

Test Report



Number	24-002938-PR04 (PB-H01-06-en)
Owner	LUOYANG LANDVAC Ti-VIG CO.,LTD Building 1 at the northwest corner of the intersection between Keji Av. and Zhuge St. YIBIN DISTRICT Luoyang City, Henan Province China
Product	Vacuum insulating glass
Designation	Shipping name: Vacuum insulating glass – Ultra Clear Triple Silver S70
Details	Manufacturer LUOYANG LANDVAC Ti-VIG CO., LTD - Luoyang City, Henan Province; Overall dimensions (W x H) in mm 500 mm x 500 mm; Glass configuration in mm 4 / 0.3 / 4; Coating, type Low-E; Coating, position Pos. 2; Coating, emissivity ??; Vacuum ??; Spacer / Edge seals Material Metal; Distance pieces; Distance in mm ??; Diameter in mm ??; Height in mm ??; Material ??
Special features	
Order	Testing of thermal transmittance
Contents	The test report contains a total of 13 pages and annexes (2 pages)
Note	The test report shall only be published in its unabbreviated form. The “Guidance Sheet for the Use of ift Test Documents” applies.

No. 24-002938-PR04 (PB-H01-06-en) dated 31.01.2025
Owner LUOYANG LANDVAC Ti-VIG CO.,LTD, YIBIN DISTRICT Luoyang City, Henan Province
(China)

Testing of thermal transmittance



1 Execution

1.1 Sampling and product description

The following details have been presented to ift:

Sampler: LUOYANG LANDVAC Ti-VIG CO.,LTD, YIBIN DISTRICT Luoyang City, Henan Province (China)
Evidence: ift Rosenheim did not receive a sampling report.
Date of delivery: 04.11.2024
Description: For product identification the specimen tested is described/represented in the Annex. Material specifications, item numbers and other company-specific descriptions are details provided by the client and will be checked for plausibility by ift.

ift-No. of test specimen (PK): 24-002938-PK04 / WE: 61784-001, 61784-002, 61784-003, 61784-004

1.2 Basic documents *) of the procedures

EN 674:2011 – 06

Glass in building – Determination of thermal transmittance (U value) – Guarded hot plate method

ISO 19916-1:2018 – 10

Glass in building – Vacuum insulating glass – Part 1: Basic specification of products and evaluation methods for thermal and sound insulation performance

*) and the relevant national versions, e.g. DIN EN

1.3 Short description of the procedures

Measurement of thermal resistance using the guarded hot plate apparatus

For thermal resistance measurement a guarded hot plate apparatus (two-specimen apparatus or single-specimen apparatus) was used. The detailed results show the method used for this test.

The method is based on measuring the thermal flux, produced by the temperature difference, which is transferred across one or two test specimens in the steady state.

For the two-specimen method a central heating unit is sandwiched between two nearly identical test specimens. The thermal flux is transferred through the test specimens to separate cooling units. The heat flow is determined by measuring the power supplied to the heating unit in the metering section.

For the single-specimen apparatus one of the two specimens is replaced with a combination of an insulating board and a protective plate. With this combination the temperature difference is set to zero. Since the properties of the insulation are known, the heat flux can be determined by the test specimen in this process.

The result provided by the two methods is the thermal resistance computed from the heat flow rate, the temperature difference and the area through which the heat flows.

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 Owner LUOYANG LANDVAC TI-VIG CO.,LTD, YIBIN DISTRICT Luoyang City, Henan Province (China)

Testing of thermal transmittance



2 Detailed results

Measuring the thermal resistance by means of guarded hot plate according to EN 674:2011-06

Project-No. 24-002938-PR04
 Basis EN 674:2011-06
 Glass in building - Determination of thermal transmittance (U value) - Guarded hot plate method
 Test equipment Pst/022001 - Guarded hot plate
 Test specimen VIG
 Test specimen No. 61784-001
 Date of test 03 January 2025
 Test engineer in charge Konrad Huber
 Test engineer Stefan Junker

Implementation of tests
 Type of guarded hot plate apparatus The measurement was performed with a guarded hot plate apparatus with a single specimen.

Deviations There have been no deviations from the test method as specified in the standard/basis.

Measurement data/Results

Test specimen information

Specimen orientation: vertical
 Heat flow direction: horizontal

Symbol	Description	Value	Unit
b	Width	500	mm
h	Height	500	mm
m	Mass	4,9	kg
m/A	Area related mass	19,7	kg/m ²
d _{tot,edge}	Total thickness (measured at the edge)	8,2	mm
d _{tot,middle}	Total thickness (measured at the middle)	---	mm

Detailed Results

Table: Detailed results of the guarded hot plate apparatus

Symbol	Description	Value	Unit
A	Metering section	62500	mm ²
Φ	Heat flow	0,3	W
θ _i	Mean surface temperature on the inner (warm) side	17,5	°C
θ _e	Mean surface temperature on the outer (cold) side	2,5	°C
θ _m	Mean temperature	10,0	°C
Δθ	Mean temperature difference	15,0	K
R	Thermal resistance	3,000	(m ² ·K)/W

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 Owner LUOYANG LANDVAC TI-VIG CO.,LTD, YIBIN DISTRICT Luoyang City, Henan Province (China)

Testing of thermal transmittance

Determination of thermal transmittance according to EN 674:2011-06

Project-No. 24-002938-PR04
 Basis EN 674:2011-06
 Glass in building - Determination of thermal transmittance (U value) - Guarded hot plate method
 Test equipment Sim/020841 - ift calculation programme
 Test specimen VIG
 Test specimen No. 61784-001
 Date of test 03 January 2025
 Test engineer in charge Konrad Huber
 Test engineer Stefan Junker

Implementation of tests

Deviations There have been no deviations from the test method as specified in the standard/basis.

Uncertainty of measurement 8%

Measurement data/Results

Symbol	Description	Value	Unit
R	Thermal resistance	3.000	(m ² ·K)/W
R _{Bufferplate internal}	Thermal resistance	0.095	(m ² ·K)/W
R _{Bufferplate external}	Thermal resistance	0.095	(m ² ·K)/W
R _{VIG}	Thermal resistance	2.810	(m ² ·K)/W
ε _n	normal emissivity of the external surface	0.89	-
ε	corrected emissivity of the external surface	0.837	-
h _i	interior heat-transfer coefficient	7.7	W/(m ² ·K)
h _e	exterior heat-transfer coefficient	25.0	W/(m ² ·K)
U _g	Thermal transmittance	0,34	W/(m ² ·K)
u _{Ug,abs.}	Uncertainty thermal transmittance	± 0,03	W/(m ² ·K)

Note: The measured thermal transmittance refers exclusively to the tested installation situation.

No. 24-002938-PR04 (PB-H01-06-en) dated 31.01.2025
 Owner LUOYANG LANDVAC TI-VIG CO.,LTD, YIBIN DISTRICT Luoyang City, Henan Province (China)

Testing of thermal transmittance



Measuring the thermal resistance by means of guarded hot plate according to EN 674:2011-06

Project-No. 24-002938-PR04
 Basis EN 674:2011-06
 Glass in building - Determination of thermal transmittance (U value) - Guarded hot plate method
 Test equipment Pst/022001 - Guarded hot plate
 Test specimen VIG
 Test specimen No. 61784-002
 Date of test 04 January 2025
 Test engineer in charge Konrad Huber
 Test engineer Stefan Junker

Implementation of tests

Type of guarded hot plate apparatus

The measurement was performed with a guarded hot plate apparatus with a single specimen.

Deviations

There have been no deviations from the test method as specified in the standard/basis.

Measurement data/Results

Test specimen information

Specimen orientation: vertical
 Heat flow direction: horizontal

Symbol	Description	Value	Unit
b	Width	500	mm
h	Height	500	mm
m	Mass	4,9	kg
m/A	Area related mass	19,7	kg/m ²
d _{tot,edge}	Total thickness (measured at the edge)	8,2	mm
d _{tot,middle}	Total thickness (measured at the middle)	---	mm

Detailed Results

Table: Detailed results of the guarded hot plate apparatus

Symbol	Description	Value	Unit
A	Metering section	62500	mm ²
Φ	Heat flow	0,3	W
θ _i	Mean surface temperature on the inner (warm) side	17,5	°C
θ _e	Mean surface temperature on the outer (cold) side	2,5	°C
θ _m	Mean temperature	10,0	°C
Δθ	Mean temperature difference	15,0	K
R	Thermal resistance	2,948	(m ² ·K)/W

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Owner LUOYANG LANDVAC TI-VIG CO.,LTD, YIBIN DISTRICT Luoyang City, Henan Province (China)

Testing of thermal transmittance

**Determination of thermal transmittance according to EN 674:2011-06**

Project-No. 24-002938-PR04
Basis EN 674:2011-06
Glass in building - Determination of thermal transmittance (U value) - Guarded hot plate method
Test equipment Sim/020841 - ift calculation programme
Test specimen VIG
Test specimen No. 61784-002
Date of test 04 January 2025
Test engineer in charge Konrad Huber
Test engineer Stefan Junker

Implementation of tests

Deviations There have been no deviations from the test method as specified in the standard/basis.

Uncertainty of measurement 8%

Measurement data/Results

Symbol	Description	Value	Unit
R	Thermal resistance	2.948	(m ² ·K)/W
R _{Bufferplate internal}	Thermal resistance	0.095	(m ² ·K)/W
R _{Bufferplate external}	Thermal resistance	0.095	(m ² ·K)/W
R _{VIG}	Thermal resistance	2.758	(m ² ·K)/W
ε _n	normal emissivity of the external surface	0.89	-
ε	corrected emissivity of the external surface	0.837	-
h _i	interior heat-transfer coefficient	7.7	W/(m ² ·K)
h _e	exterior heat-transfer coefficient	25.0	W/(m ² ·K)
U _g	Thermal transmittance	0,34	W/(m ² ·K)
U _{Ug,abs.}	Uncertainty thermal transmittance	± 0,03	W/(m ² ·K)

Note: The measured thermal transmittance refers exclusively to the tested installation situation.

No. 24-002938-PR04 (PB-H01-06-en) dated 31.01.2025
 Owner LUOYANG LANDVAC TI-VIG CO.,LTD, YIBIN DISTRICT Luoyang City, Henan Province (China)

Testing of thermal transmittance



Measuring the thermal resistance by means of guarded hot plate according to EN 674:2011-06

Project-No. 24-002938-PR04
 Basis EN 674:2011-06
 Glass in building - Determination of thermal transmittance (U value) - Guarded hot plate method
 Test equipment Pst/022001 - Guarded hot plate
 Test specimen VIG
 Test specimen No. 61784-002
 Date of test 08 January 2025
 Test engineer in charge Konrad Huber
 Test engineer Stefan Junker

Implementation of tests

Type of guarded hot plate apparatus

The measurement was performed with a guarded hot plate apparatus with a single specimen.

Deviations

There have been no deviations from the test method as specified in the standard/basis.

Measurement data/Results

Test specimen information

Specimen orientation: vertical
 Heat flow direction: horizontal

Symbol	Description	Value	Unit
b	Width	500	mm
h	Height	500	mm
m	Mass	4,9	kg
m/A	Area related mass	19,7	kg/m ²
d _{tot,edge}	Total thickness (measured at the edge)	8,2	mm
d _{tot,middle}	Total thickness (measured at the middle)	---	mm

Detailed Results

Table: Detailed results of the guarded hot plate apparatus

Symbol	Description	Value	Unit
A	Metering section	62500	mm ²
Φ	Heat flow	0,3	W
θ _i	Mean surface temperature on the inner (warm) side	17,5	°C
θ _e	Mean surface temperature on the outer (cold) side	2,5	°C
θ _m	Mean temperature	10,0	°C
Δθ	Mean temperature difference	15,0	K
R	Thermal resistance	2,918	(m ² ·K)/W

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 Owner LUOYANG LANDVAC TI-VIG CO.,LTD, YIBIN DISTRICT Luoyang City, Henan Province (China)



Testing of thermal transmittance

Determination of thermal transmittance according to EN 674:2011-06

Project-No. 24-002938-PR04
 Basis EN 674:2011-06
 Glass in building - Determination of thermal transmittance (U value) - Guarded hot plate method
 Test equipment Sim/020841 - ift calculation programme
 Test specimen VIG
 Test specimen No. 61784-002
 Date of test 08 January 2025
 Test engineer in charge Konrad Huber
 Test engineer Stefan Junker

Implementation of tests

Deviations There have been no deviations from the test method as specified in the standard/basis.

Uncertainty of measurement 8%

Measurement data/Results

Symbol	Description	Value	Unit
R	Thermal resistance	2.918	(m ² ·K)/W
R _{Bufferplate internal}	Thermal resistance	0.095	(m ² ·K)/W
R _{Bufferplate external}	Thermal resistance	0.095	(m ² ·K)/W
R _{VIG}	Thermal resistance	2.728	(m ² ·K)/W
ε _n	normal emissivity of the external surface	0.89	-
ε	corrected emissivity of the external surface	0.837	-
h _i	interior heat-transfer coefficient	7.7	W/(m ² ·K)
h _e	exterior heat-transfer coefficient	25.0	W/(m ² ·K)
U _g	Thermal transmittance	0,35	W/(m ² ·K)
u _{Ug,abs.}	Uncertainty thermal transmittance	± 0,03	W/(m ² ·K)

Note: The measured thermal transmittance refers exclusively to the tested installation situation.

No. 24-002938-PR04 (PB-H01-06-en) dated 31.01.2025
 Owner LUOYANG LANDVAC TI-VIG CO.,LTD, YIBIN DISTRICT Luoyang City, Henan Province (China)

Testing of thermal transmittance



Measuring the thermal resistance by means of guarded hot plate according to EN 674:2011-06

Project-No. 24-002938-PR04
 Basis EN 674:2011-06
 Glass in building - Determination of thermal transmittance (U value) - Guarded hot plate method
 Test equipment Pst/022001 - Guarded hot plate
 Test specimen VIG
 Test specimen No. 61784-003
 Date of test 05 January 2025
 Test engineer in charge Konrad Huber
 Test engineer Stefan Junker

Implementation of tests
 Type of guarded hot plate apparatus

The measurement was performed with a guarded hot plate apparatus with a single specimen.

Deviations

There have been no deviations from the test method as specified in the standard/basis.

Measurement data/Results

Test specimen information

Specimen orientation: vertical
 Heat flow direction: horizontal

Symbol	Description	Value	Unit
b	Width	500	mm
h	Height	500	mm
m	Mass	4,9	kg
m/A	Area related mass	19,7	kg/m ²
d _{tot,edge}	Total thickness (measured at the edge)	8,2	mm
d _{tot,middle}	Total thickness (measured at the middle)	---	mm

Detailed Results

Table: Detailed results of the guarded hot plate apparatus

Symbol	Description	Value	Unit
A	Metering section	62500	mm ²
Φ	Heat flow	0,3	W
θ _i	Mean surface temperature on the inner (warm) side	17,5	°C
θ _e	Mean surface temperature on the outer (cold) side	2,5	°C
θ _m	Mean temperature	10,0	°C
Δθ	Mean temperature difference	15,0	K
R	Thermal resistance	2,944	(m ² ·K)/W

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 Owner LUOYANG LANDVAC TI-VIG CO.,LTD, YIBIN DISTRICT Luoyang City, Henan Province (China)

Testing of thermal transmittance

Determination of thermal transmittance according to EN 674:2011-06

Project-No. 24-002938-PR04
 Basis EN 674:2011-06
 Glass in building - Determination of thermal transmittance (U value) - Guarded hot plate method
 Test equipment Sim/020841 - ift calculation programme
 Test specimen VIG
 Test specimen No. 61784-003
 Date of test 05 January 2025
 Test engineer in charge Konrad Huber
 Test engineer Stefan Junker

Implementation of tests

Deviations There have been no deviations from the test method as specified in the standard/basis.

Uncertainty of measurement 8%

Measurement data/Results

Symbol	Description	Value	Unit
R	Thermal resistance	2.944	(m ² ·K)/W
R _{Bufferplate internal}	Thermal resistance	0.095	(m ² ·K)/W
R _{Bufferplate external}	Thermal resistance	0.095	(m ² ·K)/W
R _{VIG}	Thermal resistance	2.754	(m ² ·K)/W
ε _n	normal emissivity of the external surface	0.89	-
ε	corrected emissivity of the external surface	0.837	-
h _i	interior heat-transfer coefficient	7.7	W/(m ² ·K)
h _e	exterior heat-transfer coefficient	25.0	W/(m ² ·K)
U _g	Thermal transmittance	0,34	W/(m ² ·K)
u _{Ug,abs.}	Uncertainty thermal transmittance	± 0,02	W/(m ² ·K)

Note: The measured thermal transmittance refers exclusively to the tested installation situation.

No. 24-002938-PR04 (PB-H01-06-en) dated 31.01.2025
 Owner LUOYANG LANDVAC TI-VIG CO.,LTD, YIBIN DISTRICT Luoyang City, Henan Province (China)



Testing of thermal transmittance

Determination of the U-Value based on ISO 19916-1:2018-10

Project-No. 24-002938-PR04
 Basis ISO 19916-1:2018-10
 Glass in building – Vacuum insulating glass – Part 1: Basic specification of products and evaluation methods for thermal and sound insulating performance
 Test equipment Sim/020841 - ift calculation programme
 Test specimen Vacuum insulating glass (VIG)
 Test specimen No. 61784-001, 61784-002, 61784-003
 Date of test 31.01.2025
 Test engineer in charge Konrad Huber
 Test engineer Konrad Huber

Implementation of tests

Deviations There have been no deviations from the test method as specified in the standard/basis.

Ambient conditions

Determination of the U-value

The percentage difference between the $U_{1,1}$ -value and $U_{1,2}$ -value shall be no more than 3,0%

$$100 |U_{1,1} - U_{1,2}| / ((U_{1,1} + U_{1,2}) / 2) \leq 3,0 \%$$

The average of the measured U-value on three specimens shall be calculated:

$$U_{av} = (U_1 + U_2 + U_3) / 3$$

$$U_1 = (U_{1,1} + U_{1,2}) / 2$$

The percentage deviation between U_{av} and the U-value of each specimen shall be calculated:

$$U_{dev,n} = 100 (|U_{av} - U_n| / U_{av})$$

For all the tested specimens $U_{dev,n}$ shall be no more than 10,0 %.

Symbol	Definition	Unit
$U_{1,1}$	First measured U-value of the first specimen	W/(m ² K)
$U_{1,2}$	Second measured U-value of the first specimen	W/(m ² K)
U_{av}	Average of the measured U-value on three specimens	W/(m ² K)
$U_{dev,n}$	Percentage deviation between U_{av} and U-value of each specimen	W/(m ² K)

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Owner LUOYANG LANDVAC TI-VIG CO.,LTD, YIBIN DISTRICT Luoyang City, Henan Province (China)



Testing of thermal transmittance

Results

Specimen No.	U_n in $W/(m^2 K)$	ΔU_n in $W/(m^2 K)$	$\Delta U_{r,n}$ in %	U_{av} in $W/(m^2 K)$	$U_{dev,n}$ in %
61784-002	0,342	0,004	1,0	0,34	0,9
61784-002	0,345				
61784-001	0,336	-	-		1,4
61784-003	0,342	-	-		0,5

Requirement for the first U-value test:
The requirement for the max. deviation $\leq 3,0$ % is fulfilled.

Requirement for the percentage deviation between U_{av} and the U-value of each specimen:
The requirement for the $U_{dev,n}$ is fulfilled. Thus, the requirements for the determination of the U-value of the vacuum insulating glass are fulfilled.

No. 24-002938-PR04 (PB-H01-06-en) dated 31.01.2025
Owner LUOYANG LANDVAC TI-VIG CO.,LTD, YIBIN DISTRICT Luoyang City, Henan Province
(China)

Testing of thermal transmittance



3 Summary

3.1 Result

Determination of the thermal transmittance based ISO 19916-1:2018 – 10

$$U = 0.34 \text{ W}/(\text{m}^2\text{K})$$

The data and results given relate solely to the tested and described specimen. This test/evaluation does not allow any statement to be made on further characteristics of the present structure regarding performance and quality.

3.2 Instructions for use

The result can be transferred under the manufacturer's own responsibility, taking into account the corresponding provisions of the test standard.

This test does not allow any statement to be made on further characteristics of the present structure regarding performance and quality.

On the basis of this Test Report NO "ift-Nachweis" (Evidence) can be issued. The information/documents listed in the following have to be submitted to ift Rosenheim by the client.

Missing information about distance pieces / micro support pillows (distance, diameter, height, material), coating type, emissivity of coating and vacuum

ift Rosenheim
31.01.2025

A handwritten signature in blue ink, appearing to read 'Konrad Huber'.

Konrad Huber, Dipl.-Ing. (FH)
Head of Testing Department
Building Physics

A handwritten signature in blue ink, appearing to read 'S. Junker'.

Stefan Junker, Dipl.-Ing. (FH)
Operating Testing Officer
Building Physics

Test Report

no. 24-002938-PR04 (PB-H01-06-en) dated 31.01.2025
owner (client) LUOYANG LANDVAC Ti-VIG CO.,LTD, YIBIN DISTRICT Luoyang City, Henan Province (China)



Contents list of Annexes

Annex no.	title / content	pages
1	Description of the test specimen	
2	Representation of product/test specimen	1

Test Report

No. 24-002938-PR04 (PB-H01-06-en) dated 31.01.2025
Owner LUOYANG LANDVAC Ti-VIG CO.,LTD, YIBIN DISTRICT Luoyang City, Henan Province (China)

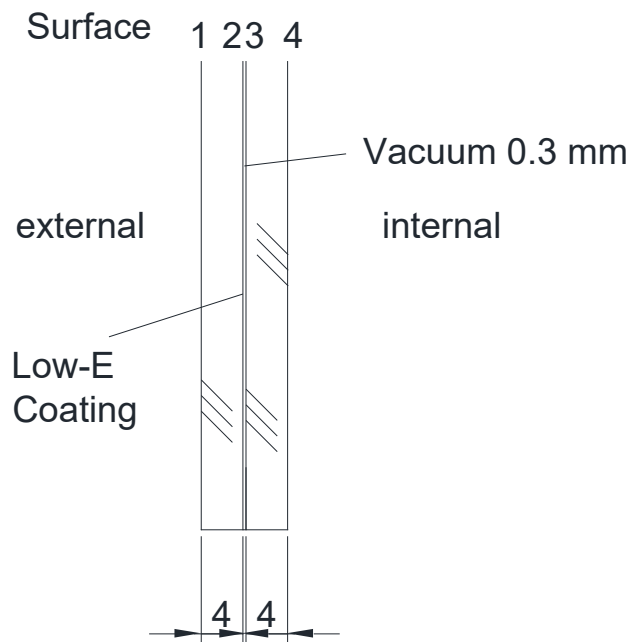


Fig. 1 Representation (Schematic view of the test specimen, drawing created by the ift).