

# Test Report



Report No 371/7771647

This report consists of 8 pages

Client Arctic Glass  
Furthergate Business Park  
Harwood Street  
Blackburn  
BB1 3EB

Authority & date Quotation Acceptance ref BSI 0000357594 dated 29 November 2011  
Equipment Record No 10131472

Items tested 15 off Insulating glass units - Components declared by the Client  
Desiccant - Molecular sieve - Roc Chemie 3A  
Spacer bar - Nedex - Isoprofil -LT  
Primary sealant - Not applicable  
Secondary sealant - Hot melt - Bostik 5000  
Date of manufacture - 13 October 2011  
System description reference - Arctic Glass 2011/12

Specification BS EN 1279 : Part 2 : 2002

Results Average Moisture Penetration Index = 19.30% Specified (max) = 20.0%  
Maximum Moisture Penetration Index = 24.06% Specified (max) = 25.0%

Prepared by S Gurney  (Senior Technician Engineer)

Authorized by S Ginger  (Senior Engineer)

Issue Date 1 March 2012

Conditions of issue



0135

This Test Report is issued subject to the conditions stated in current issue of CP 0322 'Conditions of contract for testing'. The results contained herein apply only to the particular sample/s tested and to the specific tests carried out, as detailed in this Test Report. The issuing of this Test Report does not indicate any measure of Approval, Certification, Supervision, Control or Surveillance by BSI of any product. No extract, abridgement or abstraction from a Test Report may be published or used to advertise a product without the written consent of the Managing Director, BSI, who reserves the absolute right to agree or reject all or any of the details of any items or publicity for which consent may be sought.

## TEST AND EXAMINATION OF INSULATING GLASS UNITS

### INTRODUCTION

At the request of Arctic Glass the insulating glass units, detailed below and submitted by Arctic Glass, were tested and assessed to the applicable requirements of BS EN 1279 : Part 2 : 2002, as indicated on the following pages of this Report. This request was confirmed on the Quotation Acceptance ref BSI 0000357594 dated 29 November 2011.

It is emphasized that assessments were not made against other clauses of the specification. This report relates to the actual units that have been tested and do not relate to any on-going production. BSI has not been involved in, or responsible for, the sampling of the test items. All references in this report to the identity of the product, sampling information and test items are based on information provided by the manufacturer.

### TEST ITEMS

15 off insulating glass units each nominally 502 mm X 352 mm with a 12 mm air gap between the two panes of 4 mm glass. The test items were received on 28 October 2011 and identified under Equipment Record No 10131472. The components used in the construction were declared by the manufacturer as follows:

Desiccant -	Molecular sieve - Roc Chemie 3A
Spacer bar -	Nedex - Isoprofil -LT
Primary sealant -	Not applicable
Secondary sealant -	Hot melt - Bostik 5000
Corner keys -	Polycarbonate - Profil
Cavity gas -	Air
Date of manufacture -	13 October 2011

The relevant units were subjected to the climatic test commencing on 17 November 2011.

### SUMMARY OF RESULTS

The set of insulating glass units described above exhibited the following characteristics:

Characteristic	Actual	Specified
Average Moisture Penetration index	19.3% +	20.0%(max)
Maximum Moisture Penetration index	24.1% +	25.0%(max)
Initial Moisture Content	4.5%	Not specified
Final Moisture Content	7.5%	Not specified
Dimensional requirements	See page 3	502±2 x 352±2 mm

+ In the determination of the moisture penetration index a standard moisture absorption capacity of 20.2% has been used

## TEST PROCEDURE

### Conditioning and dimensional measurement

The insulating glass units were received at BSI and stored in standard laboratory conditions of  $23 \pm 2^{\circ}\text{C}$  and  $50 \pm 5\%$  relative humidity for a period of not less than 14 days. The variation in temperature and relative humidity did not fall outside these parameters for the 14 day conditioning period. During this period each unit was measured for length, width and thickness. The thickness of each glass pane was assessed and the cavity thickness evaluated. The results are shown below:

Unit	Ref No	Length (mm)	Width (mm)	Thickness (mm)	Cavity (mm)
A	1	502	352	19.7	11.7
B	2	502	352	19.6	11.6
C	3	501	352	19.6	11.6
D	4	502	352	19.5	11.5
E	5	502	352	19.5	11.5
F	6	502	352	19.5	11.5
G	7	502	352	19.5	11.5
H	8	502	352	19.6	11.6
J	9	501	352	19.5	11.5
K	10	502	352	19.5	11.5
L	11	502	352	19.6	11.6
M	12	502	352	19.5	11.5
N	13	502	352	19.5	11.5
P	14	502	352	19.5	11.5
R	15	502	352	19.5	11.5

### Ranking

Upon completion of the conditioning period each unit was subjected to a dew point measurement test. Each unit was positioned vertically on its shorter edge and a dew point cooling cell placed in the centre of the glass. The cooling cell, containing methylated spirit, was cooled to a temperature of at least  $-60^{\circ}\text{C}$  using dry ice and maintained at this value for a period of at least 2 minutes. The internal surface of the glass pane adjacent to the cooling cell was then inspected for evidence of condensation.

*Note: This alternative method has been successfully evaluated against the reference method in BSEN 1279-2 Annex A.*

If condensation was not observed, the dew point was considered to be  $-60^{\circ}\text{C}$ . If condensation was observed then the unit was reconditioned for a period of at least 24 hours and the dew point determined as specified in the standard.

The test specimens were ranked according to their dew point temperature with the unit exhibiting the highest dew point value as number 1 and the lowest dew point value as 15. Those units exhibiting a dew point temperature of  $-60^{\circ}\text{C}$  or lower were randomly numbered.

In this test all units exhibited a dew point of  $-60^{\circ}\text{C}$  or lower, such that the ranking process was conducted by numbering the 15 units randomly.

**TEST PROCEDURE (continued)****Sample allocation**

Following the ranking process the units were selected for test as shown in the table below:

Ranking Number	Tests to be conducted
7,8,9 and 10	Measurement of initial moisture content of desiccant ( $T_i$ )
4,5,6,11,and 12	Climatic testing and measurement of final moisture content of desiccant ( $T_f$ )
2,3,13 and 14	Spare units to replace broken units for measurement of final moisture content of desiccant ( $T_f$ ) after climatic testing.
1 and 15	Rejected or measurement of standard moisture absorption capacity of the desiccant ( $T_c$ )

**Initial moisture content**

The desiccant from each of the 4 units (7, 8, 9 and 10) was removed by drilling a 10mm diameter hole approximately 60 mm from a corner. A sample of approximately 25 g was obtained from each unit after discarding approximately the first 4 g from the unit. Waste material from the sealant and spacer bar was removed from the samples. The sample was collected in a dish and a lid used to ensure that the sample remained uncontaminated.

Each sample, contained in a dish, was weighed and then placed in a furnace. The temperature in the furnace was raised to 950°C over a period of  $60 \pm 20$  minutes. The temperature was maintained at  $950 \pm 50^\circ\text{C}$  for a further  $120 \pm 5$  minutes.

The dish and sample were allowed to cool to room temperature and then weighed. The initial moisture content was calculated using the following formula:

$$\text{Initial moisture content } T_i = \frac{m_i - m_r}{m_r - m_o} \times 100$$

Where  $m_o$  = Mass of the dish when empty, clean and dry  
 $m_i$  = Mass of the dish plus desiccant and the initial water absorbed  
 $m_r$  = Mass of the dish plus the dried desiccant

The initial moisture content of the units are shown below.

Unit number	Result	<b>Average <math>T_i</math> = 4.5%</b>
7	4.5%	
8	4.7%	
9	4.4%	
10	4.3%	

**TEST PROCEDURE (continued)**

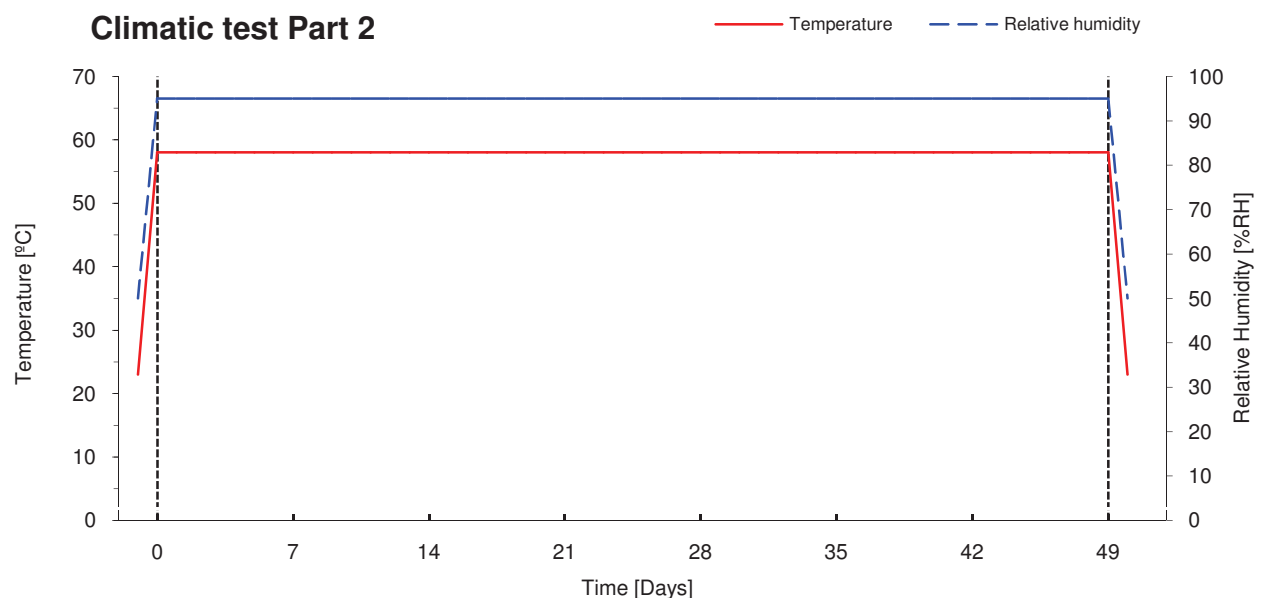
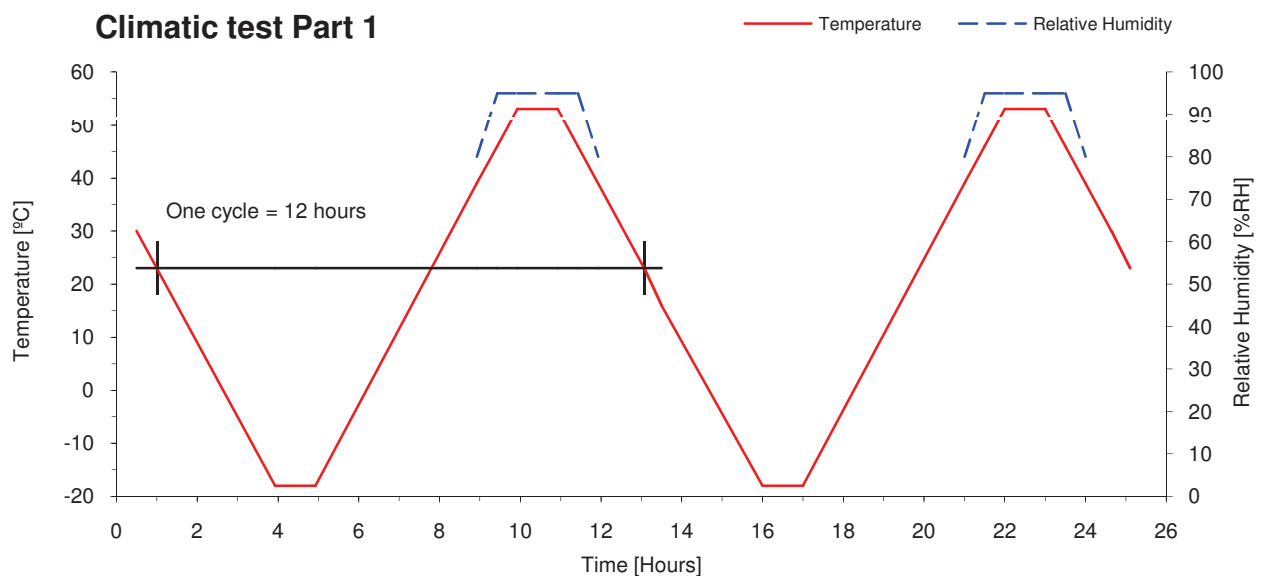
**Climatic test**

Units 4, 5, 6, 11, 12, and 13 were placed in the climatic test chamber. Units 2, 3 and 14 were stored in standard laboratory conditions as spare samples.

The climatic test consisted of two parts. The first part was 56 cycles each of 12 hours. The temperature dwells were for 1 hour at -18 °C and +53 °C with ramps of 14 °C/hour between the dwells, the humidity was maintained at 95%RH or greater for the upper temperatures. The second part was a period of seven weeks (49 days) at a constant +58 °C/≥95%RH.

**NOTE:** BSI's environmental chambers are calibrated and programmed to produce the conditions required by the specification. However, due to the uncertainty of measurement associated with environmental chamber calibration, it cannot be guaranteed that the tolerances specified in the standard for the conditions within the chamber were maintained throughout the whole of the conditioning period.

The graphs shown below detail the two parts of this climatic test.



**TEST PROCEDURE (continued)****Final Moisture content**

Upon completion of the climatic test the units were conditioned at standard laboratory conditions of  $23 \pm 2^\circ\text{C}$  and  $50 \pm 5\%$  relative humidity for a further 14 days.

The desiccant from each of the 5 units (4, 5, 6, 11, and 12) was removed by drilling a 10mm diameter hole approximately 60 mm from a corner. A sample of approximately 25 g was obtained from each unit after discarding approximately the first 4 g from the unit. Waste material from the sealant and spacer bar was removed from the sample. The sample was collected in a dish and a lid used to ensure that the sample remained uncontaminated.

Each sample, contained in a dish, was weighed and then placed in a furnace. The temperature in the furnace was raised to  $950^\circ\text{C}$  over a period of  $60 \pm 20$  minutes. The temperature was maintained at  $950 \pm 50^\circ\text{C}$  for a further  $120 \pm 5$  minutes.

The dish and sample were allowed to cool to room temperature and then weighed. The final moisture content was calculated using the following formula:

$$\text{Final moisture content } T_f = \frac{m_f - m_r}{m_r - m_o} \times 100$$

Where  $m_o$  = Mass of the dish when empty, clean and dry  
 $m_f$  = Mass of the dish plus desiccant and the initial water absorbed  
 $m_r$  = Mass of the dish plus the dried desiccant

The final moisture content of the units are shown below.

Unit number	Result	
4	8.0%	
5	8.2%	
6	7.3%	<b>Average Tf = 7.5%</b>
11	6.8%	
12	7.1%	

**Standard moisture absorption capacity**

The standard moisture absorption capacity used in this test has been taken from the generally accepted values for desiccant in bulk as detailed in Annex E of the standard. It should be noted that use of these standard moisture absorption capacity values requires the acceptable moisture penetration index to be lowered to 16.0%.

The desiccant has been declared as Zeolite with a generally accepted value for the standard moisture absorption capacity of 20.2%.

**TEST PROCEDURE (continued)****Moisture penetration index**

The moisture penetration index for the five units subjected to the climatic test was calculated using the following formula:

$$\text{Moisture penetration index } I = \frac{T_f - T_{i,av}}{T_{c,av} - T_{i,av}} \times 100$$

Where  $T_f$  = Final Moisture content of the desiccant  
 $T_{i,av}$  = Average initial moisture content of the desiccant  
 $T_{c,av}$  = Average standard moisture absorption capacity  
 (General accepted value for bulk desiccant)

**TEST RESULTS**

The results of the initial moisture content, final moisture content and the moisture penetration index for the relevant units are shown below:

Unit Number	Results		
	Initial Moisture Content	Final Moisture Content	Moisture penetration index
4	N/A	8.0%	22.5%
5	N/A	8.2%	24.1%
6	N/A	7.3%	18.3%
7	4.5%	N/A	N/A
8	4.7%	N/A	N/A
9	4.4%	N/A	N/A
10	4.3%	N/A	N/A
11	N/A	6.8%	14.9%
12	N/A	7.1%	16.7%
<b>Average</b>	<b>4.5%</b>	<b>7.5%</b>	<b>19.3%</b>
<b>Maximum</b>	<b>N/A</b>	<b>N/A</b>	<b>24.1%</b>

**Appendix A**

**BSI**  
Maylands Avenue  
Hemel Hempstead  
Herts  
HP2 4SQ

**Summary of Report No 371/7771647****Date 1 March 2012**

Insulating glass units

Moisture penetration results according to BS EN 1279 part 2 : 2002

For details, see the test report

Company: Name: **Arctic Glass**  
Address: **Furthergate Business Park**  
**Harwood Street**  
**Blackburn**  
**BB1 3EB**

Plant: Name: **Arctic Glass**  
Address: **Furthergate Business Park**  
**Harwood Street**  
**Blackburn**  
**BB1 3EB**

System description, file number: **Arctic Glass 2011/12**Product Name: **Plain units**

**Average Moisture Penetration Index = 19.30% Specified (max) = 20.0%**  
**Maximum Moisture Penetration Index = 24.06% Specified (max) = 25.0%**

*Note: Comparisons of the moisture penetration indices of different insulating glass unit systems are meaningless.*

A black rectangular box containing a white handwritten signature, which appears to be 'S Ginger'.

S Ginger  
Senior Engineer