

**TNO report**

**TQS-RAP-07-271**

**TruSeal Technologies, Inc.**

**EN1279 part 3 assessment of insulating glass:**

**IGU with Duralite™ sealant**

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# 1 Introduction

**TruSeal Technologies, Inc. (demonstrator)** has commissioned TNO Quality Services BV with initial type testing according to the EN1279-3.

It is the manufacturer's responsibility that the samples delivered for initial type test are representative to the production and that normal production variations are included in the test samples. If any changes in applied materials or other deviation of the system description are introduced, the validity of this initial type test report shall be evaluated on validity. This could mean new tests or additional tests. According to the rules this decision and full responsibility belongs to the manufacturer. The system description is the base document for this evaluation.

For any other manufacturer this initial type test (ITT) report is not automatically valid. The manufacturer for this ITT report is defined as **TruSeal Technologies, Inc.**

TNO is a fully Notified Test Laboratory for EN tests for the CPD guideline 89/106/EEG under Lab.no.1750 at the Technical Committee of the European Commission in Brussels. This report has been issued under this reference.

The following chapters describe the tested configuration(s), the results and the conclusions.

## 2 Experimental

### 2.1 Delivered samples and materials

The following materials and insulating glass units (IGU's) were delivered for the durability assessment according to EN1279: version 2003.

In the system description all information can be found concerning the used materials and parameters during production of the samples.

**Production plant of the samples** : Truseal Technologies Inc.  
**Sampling date** : May 9, 2006

The following materials were used for preparation of the samples:

Number of IGU's	Type of glass	Configuration [mm]	Inner Sealant	Outer Sealant
6	Clear float	4-12-4	Butyl	Duralite™ system

- Production date : May 9, 2006
- Spacer/Sealant system : Duralite™ (12.7 mm) sealed with passby method
- Desiccant : Molecular sieve incorporated in butyl sealant
- Corner : Bend
- Gas filling : Argon

The following process parameters were applicable:

- Temperature production hall: 22.2 °C
- Barometric pressure production hall: 1014 hPa

### 2.2 Tests

#### 2.2.1 Gas loss rate determination according to EN1279-3: 2003

The 6 test specimens were conditioned for a minimum of one week at standard laboratory conditions. At least five pre-selected samples were submitted to the specified climate test.

The climate test consists of two parts. The first part consists of 28 cycles of 12 hours from -18°C to 53°C with slopes of 14°C where at -18°C and at 53°C the temperature is constant for 1 hour. The cycle is followed by a second part consisting of a period of four weeks at a constant temperature of 58°C. For both parts a relative humidity of > 95 % is applied in case the temperature is above 0°C. The exact specification of the temperature, humidity and time, and their tolerances, is given in the EN1279-2 standard.

After submitting the selected IGU's to the climate test, these IGU's are stored for four weeks under standard laboratory conditions and then the procedure of the gas loss rate determination is started.

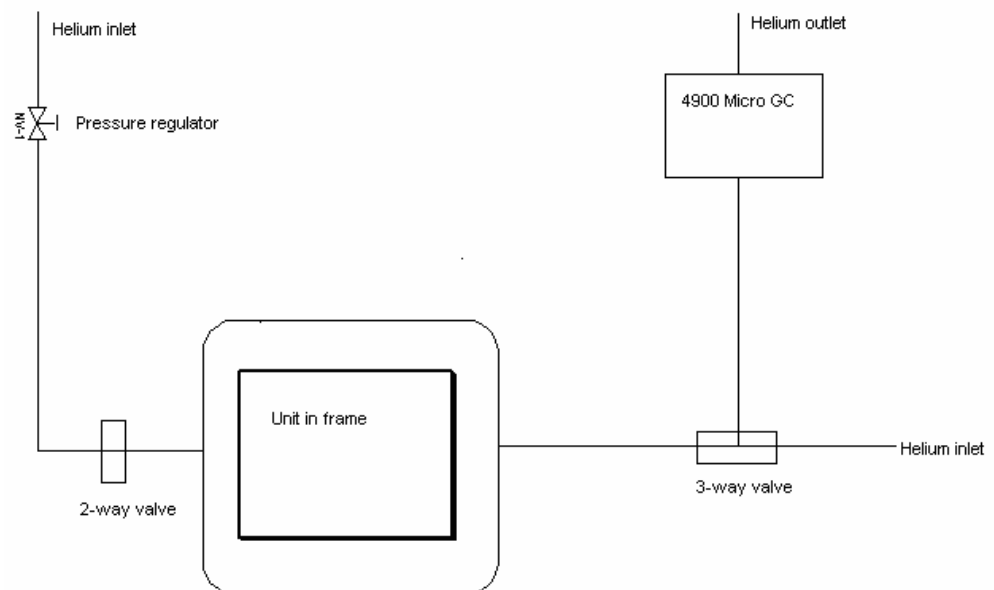
Two IGU's are installed into separate frames. The frame encloses the IGU with some space left between the IGU and the frame. The frame with the IGU is hermetically closed.

After introduction of the unit, the frame is closed and the sample frame is purged with a helium flow of  $\pm 400$  ml/min for 1 hour. At the end of the purge time, the inlet and outlet valves are closed in succession to ensure an atmospheric pressure inside the frame (starting leak time). After a minimum of 6 hours leak time, the helium in the frame is measured for its argon, oxygen and nitrogen concentration using gas chromatography (4900 Micro GC).

The amount of Argon is then determined and by calculation based on the measured amount of Argon gas and the collection time, the amount of gas loss per time (year) can be determined. The requirement is that the Argon gas loss rate is less than 1% per year.

The method and calculation formulas are described in more detail in the EN1279-3: 2003.

The schematic diagram of the equipment is as follows:



### 2.2.2 Gas filling percentage according EN1279-3: 2003

After the determination of the gas loss rate based on a theoretical assumption of 90% filling percentage, the actual gas filling percentage was determined on 2 units. This measurement is done by injection of samples taken out of the IGU's into the gas chromatograph. After these results are known, the real gas loss rate is recalculated.

## 3 Results

### 3.1 Results

#### 3.1.1 Gas loss rate determination according to EN1279-3: 2003

The 6 IGU's were visually inspected. No special deviations above variations due to the production process were found. The test specimens were randomly numbered and the units were aged. After ageing the gas loss rate was determined on two IGU's.

For calculation of the gas loss rate actual values are used for pressure ( $p = 1014$  hPa) and temperature ( $T = 295$  K) during production of the samples. The results are as follows:

	IGU with Duralite™ system					
Test specimen number	$m_{i,1}$ [ $\mu\text{g/hr}$ ]	$m_{i,2}$ [ $\mu\text{g/hr}$ ]	$m_{i,3}$ [ $\mu\text{g/hr}$ ]	$m_{i,4}$ [ $\mu\text{g/hr}$ ]	$M_{\text{avg}}$ [ $\mu\text{g/hr}$ ]	$L_i$ [%/y]*
1	1.47	2.11	1.82	1.72	1.78	0.5
2	1.58	1.59	1.46	1.59	1.55	0.4

\* corrected for actual gas filling degree.

#### 3.1.2 Gas filling percentage according to EN1279-3:2003

Two IGU's were measured on the gas filling degree. The results are as follows:

	IGU with Duralite™ system					
	$Ar_1$ [%]	$Ar_2$ [%]	$Ar_3$ [%]	$Ar_4$ [%]	$Ar_5$ [%]	$Ar_{\text{avg}}$ [%]
Test specimen	97.9	97.6	-	-	-	97.8

The conclusion is that the insulating glass IGU's in this configuration are **complying** with the requirements of durability according the EN1279-3.

## 4 Conclusion

The following summary demonstrates the consistence of the ITT and other measurements towards the requirements of the product standard EN1279:2003.

<b>Tested IGU system: IGU with Duralite™ system</b>	
EN 1279-3:2003, Gas loss rate	<b>PASS</b>

## 5 Signature

Eindhoven, February 2007

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