

Test report

Test report relating to a glass product according to European standard EN 1279-4; MVTR, gas permeation rate and tensile strength testing concerning the product marked as: Silande MF881-25HM, manufactured by: Zhengzhou Zhongyuan Silande High Technology Co., Ltd

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Author(s)	Mr. M.A.A.M. Schets, B. Sc.
Client	Zhengzhou Zhongyuan Silande High Technology Co., Ltd No.28, Dongqing West St. Zhengzhou Hi-tech Development Zone, 450001 China
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Headoffice:

Boogschutterstraat 11A
P.O. Box 541
7300 AM Apeldoorn
Tel. +31 (0)88 888 7 888
Fax +31 (0)88 888 7 879

Locations:

Vissenstraat 6
P.O. Box 541
7324 AL Apeldoorn
Tel. +31 (0)88 888 7 888
Fax +31 (0)88 888 7 879

Eiberkamp 10
P.O. Box 37
9350 AA Leek
Tel. +31 (0)88 888 7 888
Fax: +31 (0)594 504 804

Josink Esweg 10
P.O. Box 337
7500 AH Enschede
Tel. +31 (0)88 888 7 888
Fax +31 (0)88 888 7 859

TÜV Rheinland Nederland B.V. is a registered company at the Dutch Chamber of Commerce under number 27288788
info@nl.tuv.com
www.tuv.com/nl

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1 Introduction

1.1 Purpose

The tests have been performed in order to determine the properties of a sealant according to European standard EN 1279-4 [1].

Revision 1 was made because of some spelling errors.

Revision 2 was made because of a name change of the client.

1.2 Description of the samples

General

Name of the manufacturer	Zhengzhou Zhongyuan Silande High Technology Co., Ltd
Address of the manufacturer	No.28, Dongqing West St. Zhengzhou Hi-tech Development Zone, 450001 China
Production plant of the samples	No.26, Yinping Road, Zhengzhou Hi-tech Development Zone, 450001 China
Line ID where the samples are made	N.A.
Production date	11 May 2014
Sampling date	N.A.
The product was marked as	Silande MF881-25HM , two component silicone structural sealant

Specific

Sample dimensions	
Dimensions of the H-samples	H-samples (38x) Sealant: 50x12x12mm Glass: 75x12x6mm (2x)
Dimensions of the permeation samples	Disc Ø200 mm, 2.0±1 mm (8x)
Sealant material	
Type	silicone
Charge Nr. A	no batch/charge number given
Charge Nr. B	no batch/charge number given
Colour	Black
Glass Specification	
Type of glass (coating)	Clear float glass no coating

1.3 Sampling procedure

The samples have been submitted by the assignor. The test house, acting as notified test body, has had no influence on the selection of the samples. The samples were received on 13 June 2014.

1.4 Application

The request for testing was submitted by the assignor on Datum on 21 May 2014. Assignment Form number: 14.A130.

1.5 Method of testing

All applicable tests have been performed according to the European standard EN 1279-4 [1].

1.6 Put out to contract

No tests were performed at third parties.

1.7 Privacy statement

Due to privacy reasons, the names of involved personnel that executed the tests are not disclosed in the report. However, this information is available on internal work sheets, test forms etc. in the project file.

1.8 Remark concerning this ITT report

For any other manufacturer this initial type test (ITT) report is not automatically valid. The manufacturer for this ITT report is defined under 1.2.

Reference to test report for moisture penetration index according to EN 1279-2 [2]: 89205967-02.

1.9 Notifications, accreditations, designations

TÜV Rheinland Nederland B.V. has been notified by the Dutch Ministry of Infrastructure and the Environment as Notified Test Body (number 1750) and Notified Certification Body (number 0336) for the European Construction Products Directive 89/106/EEC.

TÜV Rheinland Nederland B.V. has been accredited by the Dutch Accreditation Council (RvA) as ISO 17025 Test Laboratory (nr. L 484) and ISO 17065 Certification Body (nr. C078).

TÜV Rheinland Nederland B.V. has been designated as Technical Service (Laboratory) by the Approval Authorities for the Netherlands (RDW – E4) and Germany (KBA – E1) to grant approvals as mentioned in Directive 70/156/etc. and in the 1958 Agreement of the Economic Commission for Europe of the United Nations (UN-ECE) for glass as used in the automotive sector: ECE Regulation 43, safety glazing; EC Directive 92/22, Safety glass; EC Directive 2009/144, Glazing cat. T.

TÜV Rheinland Nederland B.V. has been recognised by the German Institute for building technics (DIBt) under number NL005.

2 Test results

Moisture vapour transmission rate

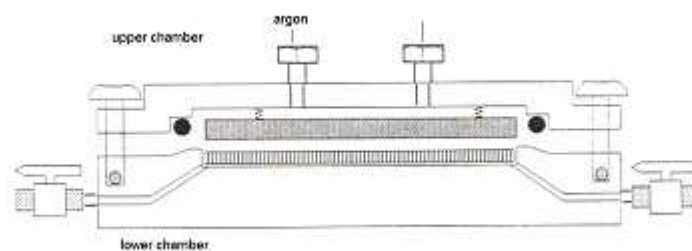
Part 4 of the EN1279 describes the determination of the moisture vapour transmission rate (MVTR) of an adhesive used for sealing of IGU's. The applied method is based on the measurement of the gravimetric increase in weight of test samples during the exposure in a controlled environment. The conditions of the environment used for this determination are (23 ± 1) °C at a relative humidity [R.H.] of > 90%. The thickness of the sample material must be as close as possible to 2 mm and have a diameter of > 150 mm. A specimen with a diameter of about 90 mm is punched out of the film sample. A metal dish is filled with a known amount of desiccant (CaCl_2 or molecular sieve with $\text{RH} < 5\%$) and covered by the foil. The dish is closed by clamping a lid with an opening of 50 cm^2 on top of the film. At regular intervals the increase in weight of the dish is measured on an analytical balance with an resolution of 0.0001 g. The increase of weight [g] (with possible corrections for the increase in mass of a blank) and exposure time and exposed area are used for the calculation of the MVTR per day per m^2 . The results are expressed as: MVTR in $[\text{g}\cdot\text{2mm}/(\text{m}^2\cdot\text{day})]$, at 23 °C and a relative humidity of > 85%.

Gas permeation rate

Part 4 of the EN 1279 [1] describes the gas permeation measurement. The gas transmission of is measured by means of a gas cell and gas chromatography. The sealant samples are placed between the upper and lower chamber of a gas cell. The upper chamber is flushed with argon and the lower chamber is flushed with nitrogen (resulting in a partial pressure difference of one atmosphere over the sample). After several hours of flushing the lower chamber is closed (steady state condition is received). This chamber is of a known volume. After a certain time (minutes to hours, depending of the gas permeability) a gas sample is taken from the lower chamber and analysed by means of gas chromatography for the argon amount. From the amount of argon in the gas sample, the elapsed time, the volume of the lower chamber and the test area (100 cm^2) the argon permeation is calculated.

The results are expressed for a 2 mm thick specimen as: argon permeation rate in $[\text{g}\cdot\text{2mm}/(\text{m}^2\cdot\text{h})]$, at 23 °C and a relative humidity of <5% with 1 bar pressure difference.

Of each type of material two samples were measured at (23 ± 2) °C.



Gas permeation cell

Physical properties of the sealants

This part covers evaluation of the edge seal strength. The requirement is that all edge seals shall have such sufficient adhesive and cohesive strength that during the strength test of the specimens, failure occurs outside the area OAB as given in Annex B of the EN1279-4. Breakage of the glass during testing will not constitute failure, providing that sufficient successful joints are tested in order that the average result can be obtained.

Besides this requirement the crossing point on the line AB is calculated. A sealant manufacturer should realize that this value has a significant meaning according to the rules of the EN 1279-4 [1]. This significant meaning is that when a repeat test is conducted (on another batch, date or for other reasons) and there is more than 20% deviation recorded towards the original crossing point AB of the official reference ITT the sealant is to be considered as a 'different sealant'. Part 4 describes the physical attributes of the joint made by the outer sealant before and after ageing cycles. This is not directly related to the durability of the joint but about the effects of these cycles on the changes of the sealants physical response.

For each of the following ageing cycles as well as no ageing (initial test) seven specimens are exposed and tested.

Initial test

After initial cure and conditioning at standard room temperature of at least 7 days, seven test specimens not subjected to any ageing regime are subjected to tensile load.

Heat exposure

After initial cure and conditioning seven test specimens are aged in a closed oven at (60 ± 2) °C for (168 ± 5) hours.

Water immersion

After initial cure and conditioning seven test specimens are immersed in one to two liters distilled or deionised water for (168 ± 5) hours.

UV exposure

After initial cure and conditioning seven test specimens are exposed to UV irradiation for (96 ± 4) hours, exposed perpendicular to the glass at an intensity in the UVA range of (40 ± 5) W/m².

After the ageing, the specimens undergo testing under tensile load at test speed of 5 mm/min. The joint width (12 ± 1) mm, length (50 ± 1) mm and height (12 ± 1) mm are measured prior to the tensile test.

The measurement uncertainty is ± 0.01 MPa in stress and $\pm 2\%$ (relative) in strain.

The standard room conditions are (23 ± 1) °C and (50 ± 5) % R.H.

The tensile stress is calculated from the mean of the contact areas between the sealant and the glass of the test specimens. The highest and lowest values are ignored so that the average values are calculated on the five remaining measured stress and strain values.

Test results after performing all applicable tests according to European standard EN 1279-4 [1].

Requirements and end result

Required	Value of the test	Pass / fail
4.1 Edge seal strength		
“All edge seals shall have sufficient adhesive and cohesive strength to allow the joints as specified to be extended such that any failure occurs outside the area OAB of figure 1.”	All ruptures outside area OAB	pass

Detailed test results

Moisture vapour transmission rate on sealant film, (23±1)°C, > 85% R.H. across the film

Test specimen	Thickness [mm]	Surface [cm ²]	MVTR [g.2mm ² /(m ² .24h)]
1	2.0	50	12.1
2	2.0	50	10.8
Average:			11.5

Argon permeation rate measurement on sealant film (23±1)°C

Test specimen	Thickness [mm]	Surface [cm ²]	Argon gas [g.2mm ² /(m ² .h)]
1	1.9	100	0.53
2	2.0	100	0.48
Average:			0.51

Physical properties of the sealant

In total 28 H-samples were delivered. These samples were divided in four groups of samples. One group was for initial values and the other three groups were used for ageing under water, heat and UV environments. The following table shows the values at AB line crossing. The results are as follows:

Seal strength test	At intersection with line AB		Type of failure observed (if any) c = cohesive ,a = adhesive				
	Average stress σ_{av} [MPa]	Average extension ϵ_{av} [%]	Specimen				
			1	2	3	4	5
initial	0.40	10.0	c	c	c	c	c
after H ₂ O immersion	0.39	10.8	c	c	c	c	c
after heating at 60°C	0.40	9.9	c	c	c	c	c
after UV radiation	0.40	9.9	c	c	c	c	c

Measurement uncertainty data

Uncertainty on measured dimensions: ±0.05 mm

Tensile test

σ_{av} : ±0.01 MPa

ϵ_{av} : ±0.5 % (absolute)

MVTR: ±10% with a resolution of 0.05 [g/(m².day)]

Gas permeation: ±10 % with a resolution of 0.0005 [g/(m².day)]

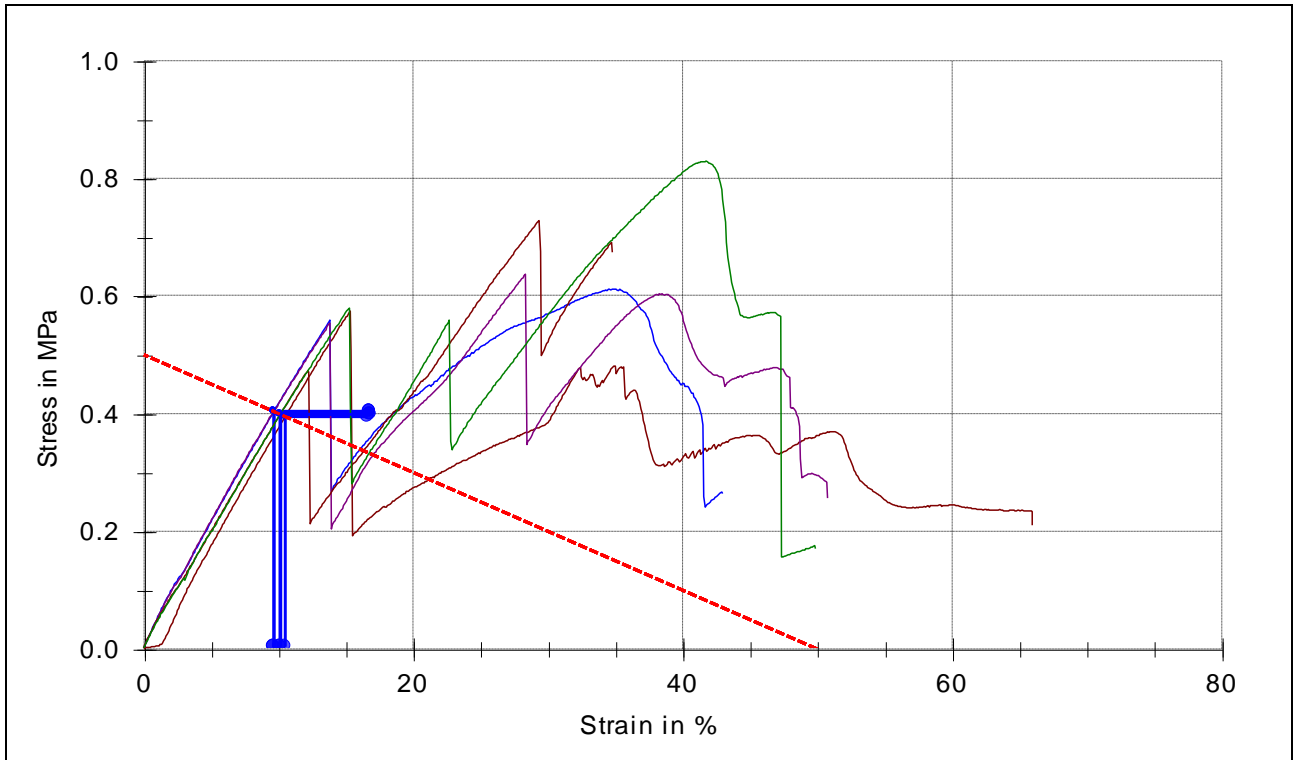


Figure 1: Stress/strain curves, initial

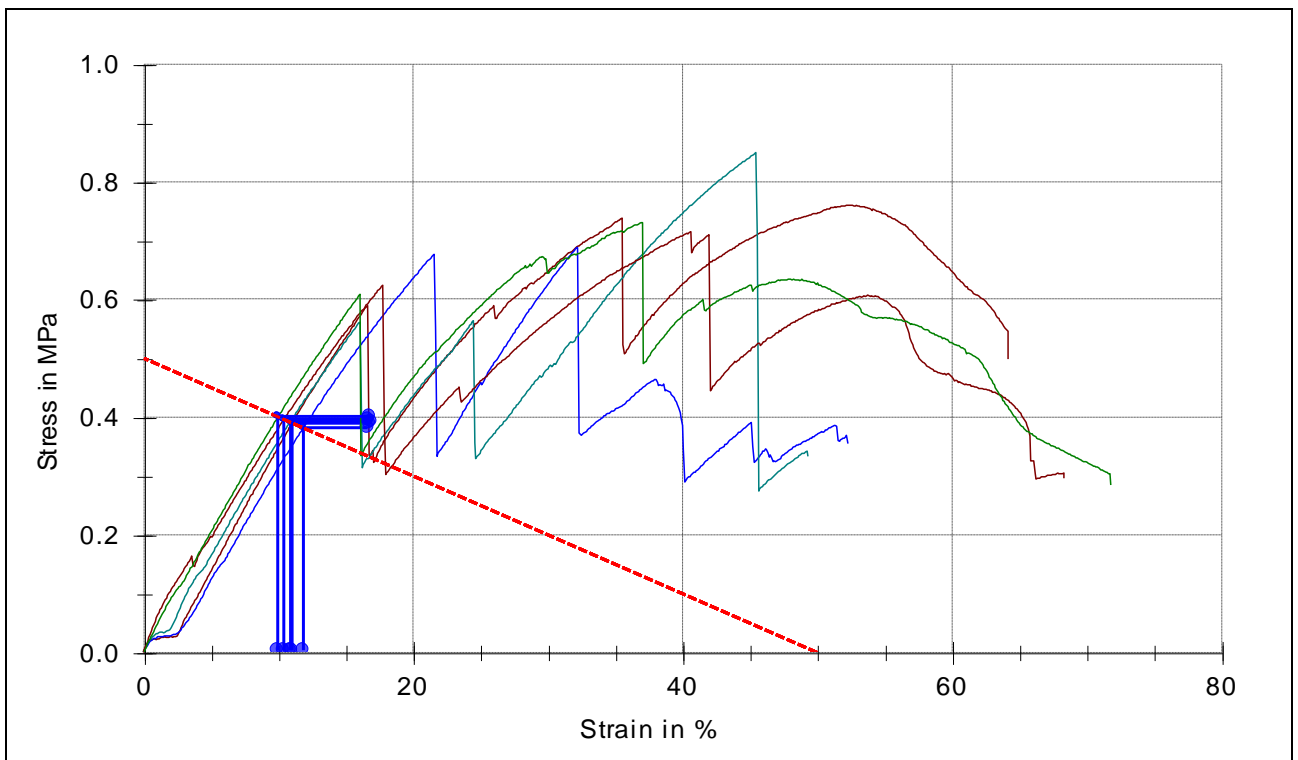


Figure 2: Stress/strain curves, after immersion in H₂O for (168 ± 5) hours

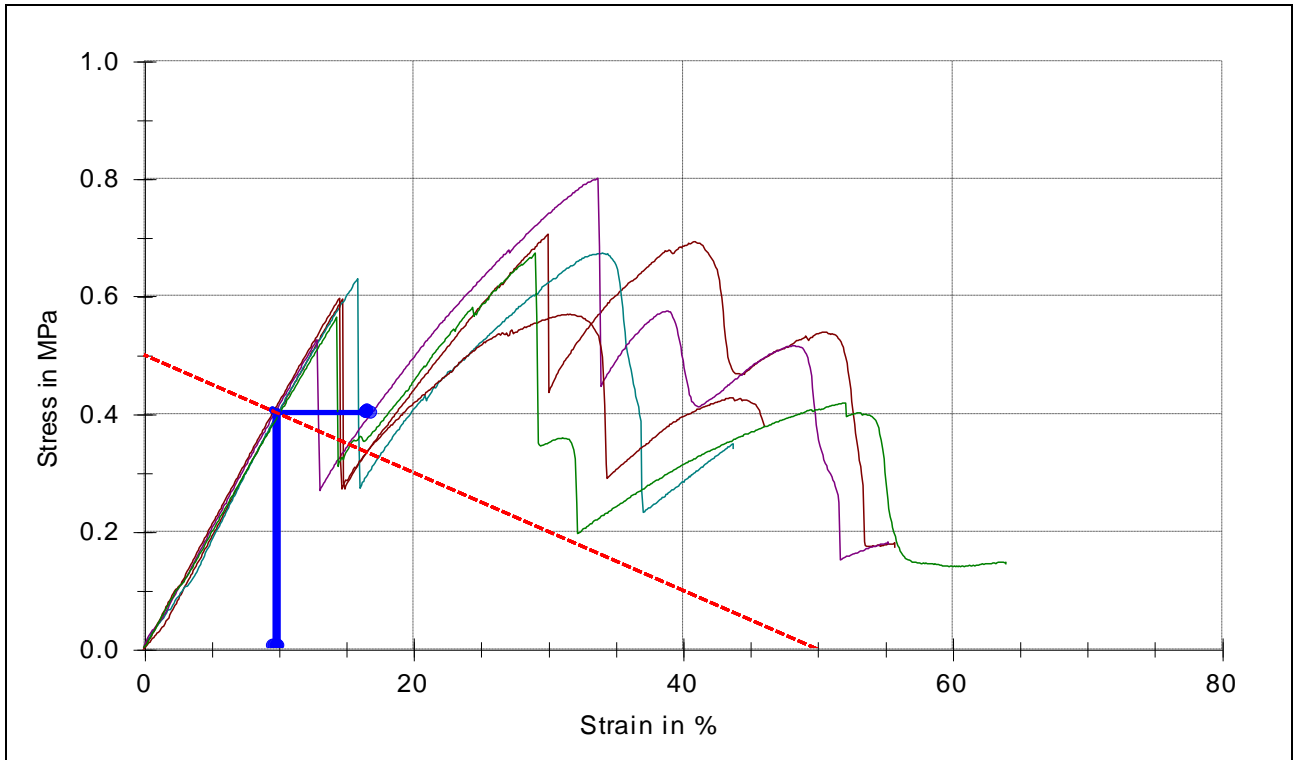


Figure 3: Stress/strain curves, after 60°C exposure for (168 ± 5) hours

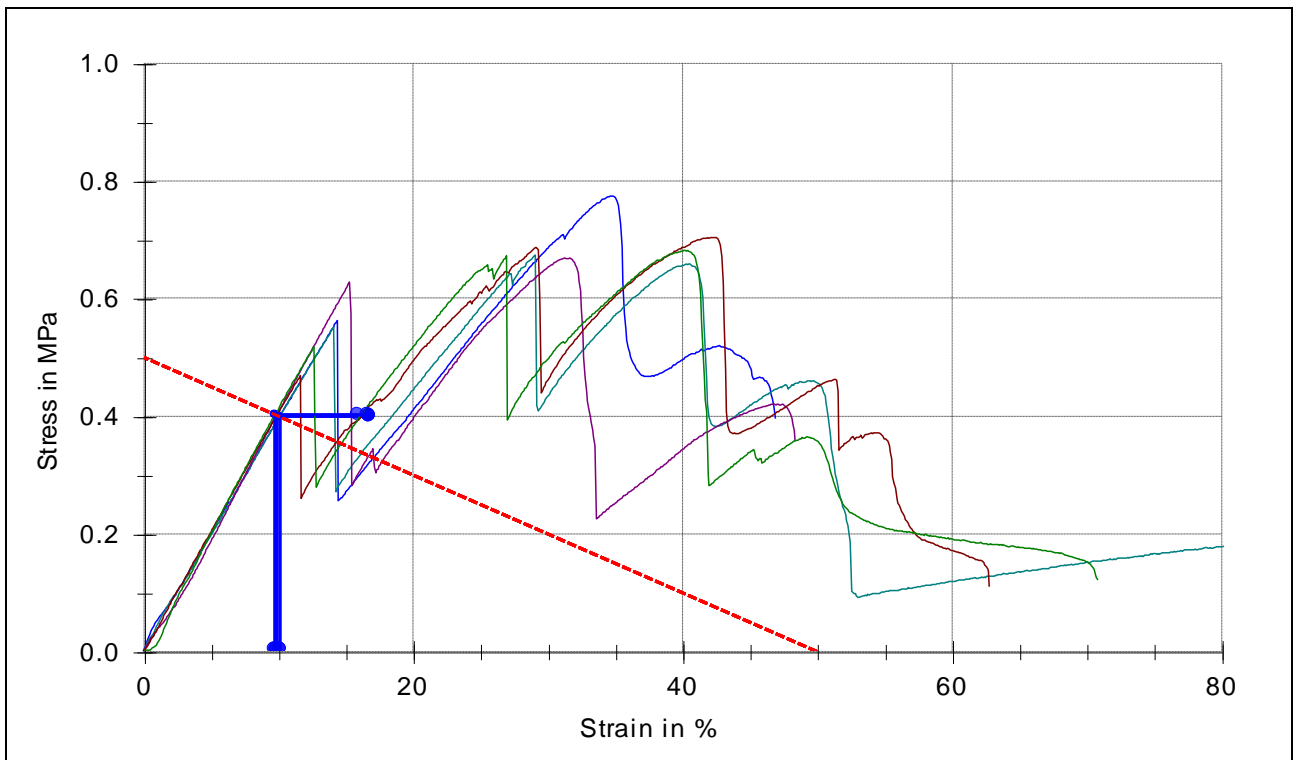


Figure 4: Stress/strain curves, after UV exposure for (96 ± 4) hours

3 Conclusion

The edge seal, marked by the client or manufacturer as: Silande MF881-25HM, manufactured by Zhengzhou Zhongyuan Silande High Technology Co., Ltd , meets the applicable requirements as stated in the European standard EN 1279-4 [1].

The test results exclusively relate to the tested objects.

Remark 1

When and if changes are made in production method and/or equipment, assessment according to this standard shall be reconsidered and re-tests shall be performed when the changes can lead to different specifications of the sealant. The decision and responsibility lies at the manufacturer.

Remark 2

Silicone sealant and aluminium spacer combination: glass products are not intended for structural application. If so, additional testing and certification is needed as stated in EN 1279-5 Annex A.




4 References

- 1 European standard EN 1279-4:2002 (E),
Glass in building – Insulating glass units – Part 4: Methods of test for the physical attributes of edge seals,
European Committee for Standardization, March 2002.
- 2 European standard EN 1279-2:2002 (E),
Glass in building – Insulating glass units – Part 2: Long term test method and requirements for moisture penetration,
European Committee for Standardization, November 2002.

5 Signatures

Author Mr. M.A.A.M. Schets, B.Sc.	Signature 
Specialist	
Peer review Mr. R. Brandhorst	Signature 
Specialist	
Approved by Mr. H. van Ginkel	Signature 
Business field manager	

Appendix A, Summary of test results

TÜV Rheinland Nederland B.V. P.O. Box 541, 7300 AM Apeldoorn The Netherlands Lab.no. 1750		 TÜVRheinland [®] Precisely Right.					
Summary of report n°: 89205967-01 rev2			Date: 17 August 2018				
Insulating glass units – Seal properties results according to EN 1279-4							
For details is referred to the full test report							
Company:	Name:	Zhengzhou Zhongyuan Silande High Technology Co., Ltd					
	Address:	No.28, Dongqing West St. Zhengzhou Hi-tech Development Zone, 450001 China					
Sealant manufacturer:	Name:	Zhengzhou Zhongyuan Silande High Technology Co., Ltd					
	Address:	No.28, Dongqing West St. Zhengzhou Hi-tech Development Zone, 450001 China					
Sealant specification:		MF881-25HM two component silicone					
Sealant in IGU positively tested according to EN 1279-2, report:		89205967-02					
Glass specification when not float glass is used:		n.a.					
Seal strength test	At intersection with line AB (EN 1279-4, figure 1)			Type of failure observed			
	Average Stress σ_{av}	Average extension ϵ_{av}	c = cohesive, a = adhesive				
Adhesion:	[Mpa]	[%]	1	2	3	4	5
Initial cure	0.40	10.0	c	c	c	c	c
After water immersion	0.39	10.8	c	c	c	c	c
After heating 60°C	0.40	9.9	c	c	c	c	c
After UV radiation	0.40	9.9	c	c	c	c	c
Moisture vapour transmission rate:		Gas permeation rate:					
Film thickness, avg [mm]:	2.0	Film thickness, avg [mm]:	2.0				
ΔP_{H_2O} [%]:	> 85	Surface (shape: circular) [cm ²]:	100				
Test temperature: [°C]:	23 ± 1	Test temperature: [°C]:	23 ± 1				
MVTR [g·2mm / (m ² ·24h)]:	11.5	Ar Permeation rate [g .2mm / (m ² ·h)]:	0.51				
Overall comments:		-					
Conclusion of the seal strength test: Sealant conforms to the test criteria:		YES					
							
Signature: M.A.A.M. Schets, B.Sc. Project leader		Signature: H. van Ginkel Business field manager					

This Summary is not a certificate.

Appendix B, Pictures of the tested object(s)



- End of report -