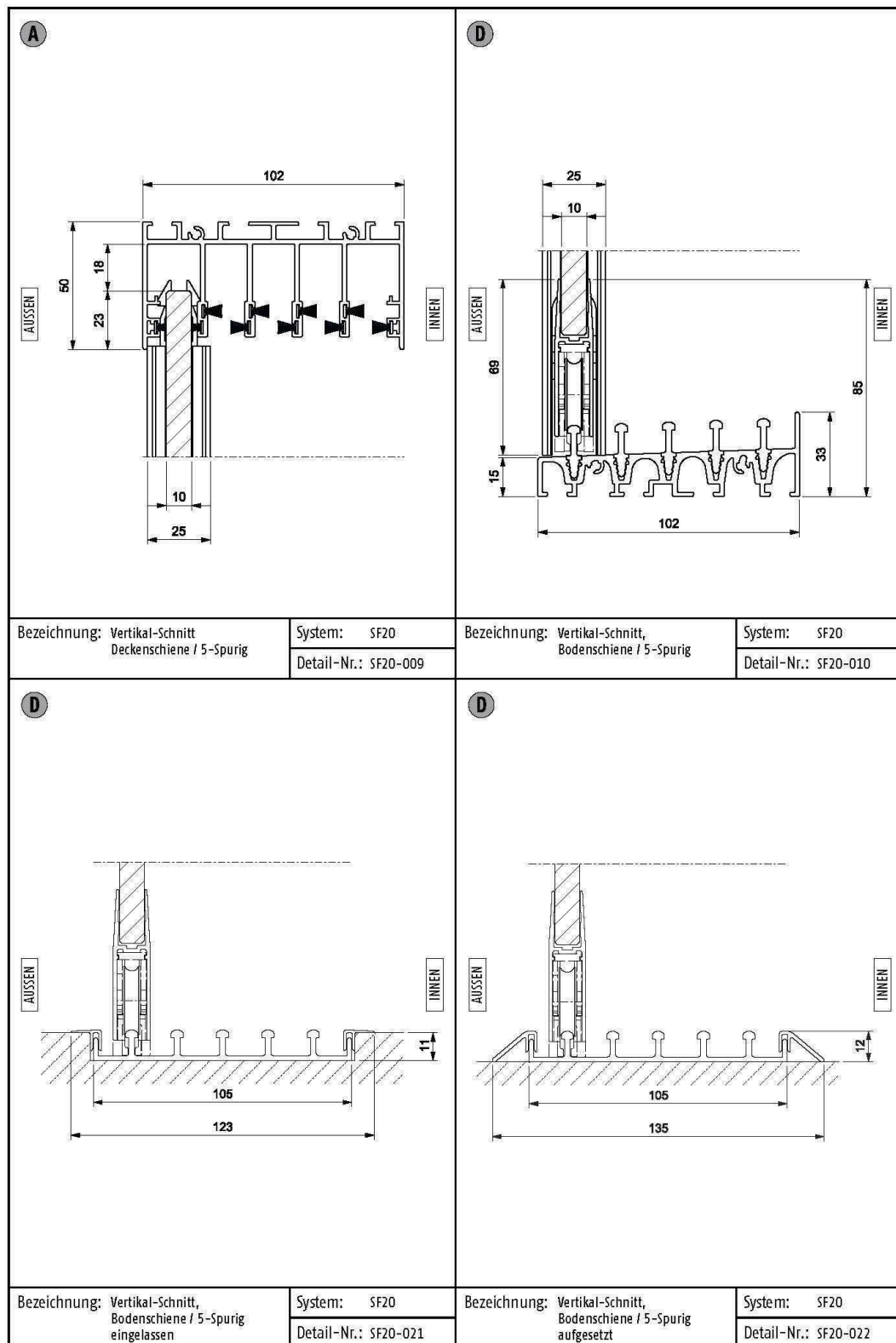
Technische Änderungen und Irrtümer vorbehalten.

## Schiebe-System SF20

**SUNFLEX**

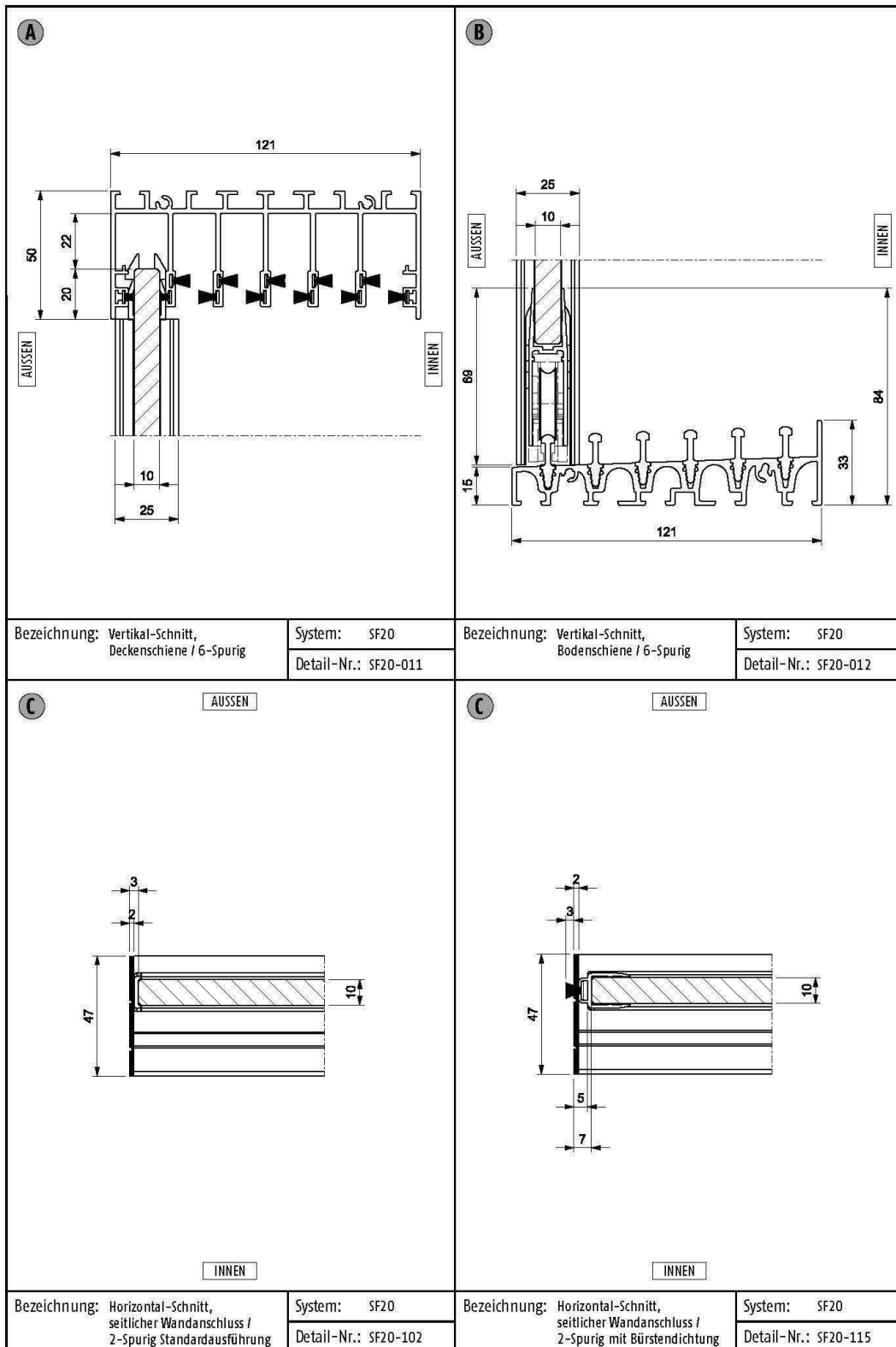
Technische Änderungen und Irrtümer vorbehalten.

## Schiebe-System SF20



Technische Änderungen und Irrtümer vorbehalten.

Schiebe-System SF20

**SUNFLEX** 

Technische Änderungen und Irrtümer vorbehalten.

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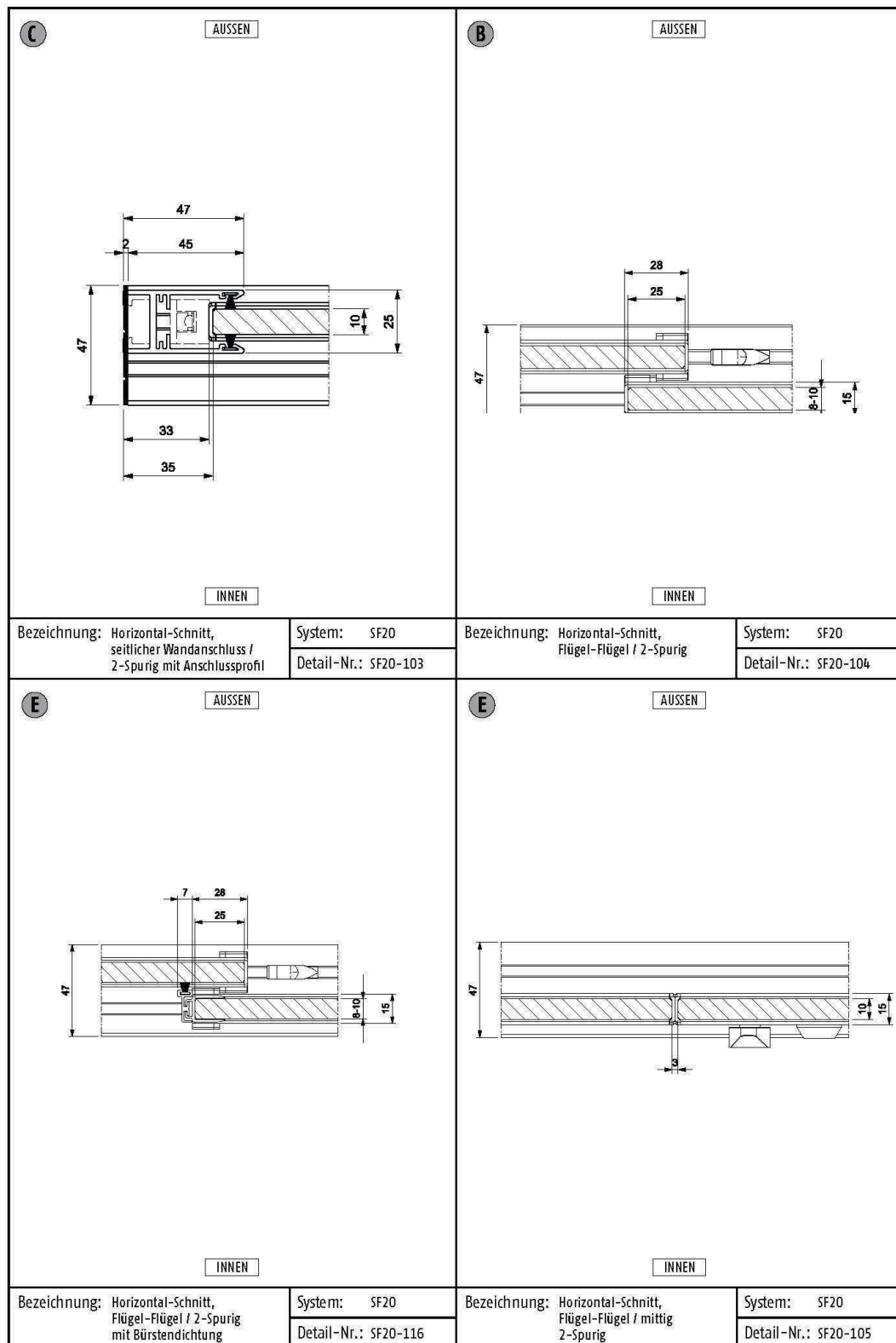
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## Schiebe-System SF20

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Technische Änderungen und Irrtümer vorbehalten.

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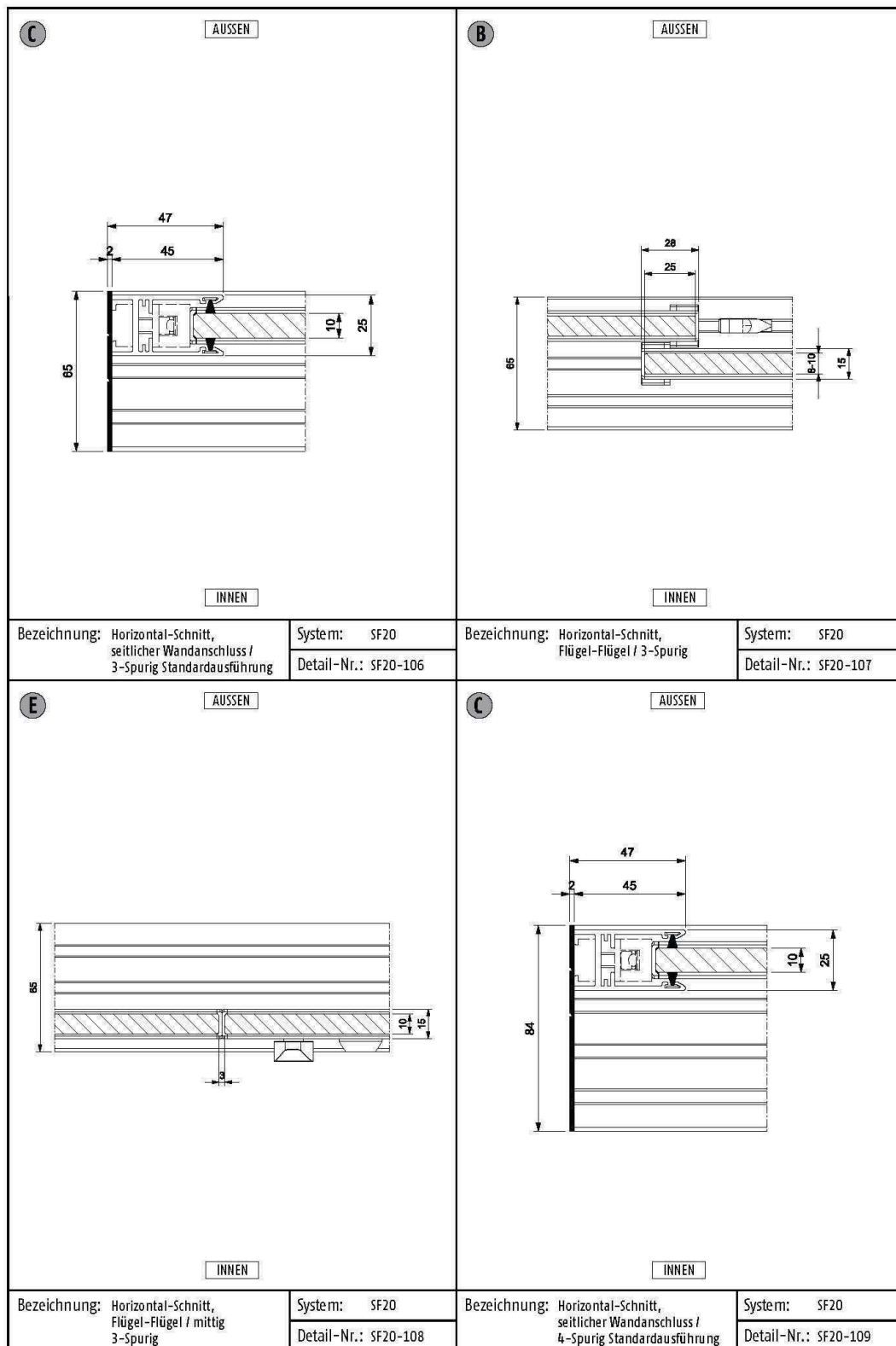
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## Schiebe-System SF 20

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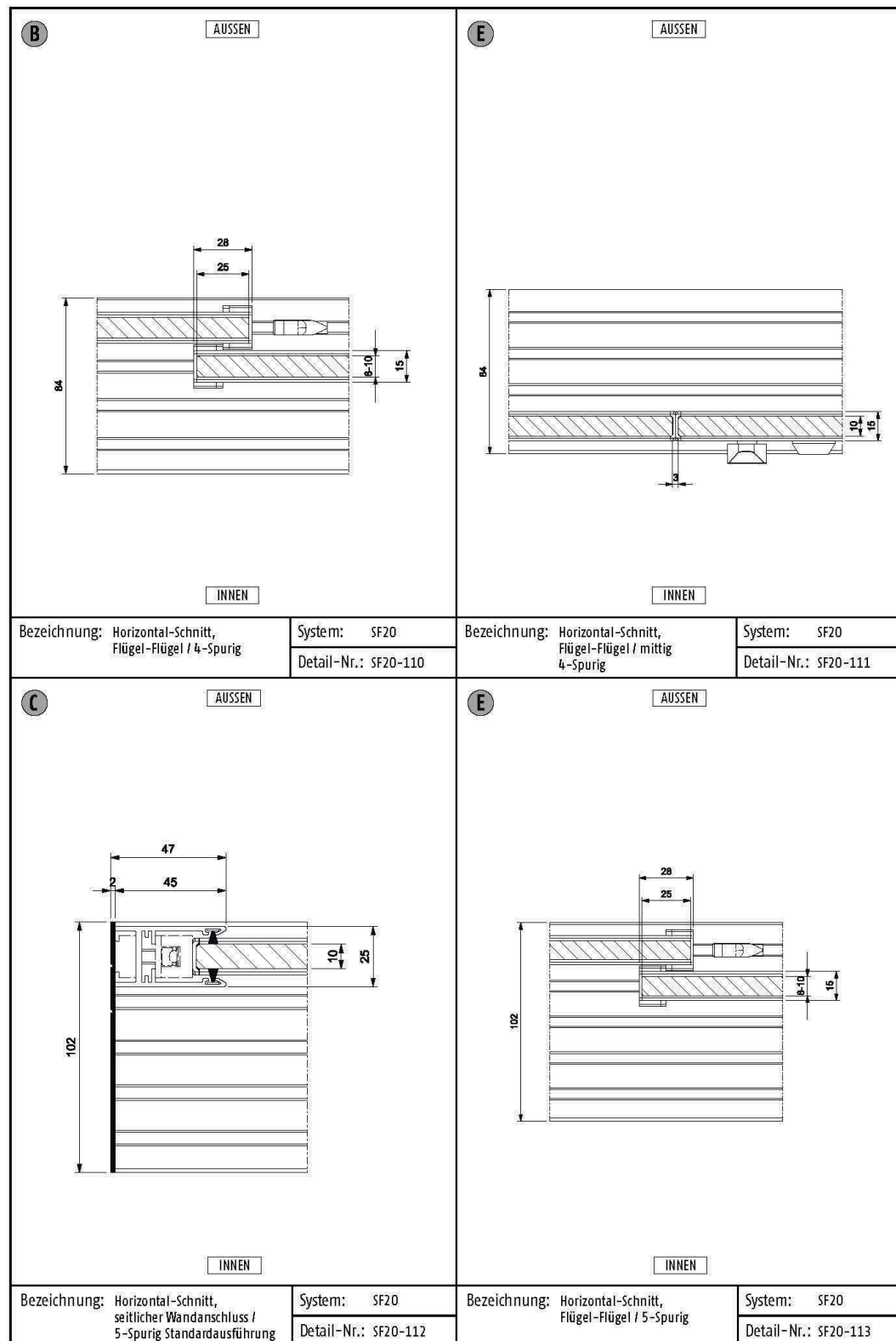
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## Schiebe-System SF 20



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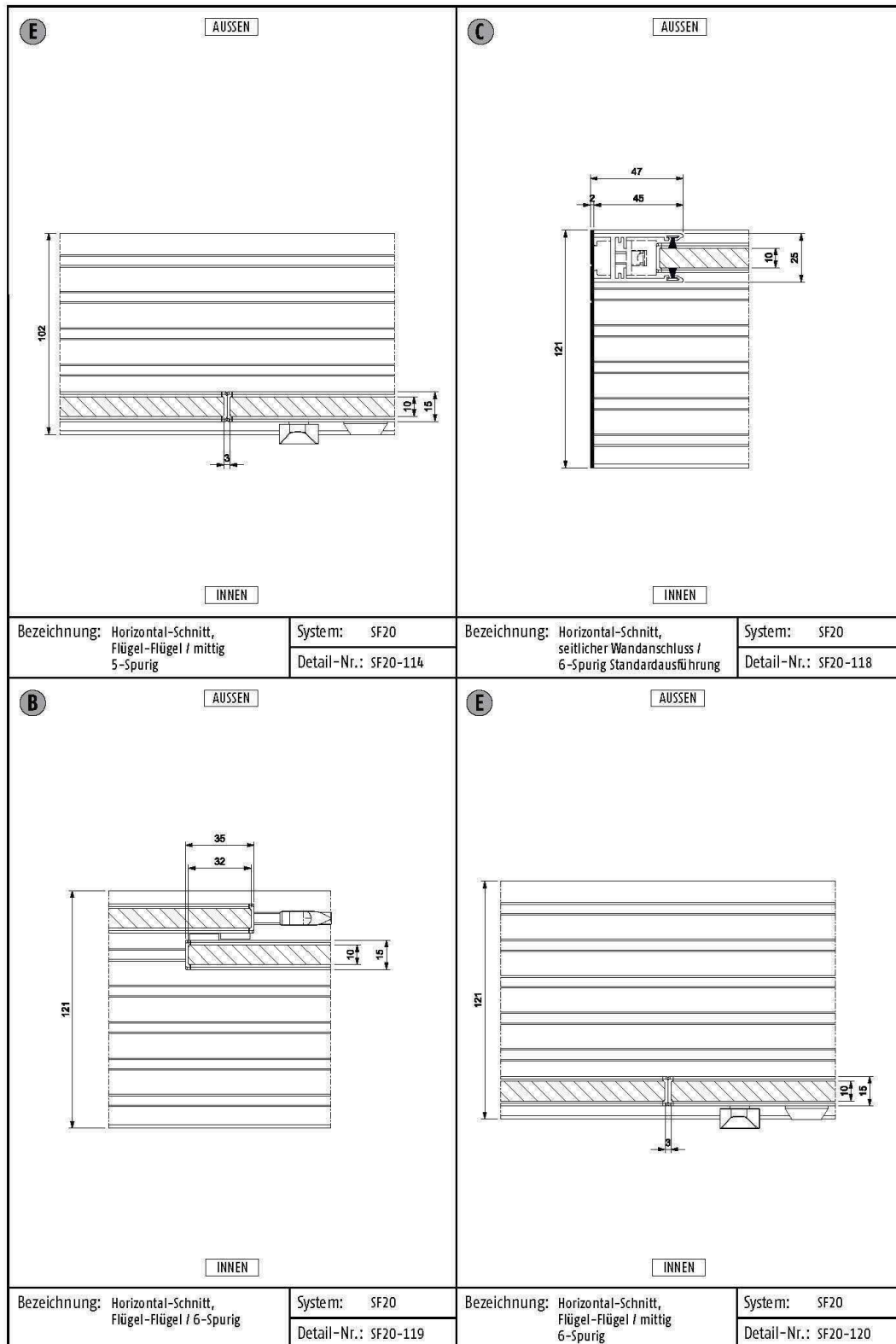
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## Schiebe-System SF 20

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Fig. 1: All-Glass Sliding System SF 20, Partial View Transmission Room



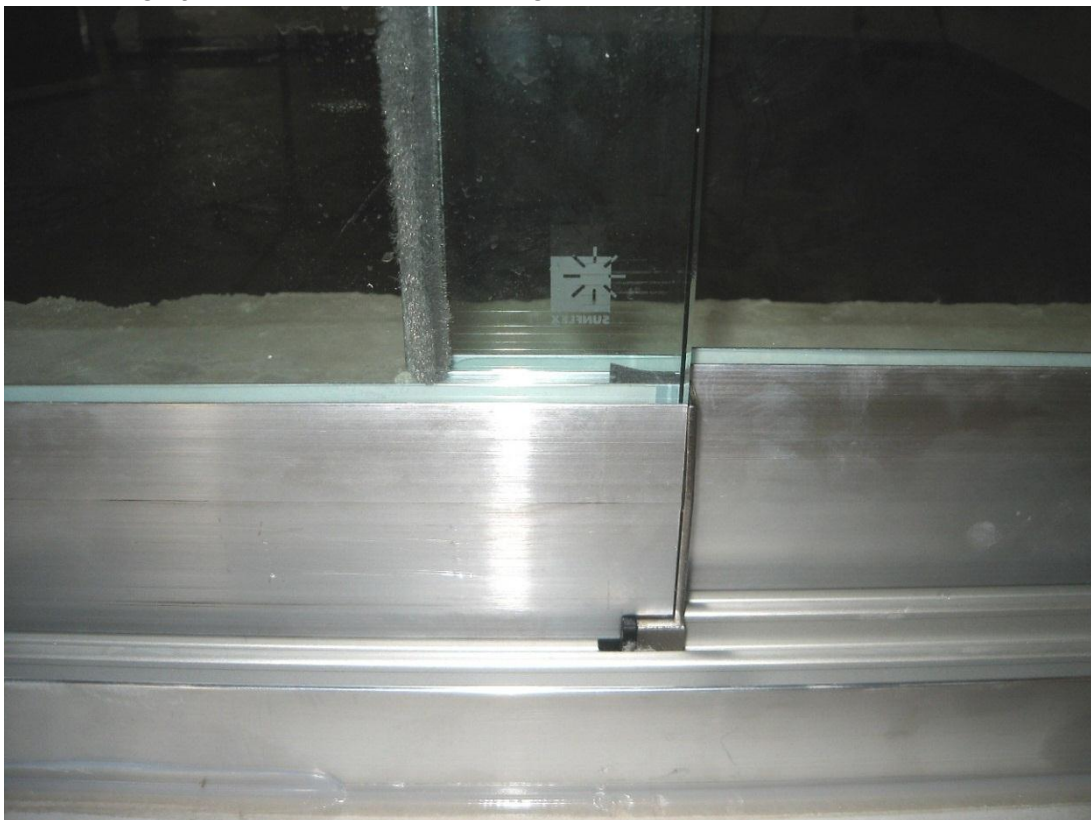
Fig. 2: All-Glass Sliding System SF 20, View Transmission Room, Detail connection ceiling



Fig. 3: All-Glass Sliding System SF 20, View Receiving Room



Fig. 4: All-Glass Sliding System SF 20, View Receiving Room, Detail connection below

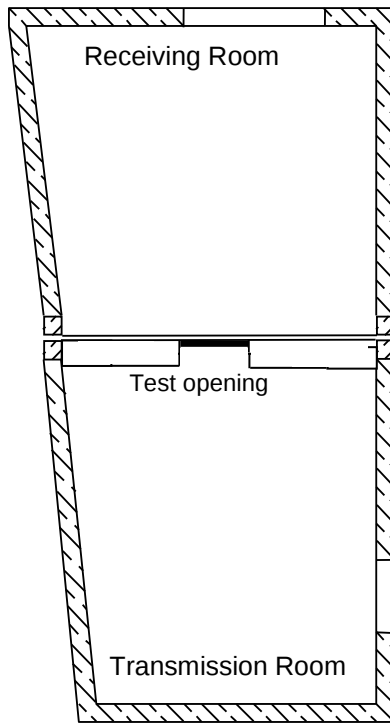


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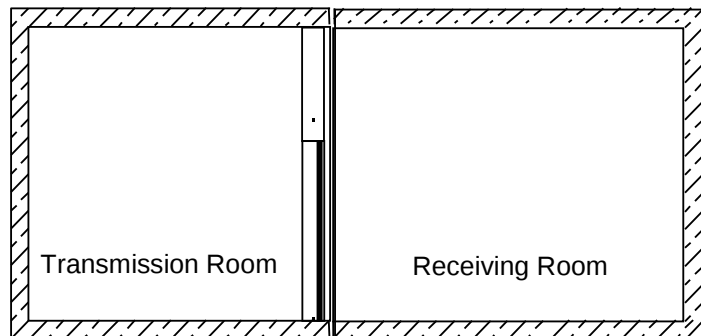
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## Principle Diagram

Ground view



Vertical Section



- Mountings:**
- Ceiling - Reinforced concrete ceiling  $d = 14 \text{ cm}$ , spaces with latex paint,  
Site-specific mass  $m_F = 322 \text{ kg/m}^2$
  - Floor - Reinforced concrete plate  $d = 20 \text{ cm}$ , straightened,  
Site-specific mass  $m_F = 460 \text{ kg/m}^2$
  - Walls - Masonry  $d = 24 \text{ cm}$ , site-specific mass  $m_F = 384 \text{ kg/m}^2$

- Ambient air:** Ambient air conditions during the measurement on 17.04.2012
- Air temperature  $T_L = 18,6^\circ\text{C}$
  - Relative humidity  $r_F = 58,2\%$

| Room Conditions |                   | Transmission Room | Receiving Room |
|-----------------|-------------------|-------------------|----------------|
| Breadth         | [m]               | 4.10 – 4.70       | 4.70 – 5.32    |
| Length          | [m]               | 4.48              | 4.38           |
| Height          | [m]               | 3.76              | 3.76           |
| Volume V        | [m <sup>3</sup> ] | 72.5              | 81.5           |
| Rev. time       | $\bar{T}_m$ [s]   | 1.42              | 1.48           |

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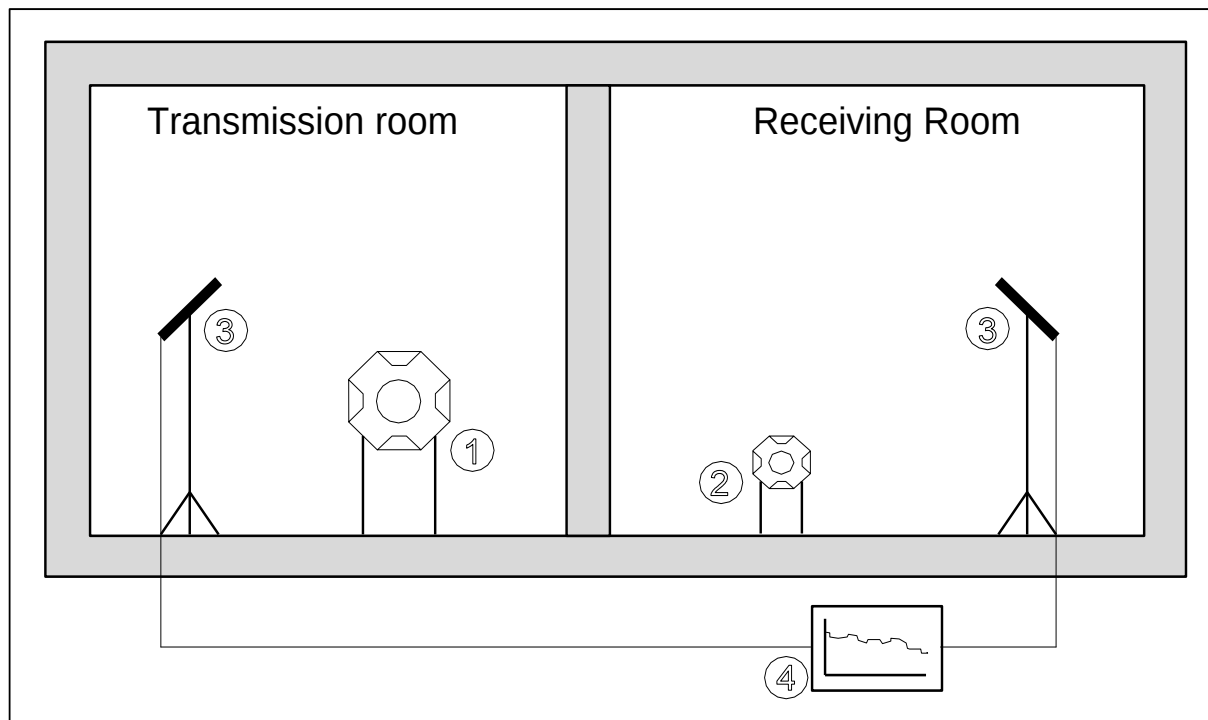
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### Description of the Implementation of an Airborne Sound Measurement, evaluated through a Measuring Device with Process Computer

**Customer:** SUNFLEX Aluminium Systeme GmbH, Im Ruttenberge 12, 57482 Wenden

**Object:** All-Glass Sliding System Sunflex, Type SF 20

#### 1. Measuring Setup



|   | Unit Designation/ Type                                                                                                          | Series number                    | Date of last check/calibrated until                                                              | Last calibration                                     |
|---|---------------------------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------------------------------------------------------------------------------------|------------------------------------------------------|
| 1 | Dodecahedron loudspeakers for radiation of third octave band noise                                                              | DL 1                             | 04.06.2009/-                                                                                     | -                                                    |
| 2 | Dodecahedron loudspeakers for radiation of third octave band noise                                                              | DL 2                             | -                                                                                                | -                                                    |
| 3 | Condenser microphones: M1: Norsonic, Type 1220<br>V1: Norsonic, Type 1201<br>M2: Norsonic, Type 1220<br>V2: Norsonic, Type 1201 | 14761<br>17598<br>38648<br>20062 | 20.01.2010/31.12.2012<br>20.01.2010/31.12.2012<br>20.01.2010/31.12.2012<br>20.01.2010/31.12.2012 | 17.04.2012<br>17.04.2012<br>17.04.2012<br>17.04.2012 |
| 4 | Sound level analyzer: Norsonic, Type 121                                                                                        | 29837                            | 20.01.2010/31.12.2012                                                                            | 17.04.2012                                           |

#### 2. Measurement Implementation

For the determination of the airborne sound insulation, electroacoustic generated third octave band noise is radiated in the transmission room via a dodecahedron loudspeaker. In the frequency range between 50 Hz and 5.000 Hz the margin values generated, are simultaneously measured and recorded in two channels in the transmission and receiving room, via two condenser microphones in third octave band steps. From these values and the rev. time, the sound insulation margins, in the individual frequency bands, are determined according to DIN EN ISO 717-1. The weighted sound reduction index  $R_w$  is determined as an individual value, with the integrated process computer of the sound level analyzer.

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# Airborne Sound Measurement according to DIN EN ISO 10140-2

## Annex 14

### Determination of the Airborne Sound Insulation in Laboratory

Manufacturer: SUNFLEX Aluminium Systeme GmbH  
Customer: SUNFLEX Aluminium Systeme GmbH  
Test item installed by Customer

Product designation: System SF 20  
Test rooms: Laboratory  
Test date: 17.04.2012

Description of the test item:

#### Measurement 1

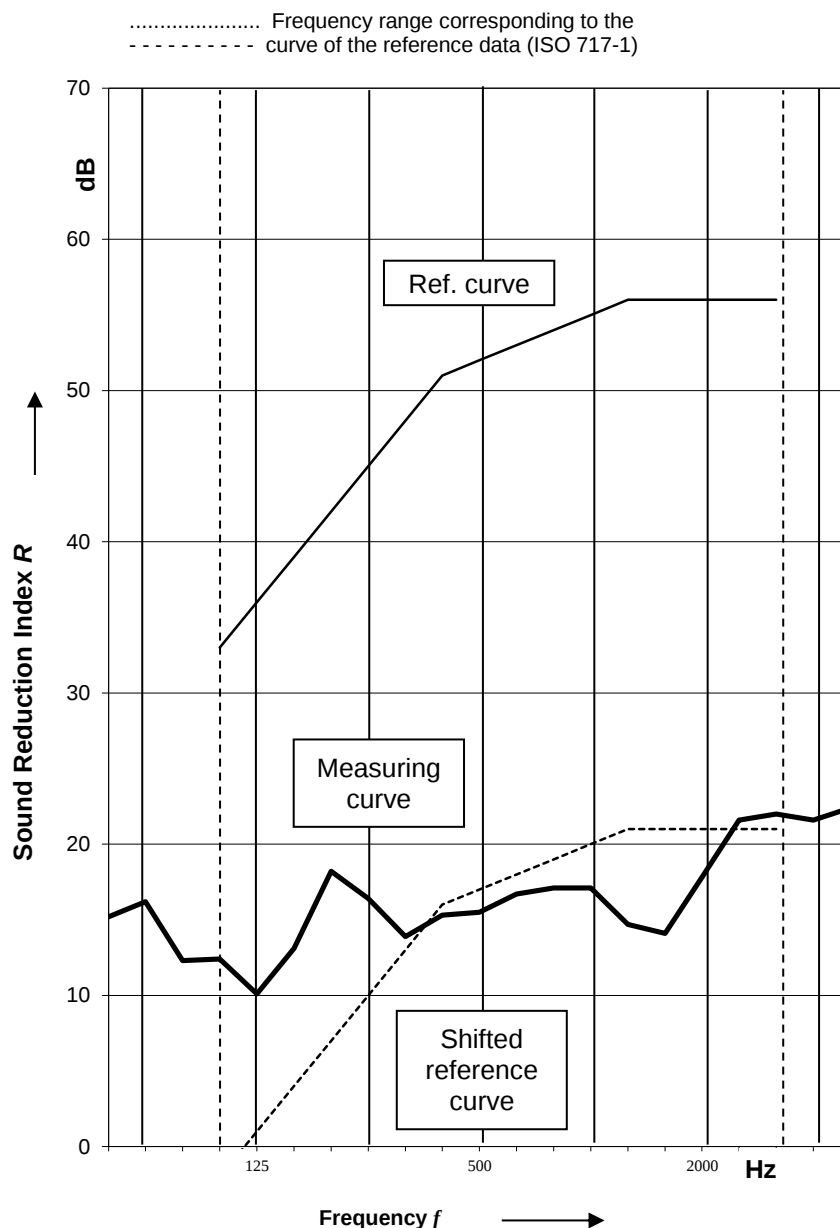
All-Glass Sliding System SUNFLEX, Type SF 20, Design with lateral vertical frame profile (Wall connection), without panel frame, with vertical gap sealing via aluminium profile with brush gaskets, glass units ESG 10 mm, 4 sliding panels, installed in test stand opening, dimensions width x height = 4.400 mm x 1.600 mm, S = 7,0 m<sup>2</sup>

Remarks:

detailed construction see Report:  
Section 2.2 and Annexes 1 thru 9

Area S test item: 7,0 m<sup>2</sup>  
Site-specific mass:  
Air temp. in test rooms: 18,6 °C  
Humidity in test rooms: 58,2 %  
Volume transmission room: 72,5 m<sup>3</sup>  
Volume receiving room: 81,5 m<sup>3</sup>

| Frequency<br>Hz | R<br>Terz<br>dB |
|-----------------|-----------------|
| 50              | 15,2            |
| 63              | 16,2            |
| 80              | 12,3            |
| 100             | 12,4            |
| 125             | 10,1            |
| 160             | 13,1            |
| 200             | 18,2            |
| 250             | 16,4            |
| 315             | 13,9            |
| 400             | 15,3            |
| 500             | 15,5            |
| 630             | 16,7            |
| 800             | 17,1            |
| 1000            | 17,1            |
| 1250            | 14,7            |
| 1600            | 14,1            |
| 2000            | 17,8            |
| 2500            | 21,6            |
| 3150            | 22,0            |
| 4000            | 21,6            |
| 5000            | 22,4            |



Evaluation acc. to ISO 717-1:

$R_w(C; C_{tr}) = 17 \quad (0; -1) \text{ dB}$

$C_{50-3150} = 0 \text{ dB} \quad C_{50-5000} = 0 \text{ dB} \quad C_{100-5000} = 0 \text{ dB}$

The determination is based on measurement results which were measured in third octave bands.

$C_{tr50-3150} = -1 \text{ dB} \quad C_{tr50-5000} = -1 \text{ dB} \quad C_{tr100-5000} = -1 \text{ dB}$

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# Airborne Sound Measurement according to DIN EN ISO 10140-2

## Annex 15

### Determination of the Airborne Sound Insulation in Laboratory

Manufacturer: SUNFLEX Aluminium Systeme GmbH  
Customer: SUNFLEX Aluminium Systeme GmbH  
Test item installed by Customer

Product designation: System SF 20  
Test rooms: Laboratory  
Test date: 17.04.2012

Description of the test item:

#### Measurement 2

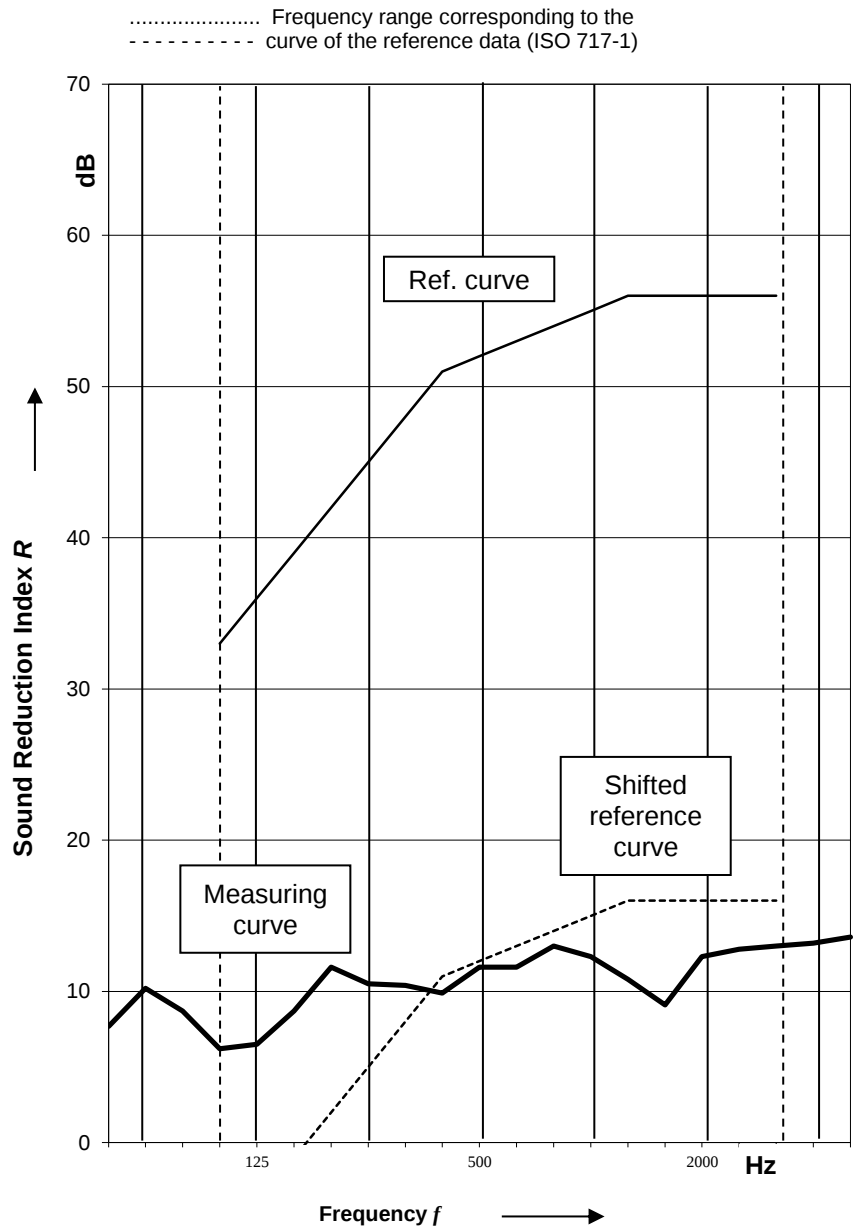
All-Glass Sliding System SUNFLEX, Type SF 20, Design with lateral vertical frame profile (Wall connection), without panel frame, without vertical gap sealing, glass units ESG 10 mm, 4 sliding panels, installed in test stand opening, dimensions width x height = 4.400 mm x 1.600 mm,  $S = 7,0 \text{ m}^2$

Remarks:

detailed construction see Report:  
Section 2.2 and Annexes 1 thru 9

Area S test item:  $7,0 \text{ m}^2$   
Site-specific mass:  
Air temp. in test rooms:  $18,6 \text{ }^\circ\text{C}$   
Humidity in test rooms:  $58,2 \%$   
Volume transmission room:  $72,5 \text{ m}^3$   
Volume receiving room:  $81,5 \text{ m}^3$

| Frequency<br>Hz | R<br>Terz<br>dB |
|-----------------|-----------------|
| 50              | 7,7             |
| 63              | 10,2            |
| 80              | 8,7             |
| 100             | 6,2             |
| 125             | 6,5             |
| 160             | 8,7             |
| 200             | 11,6            |
| 250             | 10,5            |
| 315             | 10,4            |
| 400             | 9,9             |
| 500             | 11,6            |
| 630             | 11,6            |
| 800             | 13,0            |
| 1000            | 12,3            |
| 1250            | 10,8            |
| 1600            | 9,1             |
| 2000            | 12,3            |
| 2500            | 12,8            |
| 3150            | 13,0            |
| 4000            | 13,2            |
| 5000            | 13,6            |



Evaluation acc. to ISO 717-1:

$R_w(C; C_{tr}) = 12 \quad (0; -1) \text{ dB}$

$C_{50-3150} = 0 \text{ dB} \quad C_{50-5000} = 0 \text{ dB} \quad C_{100-5000} = 0 \text{ dB}$

The determination is based on measurement results which were measured in third octave bands.

$C_{tr50-3150} = -1 \text{ dB} \quad C_{tr50-5000} = -1 \text{ dB} \quad C_{tr100-5000} = -1 \text{ dB}$

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