Evidence of Performance

Airborne sound insulation of building components

Test Report
No. 16-000936-PR01
(PB 1-H01-04-en-01)

ift ROSENHEIM

Client **Luoyang Landglass Technology CO. LTD-Guangjian Building**
No. 12 Wangcheng Road
471000 Luoyang-Henan
China

Product	Insulating glass unit
Designation	Tempered vacuum insulated glass
External Dimensions (W x H)	1,000 mm × 1,000 mm
Construction	5 Tempered Low-E Glass/0.3 Vacuum/4 Tempered Glass
Gas filling	Vacuum
Area related mass	21.9 kg/m²
Special features	-/-

Weighted sound reduction index R_w
Spectrum adaptation terms C and C_{tr}

$$R_w\ (C;\ C_{tr}) = 36\ (-2;-3)\ \text{dB}$$

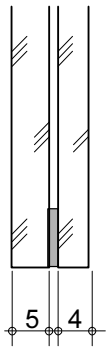
ift Rosenheim
01.08.2016

Dr. Joachim Hessinger, Dipl.-Phys.
Head of Testing Department
Building Acoustics

Florian Brechleiter, MSc, Dipl.-Ing. (FH)
operating testing officer
Building Acoustics

Basis
EN ISO 10140-1: 2010
+A1: 2012 + A2:2014
EN ISO 10140-2 : 2010
EN ISO 717-1 : 2013

Representation



Instructions for use

This test report serves to demonstrate the airborne sound insulation of a building component.

Validity

The data and results given relate solely to the tested and described specimen.

Testing the sound insulation does not allow any statement to be made on further characteristics of the present construction regarding performance and quality.

Notes on publication

The **ift**-Guidance Sheet "Conditions and Guidance for the Use of **ift** Test Documents" applies. The cover sheet can be used as abstract.

Contents

The test report contains a total of 8 pages:

ift Rosenheim GmbH
Theodor-Gietl-Str. 7-9
D-83026 Rosenheim

Kontakt
Tel. +49.8031.261-0
Fax +49.8031.261-290
www.ift-rosenheim.de

1 Object

1.1 Description of test specimen (All dimensions in mm)

Component	Insulating glass unit
Product designation	Tempered vacuum insulated glass
External dimensions (W x H)	1,000 mm × 1,000 mm
Visible size (W x H)	970 mm × 970 mm
Total thickness	
On the edge	9.3 mm
In the middle of pane	9.3 mm
Area related mass kg/m²	21.9 kg/m²
Construction	5 Tempered Low-E Glass/0.3 Vacuum/4 Tempered Glass
Pane temperature in °C	23 °C
Spacers	
Material	Metal
Manufacturer	Luoyang LandGlass Technology CO.LTD
Micro pillars	
Material	Steel
Shape	Sphere
Diameter	0.5 mm
Spacing	45 mm
Manufacturer	Luoyang LandGlass Technology CO.LTD
Edge seal	
total width	12 mm
Type	Flexible sealing material, not specified
Manufacturer	Not specified
Edge cover	1-2 mm
Gas filling in cavity	According to client
Type of gas	Vacuum, no pressure determined by ift

The description is based on inspection of the test specimen at **ift** Laboratory for Building Acoustics. Item designations / numbers as well as material specifications were provided by the client.

1.2 Mounting in test rig

Test rig	Window test rig „Z“ with suppressed flanking transmission acc. to EN ISO 10140-5: 2010+A1:2014; the test rig includes a mounting frame with a continuous acoustic break which is sealed in the test opening with closed-cell permanently resilient sealant. The test opening was adapted to the size required by the ift Laboratory for Building Acoustics by high performance double leaf wall elements.

Mounting of test specimen	Test specimen mounted by **ift** Laboratory for Building Acoustics.
Mounting conditions	The unit was fitted at a distance of 5 mm into a wooden frame of 25 mm x 25 mm cross section. The cavity between test rig and glazing beads was completely filled with plastic sealant type Perennator 2001 S grey.
Mounting position	according to EN ISO 10140-1:2010+A1:2012+A2:2014 Annex D
Preparation	Storage of the glazing one day before testing in the test rig for conditioning.

1.3 Description of test specimen

The structural details were examined solely on the basis of the characteristics to be classified. The illustrations are based on unchanged documentation provided by the client.

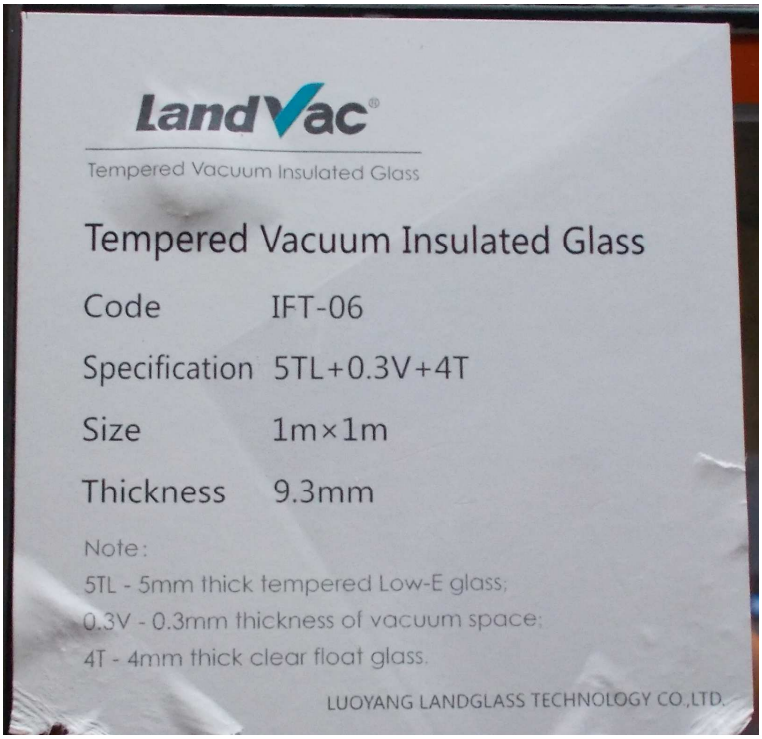


fig 1 Photo of the glass sticker, taken by **ift** Laboratory for Building Acoustics

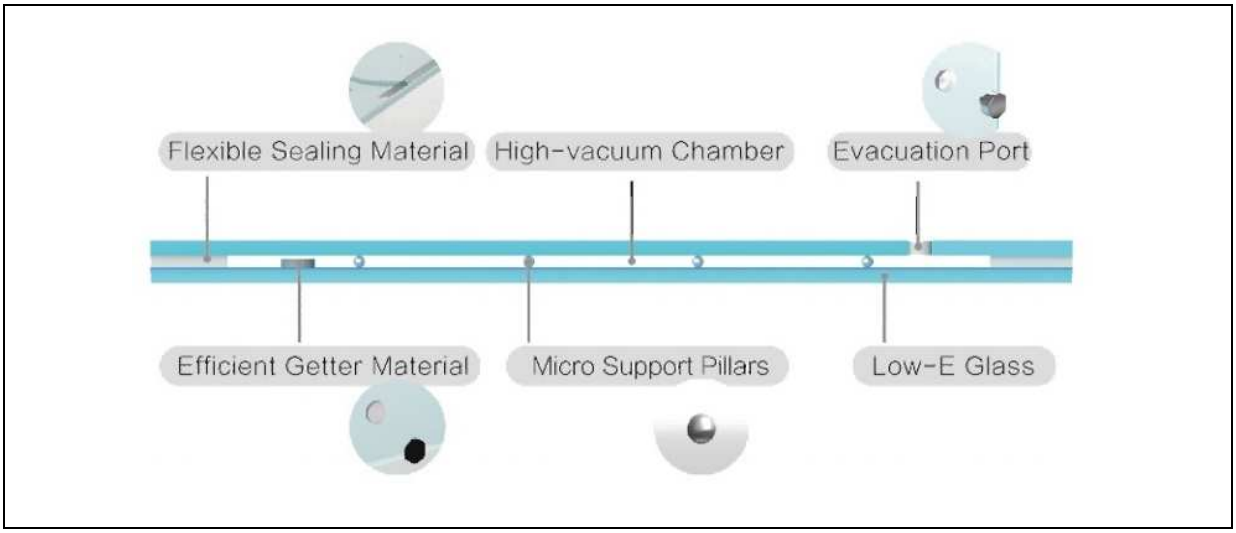


fig 2 Principal drawing of VIG Unit, provided by client

2 Procedure

2.1 Sampling

Sampling	The test specimen were selected by the client
Quantity	1
Manufacturer	Luoyang Landglass Technology CO. LTD
Manufacturing plant , Site of manufacturing	VIG Center
Date of manufacture / date of sampling	1st July 2016
Production line	Tempered Vacuum Insulated Glass Line
Responsible for sampling	Mr. Li Yanbing
Delivery at **ift**	11th July 2016 by the client via forwarding agency
ift Registration Number	41768/01

2.2 Process

Basis

EN ISO 10140-1: 2010 + A1: 2012 + A2: 2014 Acoustics; Laboratory measurement of sound insulation of building elements - Part 1: Application rules for specific products (ISO 10140-1: 2010+Amd. 1: 2012+ Amd. 2: 2014)

EN ISO 10140-2:2010 Acoustics; Laboratory measurement of sound insulation of building elements - Part 2: Measurement of airborne sound insulation (ISO 10140-2:2010)

EN ISO 717-1: 2013 Acoustics; Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation

Corresponds to the national German standard:

DIN EN ISO 10140-1: 2014-09, DIN EN ISO 10140-2:2010-12 and DIN EN ISO 717-1 : 2013-06

Procedure and scope of measurement are except for the deviations in conformity with the principles of the Working Group of sound insulation testing bodies approved by the national building supervisory authorities in cooperation with the standardization committee NA 005-55-75-AA (subcommittee UA 1 - DIN 4109).

Boundary conditions	As required in the standard.
Deviation	The dimensions of the test specimen and the test opening differ from the standard dimensions.
Test noise	Pink noise
Measuring filter	One-third-octave band filter
Measurement limits	
Low frequencies	The dimensions of the receiving room were smaller than recommended for testing in the frequency range from 50 Hz to 80 Hz as per EN ISO 10140-4:2010 Annex A (informative). A moving loudspeaker was used.
Background noise level	The background noise level in the receiving room was determined during measurement and the receiving room level L_2 corrected by calculation as per EN ISO 10140-4: 2010 Clause 4.3.
Maximum sound insulation	The maximum sound insulation of the test set-up was at least 15 dB higher than the measured sound reduction index of the test specimen. Not corrected by calculation.

Measurement of reverberation time: arithmetical mean: two measurements each of 2 loudspeaker and 3 microphone positions (a total of 12 independent measurements).

Measurement equation A: $A = 0{,}16 \cdot \frac{V}{T}$ m²

Measurement of sound level difference: Minimum of 2 loudspeaker positions and rotating microphones.

Measurement equation R: $R = L_1 - L_2 + 10 \cdot \lg \frac{S}{A}$ in dB

KEY

A	Equivalent absorption area in m²
L_1	Sound pressure level source room in dB
L_2	Sound pressure level receiving room in dB
R	Sound reduction index in dB
T	Reverberation time in s
V	Volume of receiving room in m³
S	Testing area of the specimen in m²

2.3 Test equipment

Device	Type	Manufacturer
Integrating sound meter	Type Nortronic 121	Norsonic-Tippkemper
Microphone preamplifiers	Type 1201	Norsonic-Tippkemper
Microphone unit	Type 1220	Norsonic-Tippkemper
Calibrator	Type 1251	Norsonic-Tippkemper
Dodecahedron loudspeakers	Own Design	-
Amplifier	Type E120	FG Elektronik
Rotating microphone boom	Own Design / Type 231-N-360	Norsonic-Tippkemper

The **ift** Laboratory for Building Acoustics participates in comparative measurements at the Physikalisch-Technische Bundesanstalt (PTB) in Braunschweig every three years. The last one was in April 2016. The sound level meter used, Series No. 31423, was DKD calibrated by the company Norsonic Tippkemper (DKD - Deutscher Kalibrierdienst “German Calibration Service”) on 22nd June 2015.

2.4 Testing

Date: 22nd July 2016

Operating Testing Officer: Florian Brechleiter

3 Detailed results

The values of the measured sound reduction index of the tested Insulating glass unit are plotted as a function of frequency in the annexed data sheet and tabled.

As per EN ISO 717-1 the weighted sound reduction index R_w and the spectrum adaptation terms C and C_{tr} for the frequency range 100 Hz to 3150 Hz obtained by calculation are as follows:

$$\mathbf{R_w\ (C;C_{tr}) = 36\ (-2;-3)\ dB}$$

According to EN ISO 717-1 the following additional spectrum adaptation terms are obtained

$C_{50\text{-}3,150}$	=	-2 dB	$C_{100\text{-}5,000}$	=	-4 dB	$C_{50\text{-}5,000}$	=	-4 dB
$C_{tr,50\text{-}3,150}$	=	-4 dB	$C_{tr,100\text{-}5,000}$	=	-4 dB	$C_{tr,50\text{-}5,000}$	=	-4 dB

4 Instructions for use

4.1 Measurement uncertainties, single number value in $^1/_{10}$ dB

Basis

EN ISO 12999-1: 2014	Acoustics; Determination and application of measurement uncertainties in building acoustics, part 1: sound insulation (ISO 12999-1: 2014)

The resulting weighted sound reduction index (in 1/10 dB with measurement uncertainty), determined on the basis of EN ISO 717-1:2013-06 is:

$$R_w = 36.1\ dB \pm 1.2\ dB$$

The specified measurement uncertainty is the average standard deviation of laboratory measurements (standard measurement uncertainty σ_R for measurement situation A: Characterisation of a building component by laboratory measurements as per EN ISO 12999-1:2014, Table 3 s σ_R = 1.2 dB).
For product declaration concerning CE marking the single number rating of the weighted sound reduction index and the spectrum adaptation term according to Clause 3 must be used.

$$R_w\ (C;C_{tr}) = 36\ (-2;-3)\ dB$$

ift Rosenheim
Laboratory for Building Acoustics
01.08.2016

Sound reduction index according to ISO 10140 - 2

Laboratory measurements of airborne sound insulation of building elements

Client: **Luoyang Landglass Technology CO. LTD-Guangjian Building**, 471000 Luoyang-Henan (China)

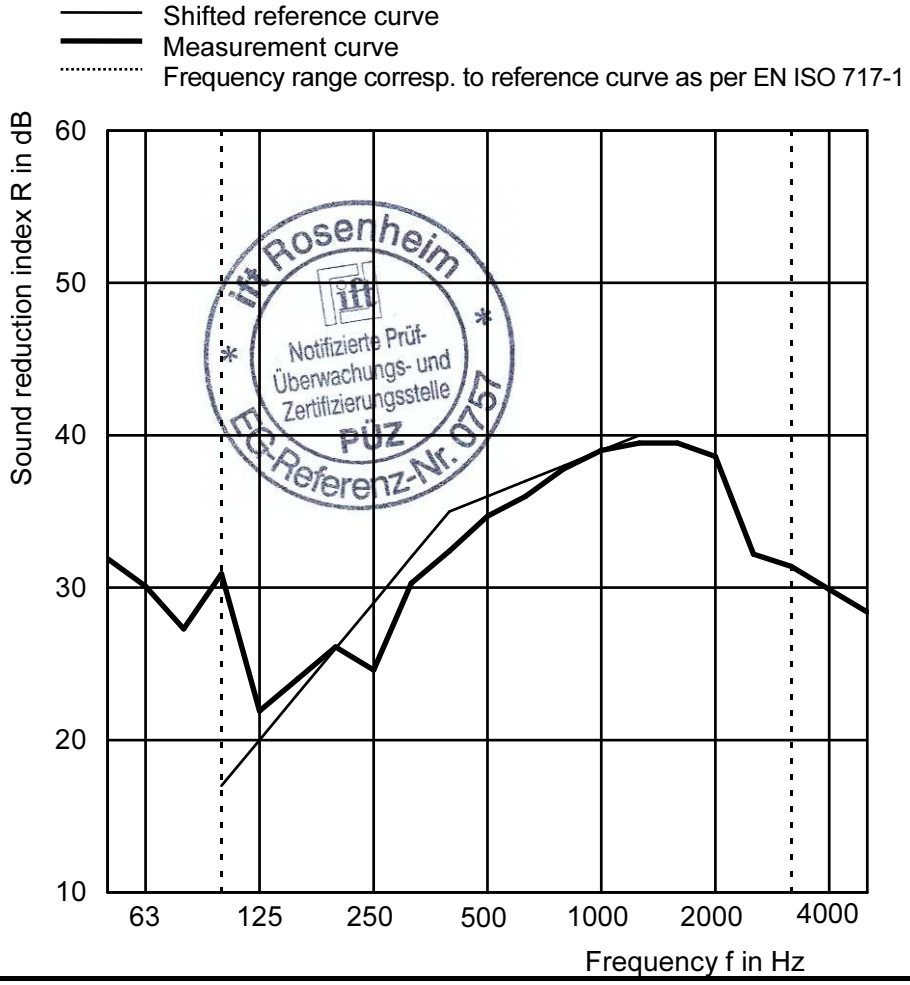
Product designation Tempered vacuum insulated glass

Design of test specimen

Insulating glass unit
External dimensions 1,000 mm × 1,000 mm
Pane configuration 5 Tempered Low-E Glass/0.3 Vacuum/4 Tempered Glass
Gas filling in cavity Vacuum
Area related mass 21.9 kg/m²
Pane temperature 23 °C

Test date 22nd July 2016
Test surface S 1.02 m × 1.02 m = 1.04 m^2
Test rig as per EN ISO 10140-5
Partition wall Double-leaf concrete wall, insert frame
Test noise pink noise
Volumes of test rooms V_S = 104 m³, V_R = 67.5 m³
Maximum sound reduction index $R_{w,max}$ = 62 dB (related to test surface)
Mounting conditions
Glass mounted in test opening and held on both sides by glazing beads (25 mm × 25 mm); gap between test rig, glazing and glazing beads was completely filled with plastic sealant
Climate in test rooms 23 °C / 65 % RH
Static air pressure 960 hPa

f in Hz	R in dB
50	31.9
63	30.1
80	27.3
100	30.9
125	21.9
160	24.0
200	26.1
250	24.6
315	30.3
400	32.4
500	34.7
630	36.0
800	37.8
1,000	39.0
1,250	39.5
1,600	39.5
2,000	38.6
2,500	32.2
3,150	31.4
4,000	29.9
5,000	28.4



Rating according to EN ISO 717-1 (in third octave bands):

R_w ($C;C_{tr}$) = 36 (-2;-3) dB $C_{50\text{-}3.150}$ = -2 dB; $C_{100\text{-}5,000}$ = -4 dB; $C_{50\text{-}5,000}$ = -4 dB
$C_{tr,50\text{-}3,150}$ = -4 dB; $C_{tr,100\text{-}5,000}$ = -4 dB; $C_{tr,50\text{-}5,000}$ = -4 dB

Test report No.: 16-000936-PR01 (PB 1-H01-04-en-01)
Page 8 of 8, Data Sheet No. Z1
ift Rosenheim
Laboratory for Building Acoustics
1. August 2016

Dipl. Ing. (FH) Florian Brechleiter
Operating testing officer