

## **Specific regulations for DS certification of insulating glass units in accordance with EN 1279-5**

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## **1 Conditions of certification**

The issue of a certificate in accordance with EN 1279-5 implies that the applicant commits himself to comply with the "Common Regulations for Danish Standard Product Certification" (hereinafter ABP), the present Special regulations for DS certification of insulating glass units in accordance with EN 1279-5 including annexes (hereinafter DS/SBC 1279) and the conditions and requirements of EN 1279.

The certification also implies that initial type testing has shown that the insulating glass units produced in accordance with the manufacturer's system description (cf. annex 1) are in conformity with EN 1279-5.

The certification covers the sealing characteristics documented by the initial type testing expressed by:

- moisture penetration index, I-value
- edge seal strength, and
- for gas filled insulating glass units also the gas leakage rate.

Other characteristics of the insulating glass units such as resistance to fire, bullets, explosions, forced entry, heavy blows, mechanical resistance and sound-, thermal-, and energy characteristics can be documented as stated in EN 1279-5, clause 4.3.2.

For voluntary permanent marking concerning the thermal performance of energy-efficient insulating glass units, cf. annex 4.

### **1.1 Requirements on manufacturers**

The manufacturers must

- be in possession of suitable production facilities and the testing- and measuring equipment necessary to carry out the inspections and tests before, during and after the production
- have implemented a factory production control that fulfils the requirements of annex 2.
- have competent personnel to handle all practical questions that have an influence on the quality of the units

The production of insulating glass units must take place at a temperature of at least 15 °C and raw materials and constituent components – such as sealants, desiccants, spacer profiles etc. - must be stored under adequate conditions according to the supplier's directions and be acclimatized for at least 5 days before being used.

The manufacturer must commit himself to comply with the requirements of annex 5 on the glass.

## **2 Application for certificate**

The basis of agreement and conditions are stated in ABP, clause 3 and 4.

The applicant may apply for a certificate using an application form - which can be obtained at DS Certificering - and enclose the following documentation:

- System description - cf. annex 1 - for the insulating glass unit constructions to be covered by the certificate.
- Initial type test reports and other documentation proving that insulating glass units produced in accordance with the manufacturer's system description comply with the requirements of EN 1279-1, clause 5.1. If the applicant is not the owner of the type test reports, documentation for the right to using must be enclosed.
- Proposal for marking, cf. clause 5.
- Name of the inspection body and the testing body, proposed by the applicant, to carry out the external inspection.
- Name of the person responsible for the DS-marking of the insulating glass units
- Copy of the quality management system manual relevant to the manufacture of insulating glass units.

All documentation which forms the basis for the issue and maintenance of a certificate in accordance with this DS/SBC 1279 must be in Danish, Swedish, Norwegian, English or German.

### 3 Certificate

A certificate can be issued when:

- initial type testing shows that the insulating glass units included in the system description comply with the requirements of EN 1279-1
- an initial inspection report shows that the applicant is capable of producing insulating glass units in accordance with the system description and the conditions of this DS/SBC 1279
- proposal for DS-marking has been approved by DS Certificering
- documentation received from the applicant is approved by DS Certificering

The certificate includes insulating glass units according to the applicant's system description and composed of materials and elements specified in the system description.

### 4 Surveillance

The surveillance includes

- Initial control
- Internal inspection and testing
- External inspection and testing
- Other control

#### 4.1 Initial control

Initial control includes initial type testing and initial inspection and assessment of the production plant and the factory production control.

##### 4.1.1 Initial type testing

Initial type testing must be carried out by a testing body accredited to the relevant testing by an accreditation body being a member of the European Accreditation (EA).

Initial type testing includes testing of the insulating glass unit specified in the system description as given in table 1.

**Table 1**

Applicable to:	Seal performance:	Validation method: /demonstration by means of available test reports or by testing	Requirement:
All insulating glass unit systems	Moisture vapour penetration	EN 1279-2	Refer to EN 1279-2
	Adhesion sealant – glass	EN 1279-4	Refer to EN 1279-4

The initial type testing of gas filled units and/or coated glass also include testing as given in table 2.

**Table 2**

Applicable to:	Seal performance:	Validation method: /demonstration by means of available test reports or by testing	Requirement:
Gas filled units Gas type	Gas leakage	EN 1279-3	Refer to EN 1279-3
Gas filled units Gas concentration		Subject to factory production control in accordance with EN 1279- 6	Refer to EN 1279-6, annex A.3
Units incorporating coated glass: Bonding to the coating	Adhesion: -sealant/coating -interlayer of coating	EN 1279-4, annex D	Refer to EN 1279-4

#### **4.1.2 Initial inspection and assessment of the production plant and the factory production control.**

Initial inspection must be carried out by DS Certificering or an inspection body having an agreement with DS Certificering about the inspection.

At the initial inspection it must be assessed whether the manufacturer's factory production control is implemented and meets the requirements of annex 2 of this DS/SBC 1279 and that the manufacturer's internal inspection is undertaken. Furthermore it must be assessed whether the manufacturer has the staff, the production facilities and the control equipment necessary to the manufacture of insulating glass units according to the system description and that the conditions in clause 1.1 are complied with.

Furthermore, 5 test units 502 x 352 mm are to be produced/selected during the initial inspection. These test units shall be sent to an external testing body for periodic testing and inspection cf. EN 1279-6 Annex B.

The test units must comply with the requirements of EN 1279-6 Annex B and the requirements on the edge seal geometry and the absolute limits of the system description

#### **4.2 Internal inspection and testing**

The internal inspection and testing includes

- inspections or tests of incoming materials,
- inspections or tests carried out during the production
- inspections of the finished insulating glass units

The inspections or tests shall be carried out according to the relevant documentation of the quality manual and cover all the relevant sections of annex 3. The results of the inspections and tests must be registered and kept for a minimum of 2 years and be accessible at the external inspections (audits)

Maintenance and adjustment of production equipment must be carried out according to the supplier's recommendations and be recorded. Traceable calibration of test- and measuring equipment must be carried out and recorded according to the quality manual.

The material control, cf. annex 3, may be reduced on basis of quality contracts between the manufacturer and the supplier on conditions stated in EN 1279-6 clause 5.2.6.

### **4.3 External inspection and testing**

External testing must be carried out by a testing body accredited to the relevant testing by an accreditation body being a member of the European Accreditation (EA).

DS Certificering causes unannounced external inspection visits which shall be carried out by DS Certificering or an inspection body having an agreement hereof with DS Certificering.

For new certificates the frequency of the external inspections shall be twice a year. When no major non-conformances have been demonstrated during four successive external inspections the frequency is reduced to once a year.

If it is demonstrated at the time of the issuing of the certificate that the manufacturer has been subjected to a similar certification scheme including third party surveillance, this may be taken into consideration, when deciding the frequency of the external inspection.

External inspection includes an inspection of production facilities and an audit of (parts of) the factory production control, below this all the records of the manufacturers internal inspection and testing.

During the external inspection 5 samples for the periodic testing and inspection, cf. EN 1279-6 Annex B, shall be selected or produced. These samples shall be marked as stated in clause 5.

If the certificate covers gas filled units, the external inspection shall include an assessment of whether the manufacturer's documentation of the gas permeability of the sealant can demonstrate conformity with the gas leakage rate requirement.

Documentation for conformity with the gas leakage requirements must be based on testing which is no more than 1 year old.

DS Certification may decide to carry out one additional audit per year. This will not include the selection of units for testing.

#### **4.3.1 Evaluation of internal and external inspection**


The audit of the manufacturer's internal inspection shall prove that the production is carried out in accordance with the conditions in this DS/SBC 1279. All results of internal and external inspection must prove that the conditions are complied with.

The inspection body/testing body draws up reports with the results of the external inspections and testing, respectively. These reports are sent to DS Certificering.

DS Certificering is to be contacted immediately, if the insulating glass unit fails the external testing. In this case DS Certificering shall cause new samples to be subject to retesting and have the manufacturer to investigate and explain the reason for failure.

## **5 Marking**

Insulating glass units covered by a certificate according to this DS/SBC 1279 can be marked with the logo of Dansk Standard. The DS labelling must be permanent, visible and as a minimum state:

- the manufacturer's identification number, e.g. 000, which is assigned by Danish Standard
- Dansk Standard's logo: 
- the standard's number: EN 1279.5
- year and month of production

in the following order: 000 EN 1279.5 year month.

Additionally, the insulating glass units may be labelled with the name of manufacturer and/or logo, data regarding the units' characteristics and other information relevant to the manufacturer.

For marking concerning the thermal performance of energy-efficient insulating glass units see Annex 4.

### **Table of annexes**

Annex 1	System description for insulating glass units
Annex 2	Factory production control
Annex 3	Internal inspection and testing
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Annex 5	Requirements on glass
Annex 6	Substitution of materials and components

### 1 Contents of system description

The system description shall contain at least a normative part and may also include an informative part, when the manufacturer foresees further development of the product.

### 2 The normative part of the system description

The normative part of the system description must include:

- a component description
- an edge seal description

#### 2.1 Component description

The component description must include:

- a. a drawing of a cross section of the sealed edge of the insulating glass unit's with each component numbered. All components must appear in a drawing.
- b. a list of cavity fillings and inserts
- c. a list with the names of the components according to the numbering of the drawing(s)
  - a record for each component - including substitute components - numbered in accordance with the detailed drawing(s) and containing:
    -
  - number and functional name of the component
  - the commercial name and the manufacturer and supplier of the component
  - a general description of the material used for the component and its relevant properties or characteristics
  - a drawing with relevant dimensions related to the component's permeation geometry for components other than those which obtain their shape during the sealing process, such as sealants and desiccant.

#### 2.2 Processed edge seal description

The description may consist of:

A

detailed drawings of relevant areas of the sealed edge, such as:

- the relevant section(s) of the continuous sealed edge
- the relevant section(s) of the edge where a joint piece is applied
- the relevant section(s) of a corner
- description of gas fill process by, e.g. by indicating:
  - position and dimensions of filling holes,
  - gas filling equipment,
  - filling holes closing methods including sealing and list of materials

indicating the relevant dimensions of the sealing, (including, if appropriate, the width of the coating to be stripped,) and the relevant quantities of those components which are introduced during the sealing process such as sealant, gas and desiccant..

B

a list of relevant dimensions and quantities mentioned above which may contain:

- the numbering according to the drawings
- the average values, and the action limits on which the production of insulating glass units will be based
- the absolute limits, e.g. per meter edge seal or per insulating glass unit, which may occur during production without affecting the economically reasonable lifetime. Among others, they may relate to:
  - air inclusions between inner and outer seal
  - length of interruption of inner seal

If the list does not contain the absolute limits, the action limits serve as absolute limits.

C

A list of absolute limits, indicating which ones appear combined with others in insulating glass units  
Tolerances, action limits and absolute limits in the quality manual may be narrower than those of the system description over time.

**2.3 Limitation**

Insulating glass unit belonging to an insulating glass unit system cannot be build of more than one component type from each of the below main components. A certificate may cover more than one insulating glass unit system.

<b>System</b>	2-layered double sealed	Or 3-layered double sealed
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<b>Main component</b>	<b>Component type</b>			
<b>Sealant</b>	Either Polyurethane	Or Polysulphide	Or Silicone one component	Or Silicone two component
<b>Spacer profile</b>	Either Metal	Or Plastic	Or Organic with desiccant	
<b>Desiccant</b>	Either Zeolite	Or Silica gel	Or in spacer profile	
<b>Corners</b>	Either Metal corners	Or Plastic corners	Or Bent corners and metal- or plastic junction(s)	
<b>Coating in the sealed edge</b>	Either None	Or coating in the edge construction		
<b>Filling</b>	Either Air filled	Or Gas filled		
<b>Inserts</b>	Either None	Or With inserts		

**2.4 Replacement of components**

A component in a system description can be replaced by other components of the same type in clause 2.3, but not by components of another type. Replacement of components provides testing carried out in accordance with EN 1279-6 Annex B. As to validation methods and requirements regarding replacement of components see Annex 6.

**3 Informative part of the system description**

The informative part may include all the information relevant to the manufacturer and is important and necessary when changing material or components. The information may be a description of the material and components as well as testing reports from impartial testing laboratories regarding material characteristics such as sealant stress/strain curves, sealant moisture vapour and/or gas permeation numbers.

## Factory production control requirements

The required CE-marking of IGUs implies that the manufacturer has implemented a factory production control typically abbreviated FPC. Below, the requirements on the factory production control for the manufacture of double sealed insulating glass units are described. These requirements also apply to the DS Certificering scheme for insulating glass units.

### Organization, responsibility and authority

Responsibility, authority and mutual relations must be defined for all personnel who manage, execute and assess work which affects the characteristics of the IGUs

Responsibility, authority and interrelations must be defined for all personnel that shall have organizational freedom and authority to

- introduce action to prevent product nonconformities
- identify and record any product quality problems

### Management review

The top management shall, at planned intervals, review the production control system to ensure its continuing suitability and effectiveness with respect to the product's conformity with the conditions in the standard. The results of these reviews shall be registered.

### Management representative for factory production control

For every production unit the manufacturer shall appoint a person having appropriate knowledge and experience of the production of insulating glass units, who shall be given defined authority to be responsible for the conduct and supervision of the factory production control procedures including assessment of the qualifications of any sub contractual testing and inspection body.

The manufacturer shall appoint a person to be responsible for construction, implementation and maintenance of the production management system.

### Quality system

The manufacturer shall establish and maintain a documented system which shall fulfil the below requirements

### Documentation

The manufacturer's documentation and procedures shall be relevant to the production and control of the insulating glass. The quality manual must include an adequate description of the following:

1. quality objectives, organisational structure, management responsibility and authority, especially for the management representative for the factory production control for the purpose of ensuring products' conformity with the product specifications
2. procedures for specification and verification of raw and constituent materials and components in accordance with the system description
3. procedures for the production processes and other systematic activities included in insulating glass unit manufacturing, including the necessary instructions for the production in accordance with relevant information from material suppliers
4. procedures for inspection and testing before, during and after production which specify the inspection and testing programmes and the records to be compiled
5. procedures for identification, filing and use of records of inspections and tests
6. precautions for managing products which do not meet the specifications, including carrying through preventive measures and routines which ensure that mixing and mix-ups of products cannot occur
7. procedures for accessibility of supplier's documentation of products' conformity with specifications and supplier's instructions for the correct use of the products

8. procedures for traceable calibration of measuring and testing equipment adapted to the specified tolerances.
9. procedures for training all personnel having influence on the product quality and for registrations of accomplished training.
10. procedures for handling, storing, packaging and delivery of insulating glass units
11. procedures for the marking of the insulating glass units and/or their delivery documents which makes the identification of delivered insulating glass units or batches of insulating glass units possible with traceability to the relevant production data
12. if relevant, procedures for computation of the energy balance of energy efficient insulating glass units and for the evaluation of the documentation for the data necessary for the computation.

In the quality manual, it must be stated how long the specific records must be filed, and in which way (electronic or physical). The records

must though be kept for a minimum of 2 years.

**Personnel for inspection and testing**

The manufacturer shall appoint a qualified person to be responsible for the internal inspection and testing to be carried out in accordance with the conditions of this SBC, including the tasks of annex 2. The responsible person must be given the authority to prevent that insulating glass units which do not comply with the requirements of EN 1279-1 are DS-marked and that these certification conditions are set aside.

The manufacturer shall appoint qualified personnel to carry out inspection and tests before, during and after the production process, respectively, and these persons must refer directly to the responsible person as far as the inspection and testing are concerned

**Production equipment**

Machinery and equipment used for the manufacture of insulating glass units, especially gas fill stations and gas concentration measurement equipment, shall be periodically checked and (if necessary) adjusted according to the supplier's recommendations.

**Internal inspection and testing**

The internal inspection and testing shall comprise the (relevant) inspections and tests of the tables of annex 3.

## Material control for air filled organic sealed IGUs

Ref.	Material, inspection or test	Recommended method	Requirement	Recommended frequency	Record
1	<b>Glass</b>				
1.1	packaging and label	Visual	Purchase specification	Each batch: 1	
1.2	identification(glass/coated glass, according to relevant standards)	Visual	Purchase specification	Each batch: 1	Yes
1.3	dimensions (length/width/shape when applicable)	Measurement	Purchase specification	Each batch, package and thickness: 1	
2	<b>Spacer Bar</b>				
2.1	packaging and label	Visual	Purchase specification	Each batch: 1	
2.2	straightness	Visual	Purchase specification	Each batch: 1	
2.3	dimensions (height, width)	Measurement	Purchase specification	Each batch 1 test per type	Yes
2.4	shape	Visual	Purchase specification	Each batch 1 test per type	
2.5	surface condition	Adhesion test (e.g. EN 1279-6 annex F)	Product description	1 test per type per batch	Yes
2.6	Diffusion openings	Visual	Product description	1 per shift per type	
2.7	undesired openings (if relevant e.g. welded on back)	Visual (see EN 1279-6 annex H)	No openings	2 tests of the amount used per shift	Yes
2.8	volatile content (if no information from supplier is available)	Weight loss	Purchase specification	Each batch: 2 tests per type	Yes
2	<b>Organic spacer incorporating desiccant</b>				
2.1	packaging and label	Visual	Purchase specification	Each batch: 1	
2.2	consistency	Visual	Purchase specification	Each batch: 2	
2.3	dimensions (if applicable)	Measurement	Purchase specification	Each batch: 2 samples per type	Yes
2.4	desiccant activity: test method shall be in agreement with organic spacer material supplier,	See EN 1279-6 annex K	Product description	Each batch: 2 samples per type	Yes
2.5	Shelf-life	Visual	Product description	Each batch: 1	Yes
2.6	Adhesion (if no outer seal)			Each batch: 2 samples per type	Yes
2.7	volatile content (if no information from supplier is available)	Weight loss	Purchase specification	Each batch: 2 samples per type	Yes
3	<b>Spacer tape</b>				
3.1	packaging and label	Visual	Purchase specification	Each batch: 1	
3.2	dimension	Measurement	Purchase specification	Each batch: 2 samples per type	Yes
3.3	adhesion	Adhesion test (e.g. EN 1279-6 annex F3)	Product description	Each batch: 2 samples per type	Yes
3.4	volatile content (if no information from supplier is available)	Weight loss	Product description	Each batch: 2 samples per type	Yes
4	<b>Desiccant</b>				
4.1	packaging and label	Visual	Purchase specification	Each batch: 1	
4.2	Activity: test method shall be in agreement with desiccant supplier, e.g. $\Delta T$ or drying (zeolite or silicagel)	See EN 1279-6 annex K	Initial H <sub>2</sub> O content $\leq 3\%$	Each batch: 1	Yes
5	<b>Inserts</b>				
5.1	packaging and label	Visual	Purchase specification	Each batch: 1	
5.2	dimensions	Measurement	Purchase specification	Each batch: 2 samples per type	Yes
5.3	volatile content (if no information from supplier is available)	Weight loss	Product description	Each batch: 2 samples per type	Yes
7	<b>Outer seal</b> (for hot applied hot melt seal see end of material control section)				
7.1	packaging and label	Visual	Purchase specification	Each batch: 1	
7.2	shelf-life	Visual	Supplier's specification	Each batch: 1	
7.3a	adhesion on glass and on spacer	Adhesion test EN 1279-6 clause F.3	Refer to EN 1279-6 clause F.3.3	Each batch: 2 samples	Yes
7.4	Hardness			Each batch: 2 samples per type	Yes
7.5	volatile content (if no information from supplier is available)	Weight loss	Product description	Each batch: 2 samples per type	Yes

**Material control for air filled organic sealed IGUs continued**

Ref.	Material, inspection or test	Recommended method	Requirement	Recommended frequency	Record
<b>7</b>	<b>Hot melt outer seal</b>				
7.1	packaging and label	Visual	Purchase specification	Each batch: 1	
7.2	shelf-life	Visual	Supplier's specification	Each batch: 1	
7.3	appearance	Visual	Purchase specification	Each batch: 1	Yes
7.4	temperature of application	Certificate from supplier	Purchase specification	Each batch: 1	Yes
7.3a	adhesion on glass and on spacer	Adhesion test EN 1279-6 clause F.3	Refer to EN 1279-6 clause F.3.3	Each batch: 2 samples	Yes
7.4	Hardness			Each batch: 2 samples per type	Yes
7.5	volatile content (if no information from supplier is available)	Weight loss	Product description	Each batch: 2 samples per type	Yes
<b>8</b>	<b>Inner seal</b>				
8.1	packaging and label	Visual	Purchase specification	Each batch: 1	
8.2	Penetration (if there is no information from supplier)	ISO 2137	Purchase specification	Each batch: 2 samples per type	
8.3	volatile content (if no information from supplier is available)	Weight loss	Purchase specification	Each batch: 2 samples per type	Yes
<b>8</b>	<b>Alternative assembly aids e.g. hot melt inner seal/spacer adhesive</b>				
8.1	packaging and label	Visual	Purchase specification	Each batch: 1	
8.2	shelf-life	Visual	Supplier's specification	Each batch: 1	
8.3	temperature of application (spacer adhesive only)	Certificate from supplier	Purchase specification	Each batch: 2 samples per type	
<b>9</b>	<b>Marking materials</b>				
9.1	packaging and label	Visual	Purchase specification	Each batch: 1	
<b>10</b>	<b>Cutting oil</b>				
10.1	packaging and label	Visual	Purchase specification	Each batch: 1	
<b>11</b>	<b>Washing machine liquid</b>				
11.1	packaging and label	Visual	Purchase specification	Each batch: 1	

**Material control for gas filled organic sealed IGUs (additional to that for air filled IGUs)**

Ref.	Material, inspection or test	Recommended method	Requirement	Recommended frequency	Record
<b>1</b>	<b>Materials for closing the gas fill holes</b>				
1.1	packaging and label	Visual	Purchase specification	Each batch: 1	
<b>2</b>	<b>Gas or gas mixture</b>				
2.1	packaging and label and date of expiration	Visual	Purchase specification	Each batch: 1	

## Production control for air filled organic sealed IGUs

Ref.	Material, inspection or test	Recommended method	Requirement	Recommended frequency	Record
1	<b>Cutting of glass (if relevant)</b>				
1.1	type of glass	Visual	Relevant specification	Continually	
1.2	cutting quality	Visual	Relevant specification	Continually	
1.3	dimensions	Measurement	Relevant specification	1 plate per shift and line	Yes
1.4	thickness	Visual	Relevant specification	Continually	
1.5	stripping of coating	Visual	Relevant specification	Continually	
2	<b>Washing efficiency</b>				
2.1	residue cutting oil	Visual	No visual contamination	Continually	
2.2	dry and clean glass surface	Visual	No visual contamination	Continually	
3	<b>Spacer bar</b>				
3.1	dimensions in relation to glass dimensions	Measurement	Product description	Per shift and width of spacer: 1 frame	Yes
3.2	desiccant filling	Measurement	Product description	Per shift and type: 1	Yes
3.3	contamination	Visual	Product description	Per shift and type: 1	
3.4	bending quality	Visual		Continually	
3.5	junction(s)	Visual	Product description	Continually	
3.6	Placing frame on glass	Visual		Continually	
3	<b>Organic spacer incorporation desiccant</b>				
3.1	continuity	Visual	Product description	Continually	
3.2	steadiness	Visual	Product description	Continually	
3.3	position relative to edge of glass	Visual	Product description	Continually	
3.4	contamination in the bonding area (if applicable)	Visual	Product description	Continually	
3.5	thread at junctions	Visual	Product description	Continually	
3.6	closing at final junction	Visual	Product description	Continually	
3.7	size control (if applicable)	Measurement	Product description	Per shift and per type: 1	Yes
3.8	weight of extruded spacer (if applicable)	Measurement	Product description	Per shift and per type: 1	Yes
3.9	desiccant activity: test method shall be in agreement with organic spacer material supplier,	EN 1279-6 annex K	Product description	Per shift : 1	Yes
3.10	extrusion temperature (if applicable)	Measurement	Product description	Per shift : 1	Yes
3.11	Adhesion to glass	Butterfly test: EN 1279-6 annex F.4	Product description	Per shift : 1	Yes
4	<b>Spacer tape</b>				
4.1	application	Visual	Product description	Continually	
5	<b>Desiccant (taken from a frame just before seal into a unit)</b>				
5.1	Activity: test method shall be in agreement with desiccant supplier, e.g. $\Delta T$ or drying (zeolit or silicagel)	See EN 1279-6 annex K	Initial H <sub>2</sub> O content $\leq 3\%$	Per shift: 1	Yes
6	<b>Inner seal (if relevant)</b>				
6.1	continuity	Visual	Product description	Continually	
6.2	thread at corners	Visual	Product description	Continually	
6.3	extruded behaviour	Visual	Product description	Continually	
6.4	contamination's in the bonding area	Visual	Product description	Continually	
6.5	amount of inner seal material per extruder head	Measurement	Product description	Each day	Yes
6	<b>Assembly aids</b>				
6.1	continuity	Visual		Continually	
6.2	application <b>at corners</b>	Visual		Continually	
6.3	dosage (if hot melt spacer adhesive)	Supplier's recommendation		Per shift: 1 time 2 samples	
6.4	contaminations in the bonding area	Visual		Continually	

**Production control for air filled organic sealed IGUs continued**

Ref.	Material, inspection or test	Recommended method	Requirement	Recommended frequency	Record
7	<b>Outer seal:</b>				
7.1	adhesion	EN 1279-6 annex F (if possible butterfly test)	EN 1279-6 clause F.3 or F.4.1 or F.4.2	Per day and at least per batch: 1	Yes
7.3	mixing ratio	Equipment- and sealant specification	Sealant specification	Quality manual	Yes
7.4	thoroughness of mixing	Mixing check (EN 1279-6 annex D)	No marbling	Per shift: 1	Yes
7.5	air inclusions (during thoroughness of mixing)		No air inclusions		
7.6	hardness	Hardness test (EN 1279-6 annex E)	Product description	Per shift: 2 samples	Yes
7.7	contamination	Visual	Purchase specification	Each drum	
7	<b>Hot melt outer seal</b>				
7.1	temperature at nozzle	Measurement		Beginning, middle and end of shift	
7.2	adhesion	Measurement: EN 1279 annex F	See EN 1279 clause F.4.1	Beginning, middle and end of shift	
7.3	air inclusions	Visual	No significant inclusions	Beginning, middle and end of shift	
7.4	contaminations	Visual	Purchase specification	Each batch: 1	
7.5	Air bubbles	Visual	Purchase specification	Each batch: 1	
7.6	Completion of junctions	Visual	Product description	continually	
7.7	Equalisation (parallelism of panes)	Visual	Product description	Per shift: 1 time 2 samples	

Note: Per shift means at least 1 per day and at most 3 per day

**Production control for gas filled organic sealed IGUs (additional to that for air filled IGUs)**

Ref.	Material, inspection or test	Recommended method	Requirement	Recommended frequency	Record
1	<b>Gas filling</b>				
1.1	type of gas or gas mixture when supplied as such and date of expiration	Visual	Product description	Per shift, per type and mixture: 1	Yes
1.2	operation of filling system	Machinery adjustment	Production manual	Per shift: 1	
1.3	setting of gas mixture: control of equipment parameters	Visual	Production manual	Per shift: 1 time	
				During gas concentration periodic test. EN 1279-6 annex B	Yes
1.4	Closing of gas fill hole (if applicable)	Measurement	Product description	continually	

### Product control for air filled organic sealed IGUs

Ref.	inspection or test	Recommended method	Requirement	Recommended frequency	Record
<b>1</b>	<b>Inner seal</b>				
1.1	dimensions	Measurement	Product description	Random sample plan	Yes
1.2	occurrences exceeding absolute limits	Visual	Product description	Random sample plan	Yes
<b>1</b>	<b>Organic spacer incorporating desiccant:</b>				
1.1	dimensions	Measurement	Product description	Random sample plan	Yes
1.2	occurrences exceeding absolute limits	Visual	Product description	Random sample plan	Yes
<b>2</b>	<b>Outer seal</b>				
2.1	dimensions	Measurement	Product description	Random sample plan	Yes
2.2	occurrences exceeding absolute limits	Visual	Product description	Random sample plan	Yes
<b>3</b>	<b>Glass components or type of used glass</b>	Visual	Label	Random sample plan	Yes
<b>4</b>	<b>Dimensions of units</b> (length and width)	Measurement	Relevant specification	Random sample plan	Yes
<b>5</b>	<b>Glass blemishes</b>	Visual	Internal quality standard	Random sample plan	Yes
<b>6</b>	<b>Storage</b>	Visual	Product description	Once per shift	
<b>7</b>	<b>Marking</b>	Visual	Product description	Random sample plan	Yes
<b>8</b>	<b>Flatness</b> (immediately after seal the unit)	Visual	No remarkable deviation	Random sample plan	Yes
<b>9</b>	<b>Fogging</b> (This test is relevant when no information exist on the volatile content of the relevant components)	EN 1279-6 annex C	No visible fogging	-One per year, or more if relevant -When relevant component change	Yes Yes

### Product control for gas filled IGUs (additional to that for air filled IGUs)

Ref.	Inspection or test	Recommended method	Requirement	Recommended frequency	Record
	May substitute the gas concentration periodic test (EN 1279-6 annex B) if the measurement accuracy is similar to the method used for the initial type testing accordance with prEN 1279-3.				
<b>1</b>	<b>Single gas concentration: <math>c_i</math></b>	Measurement	$c_i = c_{i,0}$ (+10% -5%) and maximal 10% of units sampled over five working days: $c_i = c_{i,0}$ (+20% -10%)	1 per 1000 units with a minimum of 3 units per day, or 1 unit per day when production is less than 100 units per day	Yes
	<b>Gas mixture total concentration: <math>c_t</math></b>		$C_t = (\sum c_{i,0})$ (+10% -5%) and maximal 10% of units sampled over five working days: $C_t = (\sum c_{i,0})$ (+20% -10%)		
<b>2</b>	<b>Concentration of each of the constituting gases in a mixture: <math>c_c</math></b>	Measurement	EN 1279-6 Clause B.4.1	Cf. EN 1279-6 clause B.2	Yes

**Random sample plan**

Samples for the inspection of the finished insulating glass units shall be selected according to the below random sample plan

<b>Batch size; units with identical system description and produced on the same production line</b>	<b>Sample size for product control</b>	<b>Max number of units falling outside the absolute limits of the System Description</b>
2 - 15	2	0
16 - 25	3	0
26 – 90	5	0
91 – 150	8	1
151 – 500	13	1
501 – 1200	20	2
1201 – 9999	32	3

The inspection of the finished insulating glass units shall comprise the parts of the insulating glass units which are described in the system description with absolute limits such as:

<b>Extract from the system description</b>	<b>Absolute limits</b>
Depth of outer seal perpendicular to the spacer	
Width of outer seal along the spacer	
Width of inner seal	
Width of organic spacer incorporating desiccant	
Width x length of single air pocket between inner and outer seal	
Total length of air pockets between inner and outer seal per unit	
Butyl into the unit	
Butyl interrupted, total mm/unit	
Dimension of units, deviations	
Stained profiles	
Edge chipping	
Glas blemishes	
Deviations from flatness	

If the inspection of a random sample of a lot or a day’s production reveals a higher number of units with occurrences exceeding the absolute limits of the system description than the max number of the above random sample plan, all units of the lot or day’s production shall be inspected. No unit which exceeds the absolute limits may be DS-marked unless it has been repaired and complies with the system description.

## Energy panes

If the manufacturer wishes to extend the DS-marking with a permanent marking concerning the thermal performance of energy-efficient insulating glass units (energy panes), the following requirements must be met additional to other requirements of this DS/SBC 1279

### Product description

For each type of energy panes, at least the following characteristics shall be presented

- U value: thermal transmittance
- $\lambda_k$  value: equivalent thermal conductivity of the sealed edge construction
- $L_t$  value: solar direct transmittance
- g value: total solar energy transmittance

The product description may be in the form of a document or in electronic form.

### Documentation

Documentation shall be present for all data concerning the thermal properties of the energy panes. The documentation may comprise thermal data from suppliers, test reports and possible calculation programmes

The documentation shall cover:

- the thermal transmittance U in the form of
  - calculation carried out in accordance with EN 673, or
  - measurements carried out in accordance with one of the methods in EN 674, EN 675 and prEN 1098 cf. current edition of DS 418
- the solar direct transmittance  $L_t$  and total solar energy transmittance g calculated in accordance with EN 410
- the equivalent thermal conductivity of the sealed edge construction.

As a basis for the above documentation data shall be available comprising as a minimum

- data for calculation in accordance with EN 673 and EN 410
- data for calculation in accordance with EN 410
- data for the thermal properties for the edge seal materials including dimensions of spacers and type and amount of desiccant(s)
- data for the gas filling including type of gas and gas concentration

The origin of the above data must be stated to make a validation of the data possible.

The Certification Committee shall approve the calculations as well as the documentation basis for both calculation and measuring.

### Calculation of energy class

The energy balance of a energy pane reflects the difference between the energy provided (g) and the energy lost through the energy pane (U).

The energy balance of the energy pane,  $E_{ref}$  is determined by the formula:

$$E_{ref} = 196.4 \times g - 90.36 \times U$$

Where

- g is the total solar energy transmittance value of the energy pane
- U is the centre U-value of the energy pane

### Energy panes with 2 layers:

All calculations are based on an energy pane construction consisting of 4 mm glass, 15 mm spacer and 4 mm glass.

### Energy panes with 3 layers:

Energy panes with 3 layers are classified in the same way as energy panes with 2 layers where the calculation basis is a 4–15–4–15–4-energy pane construction

### Special energy panes:

In cases where one or several energy panes are constructed as a laminated construction, classification is based on the actual glass thickness. The energy class shall be calculated on the basis of a 15 mm air gap and the actual glass thickness.

### Classification

Energy class A: Energy balance larger than 20,0 kWh/m<sup>2</sup>

Energy class B: Energy balance larger than 10,0 kWh/m<sup>2</sup> up to and including 20,0 kWh/m<sup>2</sup>

Energy class C: Energy balance larger than 0,0 kWh/m<sup>2</sup> up to and including 10,0 kWh/m<sup>2</sup>

Insulating glass units having a negative energy balance cannot be classified or marked.

### Marking


In addition to the marking of clause 5 an additional permanent marking on the spacer shall contain information about the Energy class of the energy pane:

Energy class A or Energy A

Energy class B or Energy B

Energy class C or Energy C

In the following order

000  EN 1279.5 year month: Energy A.

### Quality requirements, glass:

The quality of the glass must meet the requirements of EN 572 part 1 – 7: 2004, Glass in Building – basic soda lime silicate glass products. This requirement must be documented either by delivery notes or by a manufacturer declaration.

Coated glass must meet the requirements of EN 1096-1: 1998 and EN 1096-2: 2001, Coated Glass definitions and classification. This requirement must be documented by delivery notes or by a manufacturer declaration

### Tolerance requirements:

The finished insulating glass unit must as a minimum respect the below tolerances:

	Width- and height tolerance t [mm]		Total thickness tolerance s [mm]
	Measure ≤ 3000 mm	Measure > 3000 mm	
2-glass units	2 mm	3 mm	±1 mm
3-glass units	3 mm	4 mm	±1,5 mm

An insulating glass unit having the nominal width a and height b is within its tolerance area when the unit can be covered completely by a rectangle of (a+t) x (b+t) and the unit can cover a rectangle of (a-t) x (b-t) completely and the two rectangles have a common centre.

Along edges meant to support the unit after the installation the glass edges must be parallel. If the unit is positioned upright with such an edge on a plane surface both (or all three) glass edges must proceed within a distance of 0,5 mm from that surface.

If special support for installation of the unit is specified in an order, the glass edges must enable such special support.

The dimensioning of the glass shall be based on the SBI instruction 215: 2008 when taking possible special conditions of application into consideration. A table of glass thicknesses for typical applications will be prepared by DS-Certificering

Tables of possibilities to substitute materials and components, and of possible changes within components

Substitution for	Related to the fulfilment of the sealant	Validation method	Derived demands:
Outer sealant: All systems of IGU	- MVP index I - seal strength	Refer to table 1, or when test report(s) is (are) available for the same or (an)other system(s) where the substitute outer sealant is used, then:	
		EN 1279-4: - moisture vapour transmission - index strain curve	EN 1279-4: - moisture vapour transmission is similar to or less than that of initial sealant, - and stress/strain curve is similar to that of the initial outer sealant.
Outer sealant: For gas filled IGUs in addition to all systems of IGUs	- Gas leakage rate	Refer to table 2, or when test report(s) is (are) available for the same or (an)other system(s) where the substitute outer sealant is used, then:	
		EN 1279-4: gas permeability	EN 1279-4 Gas permeability is similar or less than with the original outer sealant.
Inner sealant: All systems of IGU	- MPV index I	refer to table1, or when test report(s) is (are) available for the same or (an)other system(s) where the substitute inner sealant is used, then:	
		EN 1279-4: - moisture vapour transmission	EN 1279-4: - moisture vapour transmission is similar to or less than that of the initial sealant.
Inner sealant: For gas filled IGUs in addition to all systems of IGU	- Gas leakage rate	refer to table 2, or when test report(s) is (are) available for the same or (an)other system(s) where the substitute inner sealant is used, then:	
		EN 1279-4: - Gas permeation	EN 1279-4 - gas permeation is similar to or less than that of initial inner sealant.
Corner or joint piece geometry: All systems of IGU	- MPV index I	table 1, or when test report(s) is (are) available for the same or (an)other system(s) where the substitute corner or joint piece is used, then:	
		System description: Compare the corner or joint geometry	System description: - permeation geometry is similar to or better than for the initial corner and joint
Corner or joint piece geometry: For gas filled IGUs in addition to all systems of IGU	-Gas leakage rate	Table 2, or where test report(s) are available for the types where replacement- corners or junctions are used, and:	
		System description: - Compare corner or joint geometry	Refer to system description: - permeation geometry is similar to or better than for the initial corner and joint
The corner or joint piece material: All systems of IGU	- Adherence of sealant	Table 1, or where test report(s) is (are) available for the same or (an)other system(s) where the substitute corner or joint piece is used, then:	
		Production control documentation: - adhesion strength	Production control documentation: - similar to previous test results
Spacer geometry: All systems of IGU	- MVP index I	Table 1, or when test report(s) is (are) available for the same or (an)other system(s) where the substitute spacer is used, then:	
		System description: - compare spacer geometry	Refer to system description - permeation geometry is similar to or better than for the initial spacer
Spacer Geometry: Gas filled IGUs In addition to all systems of IGU	Gas leakage rate	Table 2, or when test report(s) is (are) available for the same or (an)other system(s) where the substitute spacer is used, then:	
		System description: - compare spacer geometry	Refer to system description: - permeation geometry is similar to or better than for the initial space r

Substitution of	Related to the fulfilment of the sealant	Validation method	Derived demands:
Spacer material: (inorganic) All systems of IGUs	- adherence of sealant	Table 1, or when test report(s) is (are) available for the same or (an)other system(s) where the substitute spacer is used, then:	
		EN 1279-6, annex A, or production control documentation: - adhesion strength	Refer to EN 1279-6, annex A, or : production control documentation: -similar to initial test results
Gas filling holes closing method: For gas filled IGUs	- gas leakage rate	Table 2, or when test report(s) is (are) available for the same or (an)other system(s) where the substitute closing method is used, then:	
		No further validation necessary.	
Glas/Plastic composite sheet by glass sheet: All systems of IGU	- adherence to sealant	Table1, or when test report(s) is (are) available for the same or (an)other system(s) where the substitute glass sheet is used, then:	
		EN 1279-4: - stress/strain curve	EN 1279-4: - stress/strain curve is similar to that with the initial plastic pane
Glass sheet by glass/plastic composite: All systems of IGU	-MPV index I	Refer to table 1	
	- adherence to sealant		
And additionally to Gas filled IGUs	- gas leakage rate	Refer to table 2	
Type of desiccant: All systems of IGU	MVP index I	Table 1, or when test report(s) is (are) available for the same or (an)other system(s) where the substitute desiccant is used, then:	
		EN 1279-2: - determination of adsorption capacity Tc	EN 1279-2: - recalculated MVP index I complies with EN 1279-2:
Type of desiccant: For gas filled IGUs  In addition to All systems of IGU	Maintaining the quantity of gas in the cavity	Table 2, or when test report(s) is (are) available for the same or (an)other system(s) where the substitute type of desiccant is used, then:	
		EN 1279-6: - flatness of IGU after 2 weeks	Annex A of EN 1279-6: - flatness of IGU in factory production control
Mass of desiccant: All systems of IGU	MVP index I	EN 1279-2: - calculation of MVP index I	EN 1279-2: - recalculated MVP index I complies with EN 1279-2:
NOTE In the case of decreasing the amount of desiccant so that the recalculated I-value is between 0,10 and 0,20 (long term test), the periodic test on moisture vapour penetration in accordance with EN 1279-6 shall be performed and its requirement shall be respected.			

With all replacements a testing acc. to EN 1279-6 annex B, "short climate test", must be carried out.

- NOTE 1 When available test reports are used, the result(s) shall indicate conformance with the specified requirements.  
 NOTE 2 Tests can be carried out by different test laboratories.  
 NOTE 3 Similar considerations should be taken into account when substituting inserts.  
 NOTE 4 Following any substitutions; the fogging requirements in EN 1279-6 should be met.  
 NOTE 5 Due to lack of experience with spacer materials other than inorganic, substitution with such materials is not allowed.  
 NOTE 6 For the substitution of sealant, the conditions as described in EN 1279-4 shall be respected.