

**CERTIFICATION PROVISIONS**

**RELATING TO**

**EN 1279 - INSULATING GLASS UNITS**

3. EDITION,  
JANUARY 2022

## Content

<b>1. INTRODUCTION</b>	<b>4</b>
<b>2. GENERAL REQUIREMENTS</b>	<b>5</b>
2.1 GENERAL INFORMATION	5
2.2 ENVIRONMENTAL ASPECTS	5
2.3 MANAGEMENT	5
2.4 SYSTEM DESCRIPTION	5
2.5 STORAGE AND PRODUCTION PREMISES	5
2.6 PRODUCTION EQUIPMENT AND METHODS	5
<b>3. PRODUCTION REQUIREMENTS</b>	<b>5</b>
3.1 GLASS	5
3.2 SPACER BARS	6
3.3 DRYING AGENTS	6
3.4 FLEXIBLE SPACER	7
3.5 INTERNAL AND EXTERNAL SEALING	
3.6 GAS FILLING	7
3.7 GLAZING BARS	7
3.8 OTHER COMPONENTS	7
3.9 MARKING	7
3.10 VISUAL QUALITY	7
<b>4. REQUIREMENTS FOR MECHANICAL PROPERTIES</b>	<b>8</b>
4.1 GLASS MEASURES	8
4.2 TOLERANCES	8
4.3 ANTI-INTRUSION	8
4.4 PERSONAL SAFETY	8
<b>5. REQUIREMENTS FOR THERMAL PROPERTIES</b>	<b>9</b>
5.1 DOCUMENTATION REQUIREMENTS	9
<b>6. SOUND-REDUCING PROPERTIES</b>	<b>9</b>
<b>7. ENVIRONMENT</b>	<b>9</b>
7.1 INTERNAL ENVIRONMENT – WORK ENVIRONMENT	9
<b>8. QUALITY CONTROL (FPC)</b>	<b>9</b>
8.1 BACKGROUND	9
8.2 GENERAL INFORMATION	9
8.3 EQUIPMENT	10
8.4 RAW MATERIALS AND COMPONENTS	10
8.5 THE PRODUCTION PROCESSES	10
8.6 PRODUCT TESTING AND EVALUATION	10
8.7 DEVIATING PRODUCTS	10
8.8 TRACEABILITY	10
<b>9. CERTIFICATION PROVISIONS</b>	<b>11</b>
9.1 MARKING OF READY-MADE GOODS	11
9.2 INTERNAL QUALITY CONTROL	11
<b>10. EXTERNAL INSPECTION</b>	<b>11</b>
10.1 INSPECTION PERFORMANCE	12
10.2 INSPECTION VISITS	12
10.2.1 External inspection type A	12
10.2.2 External inspection type B	12
10.2.3 Reduced external inspection	12
10.3 SAMPLE TAKING	13
10.4 DEFECT CATEGORIES	13
10.5 PROCESSING OF DEFECTS	14

10.5.1	<i>Critical defects</i> .....	14
10.5.2	<i>Significant defects</i> .....	14
10.5.3	<i>Insignificant defects</i> .....	14
10.6	VISIT REPORT.....	14
10.7	ADDITIONAL INSPECTION .....	14
10.8	STRICTER INSPECTION .....	14
<b>APPENDIX 1. CONSEQUENCES OF DEVIATIONS .....</b>		<b>15</b>
<b>APPENDIX 2. INTERNAL INSPECTION: RECEPTION OF GOODS - MINIMUM REQUIREMENTS.....</b>		<b>16</b>
<b>APPENDIX 3. INTERNAL INSPECTION – DEFECT TYPES .....</b>		<b>17</b>
<b>APPENDIX 4. INTERNAL INSPECTION: PRODUCTION CONTROL - MINIMUM REQUIREMENTS.....</b>		<b>18</b>
<b>APPENDIX 5. INTERNAL INSPECTION: PROCESS CONTROL OF GAS FILLED INSULATING GLASS UNITS - MINIMUM REQUIREMENTS .....</b>		<b>19</b>
<b>APPENDIX 6. INSPECTION OF READY-MADE GOODS. (EXAMPLE – BASED ON A VIRTUAL SYSTEM DESCRIPTION AND PRODUCTION).....</b>		<b>20</b>
<b>APPENDIX 7.....</b>		<b>21</b>
<b>APPENDIX 8. TERM EXPLANATION.....</b>		<b>22</b>

## 1. Introduction

By means of the present product certification for insulating glass units, which is based on EN 1279-5 - Glass in Building – Insulating glass units – Part 5: Product standard, the Danish glass trade aims to ensure a basis for CE marking of insulating glass units in accordance with the construction products regulation of the EU.

This product certification scheme covers all properties of insulating glass units under AVCP-system 3 as stated in EN 1279.

The purpose of the product certification is:

- to take part in ensuring the quality of insulating glass units
- to ensure that the connected companies fulfil the requirements of EN 1279-5 and EN 1279-6
- to ensure that the production of insulating glass units is performed, while taking account of the internal and external environment
- to provide a documented and adequate basis for the evaluation of the properties of insulating glass units with respect to individual and varying requirements such as safety and sound

The product certification is based on the applicable version of the EN 1279 series and its interpretations and will be updated successively in line with the legal provisions and/or the EN 1279 series.

In case of doubt, the applicable version of EN 1279 in English will prevail.

The Danish Glass Trade, GLASINDUSTRIEN, transfer the task with auditing and certification totally to the assigned third party certification body.

**The present certification basis has been discussed and approved by the management board of the Danish Glass Trade, GLASINDUSTRIEN, on December 1. 2021.**

## 2. General requirements

### 2.1 General information

Any company desiring to become part of the product certification must have the personnel, production premises and equipment with a scope and quality that can form the basis for a production of insulating glass units, the quality, homogeneity and environmental aspects of which fulfil the requirements set in the present certification basis.

The production of insulating glass units does not necessarily have to be the primary activity of the company, it does, however, have to be prioritised in such a manner that the personnel and equipment at all times provide the required knowledge and experience, necessary for the production of insulating glass units at a high level of quality and environmental responsibility.

The production and products must fulfill the minimum requirements listed in the present certification basis, which includes the right to mark the finished insulating glass units with the CE marking as well as the GS marking of the GTC system. See bullet 3.8.

### 2.2 Environmental aspects

The company must ensure that all relevant legal requirements with respect to the external environment are fulfilled and updated on an ongoing basis.

### 2.3 Management

The production must be carried out under the management of a person appointed by the company and responsible for any matters relating to the quality of the finished products, the internal control and the environmental aspects, which implies detailed knowledge about the certification provisions. In addition, the company must appoint a person competent enough to handle questions about the product certification.

### 2.4 System description

Any production of insulating glass units must be accompanied by the relevant documentation in the shape of system descriptions and documented type tests in line with the applicable EN standards.

### 2.5 Storage and production premises

Companies forming part of the product certification must ensure sufficient storage and production premises, which in no way affect the quality of the raw materials, sub-components or the finished glass units.

### 2.6 Production equipment and methods

There are no requirements about special equipment (machines, etc.) or specific methods for the production of insulating glass units for companies forming part of the product certification.

The production of insulating glass units must be performed at a temperature of at least 15 °C.

## 3. Production requirements

### 3.1 Glass

#### Reception and storage of glass

When receiving glass, the following must be ensured:

- compliance between the ordered and delivered glass and a glass quality suitable for the production of insulating glass units for uncoated glass in acc. with the EN 572 series and for coated glass in acc. with the EN 1096 series
- availability of sufficient documentation for the correct handling of the glass as well as the required documentation regarding the production of the finished product.

The glass must be stored in a dry place and be protected against the weather in order to avoid

tarnishing of the glass. In addition, the glass must be stored and handled in line with the supplier's instructions and in such a manner that the thermal properties of possible coatings will not be diminished.

Personnel handling the glass must have access to the supplier's instructions for storage and handling and be familiar with those instructions.

## **Glass cutting**

The glass must be cut in line with the glass selection and measurements forming the basis for the finished type and measurements of the insulating glass unit. It is important that the glass is cut and handled in such a manner that the glass is free of stress, which might lead to defects later on.

The cutting areas of the glass must not show conchoidal fractures in accordance with EN 572-8 or "notches", which may result in defects later on (max. 1/4 of the glass thickness).

## **Glass types**

The glass must be stored in such a manner that the individual glass types are not mixed. The glass types must be marked distinctly in order to avoid misunderstanding.

Personnel working with glass cutting must be familiar with the individual glass types. An overview should be available, possible in the shape of glass samples marked with the name of the glass/type designation.

## **Coatings**

If the glass has a soft coating, the coating in the sealing zone must be removed prior to assembling the insulating glass unit, if recommended/required by the supplier.

Personnel working with the process must have access to the glass supplier's instructions for the possible removal of the coating in the sealing zone and be familiar with those instructions.

## **3.2 Spacer bars**

### **Reception and storage**

When receiving spacer bars, it must be ensured that the ordered and received goods are compliant and that the specified tolerances are met.

Spacer bars must be stored in a dry place and protected against dust and weather in order to avoid dirt and corrosion/tarnishing. Spacer bars with integrated drying agents must additionally be protected in such a manner that the quality of the drying agent is not affected.

### **Handling**

The spacer bars must be handled in such a manner that the adhesion to the sealing is not diminished. Gloves should be worn when handling the bars in order to avoid dirt and grease on the bar surfaces.

## **3.3 Drying agents**

### **Reception and storage**

When receiving drying agents, it must be ensured that the ordered and received goods are compliant.

The drying agents must be stored in such a manner that the quality of the drying agent is not diminished.

### **Processing**

During filling of the spacer bars, it must be ensured that the amount of drying agents in the finished glass unit complies with the system description in order not to diminish the index I of the glass unit.

Spacer bars with a drying agent inside must be used as quickly as possible and must not be stored for more than 4 hours without special measures to prevent the drying agent from drawing moisture and without performance of a  $\Delta t$  test to ensure that the drying agent is still usable.

3.4. Flexible spacers must be stored, handled and installed according to the instructions of the manufacturer/supplier.

### 3.5 Internal and external sealing

The internal and external sealing must be carried out in line with the system description.

Internal sealing: Butyl or equivalent to ensure gas tightness and fixation of the frame prior to pressing.  
External sealing: Two- or one-component sealing to ensure that water or steam cannot penetrate.

### 3.6 Gas filling

The gas filling of insulating glass units can be carried out prior to the sealing of the insulating glass unit or subsequently. The process can be performed automatically by means of a gas-filling press prior to sealing or manually after sealing.

It must be ensured that the customer requirements (in the shape of a pane label) correspond to the gas filling used.

The gas filling must comply with the system description and EN 1279-6. The measured degree of gas filling must be between 85% and 100%, nominal value 90%.

### 3.7 Glazing bars

The attachment of glazing bars may not affect the index I negatively. In addition, it must be ensured that the utilisation of the applicable components complies with the company's type approvals.

### 3.8 Other components

Other components may refer to Venetian blinds or other components to be attached between the panes.

Components to be attached between the panes must not diminish the tightness of the pane due to penetration of the edge construction or deposit coatings (chemical condensation) or diminish the visual quality of the pane in other ways.

### 3.9 Marking

The marking must be durable, visual and state at least the following:

- The manufacturer's GS ID no., issued by the Danish glass trade
- The standard number: EN 1279-5
- Year and month of production

**Example: GS XX EN1279-5 year/month**

### 3.10 Visual quality

Regarding the visual quality of insulating glass units, we refer to the publication "Termoruders visuelle kvalitet" (visual quality of insulating glass units) to be found on the website of the Danish glass trade under "Publikationer" (publications). See also EN 1279-1, Annex F and Annex G.

## 4. Requirements for mechanical properties

### 4.1 Glass measures

The applicable version of EN 16612 shall be applied for glass measures. The manufacturers must take into account that market specific requirements may exist.

### 4.2 Tolerances

**Table 1 – dimensional tolerances for 2- or 3- layer panes**

2- or 3-layer insulating glass units	Tolerances with respect to W and H	Displacements
All panes $\leq 6$ mm and (W and H) $\leq 2,000$ mm	$\pm 2$ mm	$\leq 2$ mm
6 mm < pane thickness < 12 mm or 2,000 mm < (W or H) $\leq 3,500$ mm	$\pm 3$ mm	$\leq 3$ mm
3,500 mm < (W and H) $\leq 5,000$ mm and thickest pane $\leq 12$ mm	$\pm 4$ mm	$\leq 4$ mm
1 pane > 12 mm or (W or H) > 5,000 mm	$\pm 5$ mm	$\leq 5$ mm
The thickness refers to the nominal thickness.		

Source: EN 1279-1, chapter 6.3.2

**Table 2 – thickness tolerances for panes with 2 or 3 layers**

Insulating glass unit	Pane	Insulating glass unit thickness tolerance a
2-layer pane	All panes are float glass	$\pm 1$ mm
	At least one pane is laminated, patterned or non-float glass	$\pm 1.5$ mm
3-layer pane	All panes are float glass	$\pm 1.4$ mm
	At least one pane is laminated, patterned or non-float glass	+ 2,8 mm / -1,4 mm
<sup>a</sup> If a pane has a nominal thickness above 12 mm for float or tempered glass or above 20 mm in the case of laminated glass, the glass manufacturer should be consulted.		

Source: EN 1279-1, chapter 6.3.3

### 4.3 Anti-intrusion

Anti-intrusion must be determined and classified in accordance with EN 356.

### 4.4 Personal safety

In the case of specified requirements for personal safety, safety glass in accordance with EN 12600 and in line with the applicable instructions by the Danish Building Regulations shall be applied.



## 5. Requirements for thermal properties

### 5.1 Documentation requirements

Documentation for the transmission coefficient  $U_g$  of the panes must be available. This documentation must be available in the following shape:

- Calculation or measurement
- The calculation of  $U_g$  must comply with EN 673
- The measurement of  $U_g$  must be carried out according to one of the following methods, as stated in EN 674 and EN 675, see the applicable version of DS 418
- Documentation for the sunlight transmission of the panes and the total solar energy transmittance in accordance with EN 410 must be available
- Documentation for the equivalent thermal conductivity of the edge construction must be available
- As a basis for the above documentation, specifications must be available, containing at least
  - Data for calculation in accordance with EN 673 and EN 410
  - Edge sealing and applied sealing materials
  - Spacer bars with measurements, materials and drying agent (type and amount)
  - Corners with measurements, materials and surface treatment
  - Gas filling and gas type
- The specifications may comprise product certificates from an accredited institute for the components (alternatively) used in the insulating glass units
- The documentation basis for the calculation and the measurement must be approved by the certification body

## 6. Sound-reducing properties

The requirements for the sound-reducing properties of the panes may vary from one project to another. The statement of sound-reducing properties must comply with EN 12758.

An improved  $R_w$  value can be achieved by:

Lamination of one or several glass layers, gas filling, increased glass thickness, increase of the number of glass layers or an asymmetric construction.

## 7. Environment

### 7.1 Internal environment – Work environment

The company must ensure that current safety data sheets are available for all the chemical substances and products and that workstation operational instructions (APB) for the safe handling of chemical or health-endangering substances are followed.

## 8. Quality control (FPC)

### 8.1 Background

According to the construction products regulation and EN 1279-5, the individual companies are required to establish, document and maintain a factory production control (FPC). The company's FPC must consist of procedures, periodic inspections and tests / evaluations as well as the utilisation of results for monitoring of the received materials or components, production processes and the finished product.

### 8.2 General information

The results of tests/evaluations requiring corrective or preventive measures must be documented; the same applies to any decisions made in this connection.

The company must appoint a person responsible for the FPC system at each production site. By means of set procedures with respect to instruction and training, the company must ensure sufficient and qualified personnel for the production as well as establishment, documentation and maintenance of the FPC system.

If the company has a certified EN ISO 9001 system or a different certified quality control system, this will be deemed sufficient.

### **8.3 Equipment**

Testing: Weighing, gauging and testing equipment must be calibrated and checked periodically with respect to procedures, frequency and criteria.

Production: Equipment regularly used in the production processes must be inspected and maintained periodically in order to ensure that its application, wear and tear and defects do not result in defects in the production processes. Inspection and maintenance must be carried out in accordance with the company's written procedures.

### **8.4 Raw materials and components**

The specifications of all raw materials or components of importance for the finished product must be documented in such a manner that a receiving inspection can be carried out in order to ensure compliance with the specified requirements.

### **8.5 The production processes**

The FPC system must document the various stages of the production, identify the inspection procedures and the persons responsible for the inspection at all stages.

The production itself must ensure the registration of all inspections and their results as well as any remedying action. The registrations must be sufficiently detailed and accurate in order to demonstrate that all stages and inspections of the production have been carried out in a satisfying manner.

### **8.6 Product testing and evaluation**

The company must establish procedures, which ensure that the set values for the individual product properties are met, by:

- testing or inspecting raw materials or components
- testing or inspecting work pieces or not finished products during production
- testing or inspecting ready-made goods

The testing or inspection must be carried out and evaluated in accordance with a test plan determined by the company. The test plan must also include the frequency and criteria.

### **8.7 Deviating products**

The company must have written procedures that specify how deviating products including complaints are to be handled and registered.

### **8.8 Traceability**

Traceability must - by means of the marking on the pane - be ensured from the end user till suppliers of raw materials by means of production documents, the inspections performed during the production period and the received raw materials (glass, butyl, sealing and spacer bars). The archiving period for traceability documents is 10 years.

## 9. Certification provisions

A company's membership of the certification system of the Danish glass trade depends on the performance of:

- type testing
- quality control (FPC)
- external inspection

The approved inspections must determine the degree of compliance between the certification provisions and the finished product as well as the applicable documentation.

### 9.1 Marking of ready-made goods

Every company under the certification system of the Danish glass trade must furnish type-approved panes with the mark approved by the certification system.

The marking on the spacer bar on the panes must be legible and permanent.

As permanent marking of the spacer bar, the following information may also be given:

- Ug value. Thermal transmittance.
- Leq value. Equivalent thermal conductivity of the edge construction;
- Designation of producer and production type.
- LTg value. Solar transmittance.
- gg value. Total solar energy transmittance.

Entering the product name or code that provides traceability

Thermal properties of glazing units must be specified with 2 significant digits.

Glazing data differing from the ones stated in the certification may thus be stated voluntarily in the spacer bars of the panes without losing the validity of the certification.

Any indication of supplementary data is voluntary; however, window manufacturers may be met by thermal data requirements, due to individual third-party certification terms.

The present certification will respect any such agreement without loss of validity.

### 9.2 Internal quality control

The individual companies develop the factory production control most suitable for the company and the purpose with a view to ensure that the production circumstances and the supplied panes comply with the present certification system. The minimum requirements for the internal control are stated in appendices 2, 4, 5 and 6.

Every day, a certain number of panes ready for delivery are taken out for inspection purposes. The amount taken out may vary depending on the internal requirements and the amount produced, see point 10.3 Table 4.

## 10. External inspection

The purpose of the external inspection is as follows: By means of an impartial and critical inspection of the company's products and production circumstances to help the company in its aim to deliver a product, which in every way meets the requirements of EN 1279-5, where the product quality has been achieved while taking into account environmental matters that are at least compliant with the present certification basis.

The external inspection comprises:

- sample taking and evaluation
- measuring/testing
- inspection of the companies' FPC system
- inspection of the technical documentation with respect to performance abilities
- reporting with respect to individual visits

## 10.1 Inspection performance

The external inspection must be carried out by an accredited institution.

## 10.2 Inspection visits

The membership of the certification system demands that the company accepts inspection visits with the frequency stated in table 3.

The external inspection may be carried out without notice by a supervisory body that has signed an agreement with the Danish glass trade in this respect. The inspection is carried out at normal working days.

**Table 3: Frequency of the external inspection and testing**

Total production in m <sup>2</sup> per year		Type A Inspection visits	Type B Inspection visits	Number of samples taken per year	
				5 sample panes in acc. with EN 1279-6	28 work pieces in acc. with EN 1279-4
0	20,000	1	1	1	1
20,000	60,000	2	2	2	1
60,000	180,000	3	2	3	1
> 180,000		4	2	4	1

### 10.2.1 External inspection type A

Inspection visits of the type A comprise an inspection of the company's production control, test items and registrations. In addition, the production premises and monitoring equipment are inspected.

During the inspection visit, 5 insulating glass units are produced with the measurements 352mm x 502mm x spacer bar. The work pieces are tested in line with EN 1279-6. The company delivers the work pieces to an accredited testing institution for testing purposes. The work pieces are marked as stated under point 3.7. 28 sample items are produced and delivered at least once a year for testing purposes in accordance with EN 1279-4, Annex A

### 10.2.2 External inspection type B

The external inspection visit of the type B comprises an inspection of the production and sample testing of the internal control system in the company.

The type B visit may be replaced by a quarterly electronic submission of the internal control system to the supervisory body. The submission must at least contain the documentation for the execution of registrations with respect to the receiving inspection, production control and defect level.

The supervisory body reports the result of the internal inspection with a frequency corresponding to an inspection visit of the type B, see Table 3.

### 10.2.3 Reduced external inspection

Companies manufacturing less than 10,000 m<sup>2</sup> of insulating glass units per year may be subject to

a reduced external inspection and have only one inspection visit per year.

The prerequisite is a quarterly internal inspection with submission of reports to the supervisory body. The submission must at least contain the documentation for the execution of registrations with respect to the receiving inspection, production control and error level.

The tests are performed as stated under point 10.2.1.

**10.3 The taking of samples**

**Table 4: Sample taking schedule**

Batch size; panes with the same system description and from the same production line	Sample size at final inspection	Acceptance limits for panes with defects					
		Critical KI A		Significant KI B		Insignificant KI C	
		Ac.	Re.	Ac.	Re.	Ac.	Re.
1 - 25	100 % inspection						
26 - 90	5	0	1	0	1	1	2
91 - 150	8	0	1	1	2	2	3
151 - 500	13	0	1	1	2	3	4
501 - 1200	20	0	1	2	3	5	6
1201 - 9999	32	0	1	3	4	7	8

Source: ISO 2859-1

If the Ac values stated are exceeded, the applicable batch is subjected to 100% inspection. The sample is taken out arbitrarily in such a manner that it comprises different pane sizes and types. The panes taken out must be finished and ready for delivery.

**10.4 Defect categories**

The defects found in the sample must be categorised in line with the following defect description and as described in the schedule below. See also table B3.1, where the below terms are used.

**Table 5: Defect categories**

Defect categories Defect types	Critical defects	Significant defects	Insignificant defects
<b>Materials defect</b>	Defects significantly affecting the function and useful life of the pane	Defects insignificantly affecting the function and useful life of the pane	Defects not affecting the function and useful life of the pane
<b>Processing defects</b>	Defects significantly affecting the function, useful life and appearance of the pane	Defects insignificantly affecting the function, useful life and appearance of the pane	Defects not affecting the function and useful life of the pane and insignificantly influencing the appearance
<b>Other defects</b>	Defects damaging or seriously affecting the pane	Defects insignificantly damaging or affecting the pane	Defects hardly damaging or affecting the pane
<b>Defects connected to</b>	Defects which may seriously affect the	Defects which may affect the	Defects which may affect the

<b>environmental aspects</b>	environment/health	environment/health	environment/health to a lesser extent
------------------------------	--------------------	--------------------	---------------------------------------

## 10.5 Processing of defects

The defects found are processed according to the following guidelines.

### 10.5.1 Critical defects

Measuring does not take place; the only options are: accepted or rejected.

If 1 critical defect is found in the sample, it is rejected and stricter inspection will take place (see point 9.8)

### 10.5.2 Significant defects

The acceptance criteria are stated in the sample taking schedule under point 10.3.

### 10.5.3 Insignificant defects

The acceptance criteria are stated in the sample taking schedule under point 10.3.

## 10.6 Visit report

Subsequent to the inspection the client receives a report with the conclusion from the visit.

If deviations have been registered, the according consequences are stated in Appendix 1. Deviations are treated according to the following procedure:

1. the supervisory body describes the deviation
2. the manufacturer//license owner must develop suggestions for remedying actions for the supervisory body within 14 days
3. if the supervisory body accepts the suggestions submitted for remedying/corrective actions, these are submitted for acceptance.

If deviations have been registered, the according consequences are stated in Appendix 1.

## 10.7 Additional inspection

Companies failing to meet the requirements stated in the present certification system must expect additional inspection visits. The inspection visits may be of the type A or type B.

## 10.8 Stricter inspection

In the case of repeated deviations, the company must expect stricter inspections and the maintenance of the marking right will be evaluated.

## Appendix 1. Consequences of deviations

Table B1.1: Consequences of deviations

Deviations found	Follow-up at the next ordinary inspection visit	Extraordinary inspection visit	
		Type A	Type B
<b>Receiving inspection</b>			
Tests or measurements not fully performed			x
Product brought into use prior to availability of the test result	x		
Tests or measurements carried out, but not registered*			x
<b>Production control</b>			
Individual tests not performed	x		
Tests or measurements not performed in a certain period			x
Tests or measurements carried out, but not registered*			x
Poor order and tidiness			x
Glass stored outside without cover			x
Acclimatisation not performed	x		
<b>Inspection of ready-made goods</b>			
Stated AQL values are exceeded without resorting			x
<b>Quality control system</b>			
Calibration of gauging equipment deficient*			X*
Lack of training and instruction of personnel*			X*
Lack of implementation of the system in the company		x	
Defects in procedures and/or procedure*			X*
<b>Laboratory tests</b>			
Impurities in the pane	x		
Index I too high			New sample taking <sup>1</sup>
Amount of drying agent too low			New sample taking <sup>1</sup>
Gas filling too low			New sample taking <sup>1</sup>
Defects in the edge construction			New sample taking <sup>1</sup>

<sup>1</sup> The manufacturer is requested to find the reason for the deviation. If new test panes fail to meet the requirements, the license is re-evaluated.

\* In case of deficiencies during 3 sequential inspection visits, the stated consequences will follow.

## Appendix 2. Internal inspection: Reception of goods - minimum requirements

All components must be evaluated with a positive result, before they can be used in production.

Table B2.1: Reception of goods - minimum requirements

Component	Method	Requirement	Frequency
<b>Glass</b>			
Identification	Visual	Supplier's documentation	At each reception of glass
<b>Spacer bars</b>			
Identification	Visual	Purchase specification	Each batch. <sup>1</sup>
Measurements	Measurement	Purchase specification	1 sample per type per batch. <sup>1</sup>
Surface aspects / adhesion	EN 1279-6, e.g. Annex D	Purchase specification	1 sample per type per batch. <sup>1</sup>
Volatile substances	EN 1279-4, Annex H	Purchase specification	1 sample per batch and per type. <sup>2</sup>
<b>Drying agent</b>			
Identification	Visual	Purchase specification	At each reception
Activity zeolite	EN 1279-6, Annex H	Purchase specification	1 sample from each package. ( <b>only</b> to be performed at production start) <sup>3</sup>
<b>Internal sealing (butyl)</b>			
Identification	Visual	Purchase specification	At each reception
Volatile substances	EN 1279-4, Annex H	Purchase specification	2 samples per batch and per type. <sup>2</sup>
<b>External sealing</b>			
Identification	Visual	Purchase specification	Each batch
Adhesion to glass	EN 1279-6, Annex D adhesion test	See D.3.1 or D.3.2	1 sample per batch and per type. <sup>1</sup>
Adhesion to spacer bar	EN 1279-6, Annex D adhesion test	See D.2	1 test per batch and per type. <sup>1</sup>
Hardness measurements	EN 1279-6, Annex E	Supplier's data sheet	1 sample per batch and per type. <sup>1</sup>
Volatile substances	EN 1279-4, Annex H	Purchase specification	2 samples per batch and per type. <sup>2</sup>

<sup>1</sup> The inspection may be carried out by the supplier if the relevant tests have been performed and can be documented. A quality contract of this kind is to enable an audit at the supplier.

<sup>2</sup> May be replaced by the supplier's data sheet.

<sup>3</sup> The test method must comply with the supplier's instructions. (E.g.  $\Delta T$  measurements)



Appendix 3. Internal inspection – Defect types

Classification of defect types

	Critical defects	Significant defects	Insignificant defects
External sealing surface	< X mm		
Butyl penetrating the external sealing	<b>Not accepted</b>		
W x h of air gap between butyl and external sealing Length of air gap = L	> w = X mm and > h = X mm/m Or > L= x mm/pane	< w = X mm and < h = X mm/m Or < L= x mm/pane	
Butyl inside the pane -max 2 mm		> X mm	< X mm
Butyl interrupted in total	> X mm		
Butyl width		< X mm	> X mm
Exposed back edge of the profile	<b>Not accepted</b>		
Profile bent inwards – max 4 mm		> X mm	
Profile displacement – max 4 mm		> X mm	
Internal impurities. Visual quality of insulating glass units			
Profile displacement 3-layer panes - max 3 mm		> X mm	
Edge damage/conchoidal fractures above edge		1/x of glass thickness	
Internal impurities			
Deviation from evenness			

The requirements for classification of the various defect types must be stated in the type testing and the system description of the company. Please note that the standard requirements according to EN 1279-1 Annex F must be met as a minimum. The above table must be filled in by the manufacturer. Table B6.1 shows an example of this.

## Appendix 4. Internal inspection: Production control - minimum requirements

Table B4.1: Production control

Component/ Process	Regarding	Method	Requirement	Frequency
<b>Glass</b>				
	Measurement for cutting	Measurement	Product specification	1 sample per shift per cutting table
	Sanding of soft coated glass	Visual	System description	All panes
<b>Spacer bars</b>				
	Measurements compared to glass	Measurement	Product specification	1 sample per shift
	Dry agent filling	Measurement	System description	Per shift: 1 frame/type/thickness <sup>3</sup>
<b>Spacer bars with integrated drying agent</b>				
	Water absorption capacity	EN1279-6 Annex H <sup>2</sup>	See annex	1 per batch <sup>3</sup>
	Extrusion temperature (if applicable)	Measurement <sup>1</sup>	Product specification	1 sample per type per shift <sup>3</sup>
<b>Drying agent</b>				
	Water absorption capacity of filling device	EN 1279-6, annex H	Purchase specification, but initially H <sub>2</sub> O ≤ 3 %	1 sample per shift per dry agent filling device
	Water absorption capacity for a filled frame during queue time in an open area	EN 1279-6 annex H	Purchase specification, but initially H <sub>2</sub> O ≤ 3 %	1 frame per shift if applicable
<b>External sealing</b>				
	Adhesion to glass and spacer bar	EN 1279-6, Annex D	EN 1279-6, Annex D.3.1 or D.3.2	1 sample per shift per joining station <sup>3</sup>
	Mixing ratio	Product specification	Product specification	Quality system
	Homogeneity	EN 1279-6, Annex F	No marbling	1 test per shift per joining station <sup>3</sup>
	Hardness	EN 1279-6, Annex E	Product specification	1 test per shift per joining station <sup>3</sup>

<sup>1</sup> The inspection is carried out in line with the supplier's instructions

<sup>2</sup> The test method must comply with the supplier's instructions. (E.g. ΔT measurements)

<sup>3</sup> Further tests are carried out at batch changes

## Appendix 5. Internal inspection: Process control of gas filled insulating glass units - minimum requirements

Table B5.1: Process control - gas filling

Component/ Process	Regarding	Method	Requirement	Frequency
<b>Gas filling</b>				
	Gas concentration	Measurement <sup>1</sup>	$C_i = C_{i,0}$ (+10 %, -5 %)	1 per 1,000 units with a minimum of 3 per day and line.

<sup>1</sup> At a production of less than 100 units per shift, at least 1 test is carried out per day. Companies that use only probe filling may choose to have the inspection performed by external inspection at least twice a year.

## Internal inspection: Process control of panes with energy coatings - minimum requirements

Table B5.2: Process control of panes with energy coatings - and sun reflective coatings

Component/ Process	Regarding	Method	Requirement	Frequency
<b>Glass</b>				
	Sanding of soft coated glass	Visual	System description	All panes
	Compliance between prescribed glass and actual glass	Visual <sup>1</sup>	Product specification	All panes
	Marking on pane label	Visual	Product specification	2 samples per shift
<b>Spacer bars</b>				
	Marking on spacer bar	Visual	Product specification	2 samples per shift
	Edge construction must comply with order specification	Visual	Product specification	2 tests per shift

<sup>1</sup> The inspection can be carried out at the cutting table or at the line.

**Appendix 6. Inspection of ready-made goods. (Example – based on a virtual system description and production)**

Table B6.1: Inspection of ready-made goods (example)

Factory for insulating glass units		Inspection of ready-made goods.				
Year:		Amount produced: 501 - 1200				
Week:	<b>20 PANES</b>	Monday	Tuesday	Wednesday	Thursday	Friday
Critical defects. AQL 0.65						
Accepted 0 > = Rejected		<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
External sealing surface < 3 mm						
Butyl penetrating the external sealing						
Air gap butyl - external sealing >1.5 mm and >50 mm/m or >200 mm/pane						
Butyl interrupted in total > 10 mm						
Exposed profile edge						
Edge damage/conchoidal fractures > ¼ glass thickness						
Glass edge offset/displacement > 3 mm						
Total critical defects						
Significant defects. AQL 4.0						
Accepted 2 > = Rejected		<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
Compliance between pane and label						
Air gap butyl - external sealing <1.5 mm and <50 mm/m or <200 mm/pane						
Butyl into the pane > 2 mm						
Butyl interrupted in total 5 - 10 mm						
Butyl width < 2,0 mm						
Profile bent inwards > 2 mm						
Impurities. Used visual quality of insulating glass units						
Gap width < 1.5 mm						
Glass edge offset/displacement 2 - 3 mm						
CGS marking missing						
Total significant defects						
Insignificant defects. AQL 10.0						
Accepted 5 > = Rejected		<b>6</b>	<b>6</b>	<b>6</b>	<b>6</b>	<b>6</b>
Butyl into the pane > 2 mm						
Butyl interrupted in total < 5 mm/pane						
Butyl width > 5 mm						
Profile displacement (3-layer panes) < 1 - 2 mm						
Spotted profiles						
Impurities on the outer surface of the pane, e.g. putty						
Total insignificant defects						

Table B6.1

### Appendix 7

The panes are dimensioned according to the dimension table of the Danish glass trade and suitable Eurocodes or the latest EN 16612.

## Appendix 8. Term explanation

### Accelerated ageing

Test method EN 1279-2. Long-term test method and requirements regarding moisture penetration.

### Physical properties of sealing

Test method EN 1279-4 Methods for testing the physical properties of edge sealing components and insertion elements.

### Gas leakage

Test method EN 1279-3 Long-term test method and requirements regarding gas leakage and gas concentration tolerances.

### Index I

Test method EN 1279-2 Long-term test method and requirements regarding moisture penetration.

### Sunlight transmission

The sunlight transmission ( $L_t$ ) of a pane shows the relationship between the sunlight flow on a surface directly inside and outside of the pane. The pane's sunlight transmission is a value for the centre of the pane. The unit is a pure figure, stated in %. The value of the sunlight transmission shall apply for a perpendicular incident of sunlight with a spectral distribution as stated in EN 410.

### Standard relationship

The standard relationship has been defined by an external and internal heat transfer coefficient of 0.04 and 0.13  $0,13 \text{ m}^2\text{K/W}$ , respectively, and an external and internal air temperature of  $0 \text{ }^\circ\text{C}$  and  $20 \text{ }^\circ\text{C}$ , respectively.

### Total solar energy transmittance (g-value)

The total solar energy transmittance (g) of a pane states the pane's ability to transmit solar energy as solar radiation and as heat. The total solar energy transmittance is a value for the centre of the pane. The unit is a pure figure, stated in %. The total solar energy transmittance shall apply for standard relationships and for a perpendicular incident of solar radiation with a spectral distribution as stated in EN 410.

### Heat transfer coefficient (U-value)

The heat transfer coefficient ( $U_g$ ) of a pane is the value in the centre of the pane, where the heat transmission through the spacer bar is neglected. The unit is  $\text{W/m}^2\text{K}$ .

### Type testing

Type testing (ITT – Initial Type Test) is carried out in connection with the CE marking and must be performed at an accredited laboratory, which must be notified about the type testing. The laboratory can be selected freely and the various properties of the panes can be tested at various institutions.

### Equivalent thermal conductivity of the edge construction

The equivalent thermal conductivity (here termed  $\lambda_k$ ) of the edge construction states the thermal conductivity of a homogeneous material with the same geometry and heat transfer properties as the spacer bar with the drying agent and the sealing putty. The unit is  $\text{W/mK}$ .