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**Prosojna profilirana polimerna plošča za enoslojno strešno kritino - 2. del:  
Posebne zahteve in preskusne metode za plošče iz poliestrske smole, ojačene s  
steklenimi vlakni (GRP)**

Light transmitting profiled plastic sheeting for single skin roofing - Part 2: Specific requirements and test methods for sheets of glass fibre reinforced polyester resin (GRP)

Lichtdurchlässige profilierte Platten aus Kunststoff für einschalige Dacheindeckungen - Teil 2: Besondere Anforderungen und Prüfverfahren für Platten aus glasfaserverstärktem Polyesterharz (GF-UP)

Plaques profilées éclairantes en matière plastique pour couverture en simple paroi - Partie 2: Exigences spécifiques et méthodes d'essai pour plaques en résine de polyester renforcée de fibres de verre (PRV)

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English version

Light transmitting profiled plastic sheeting for single skin roofing  
- Part 2: Specific requirements and test methods for sheets of  
glass fibre reinforced polyester resin (GRP)

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This European Standard was approved by CEN on 23 September 1998.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

**Contents**

Foreword .....	2	7 Determination of tensile properties . . .	5
1 Scope .....	2	8 Presence of protective coatings . . . . .	5
2 Normative references .....	2	9 Adhesion of surface coating .....	6
3 Materials .....	3	10 Classification of tests .....	6
4 Classification .....	3	11 Test methods .....	6
5 Visual characteristics .....	5	Annex A (normative): Glass fibre	
6 Barcol hardness .....	5	content by density of laminate .....	10

**Foreword**

This European Standard has been prepared by Technical Committee CEN/TC 128 "Roof covering products for discontinuous laying and products for wall cladding", the secretariat of which is held by IBN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 1999, and conflicting national standards shall be withdrawn at the latest by May 1999.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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**1 Scope**

SIST EN 1013-2:2000

1.1 This part of EN 1013 specifies requirements for materials and performance of light transmitting profiled sheets of glass fibre reinforced polyester resin (GRP) intended for single skin roofing applications. It has to be read in conjunction with the general requirements contained in EN 1013-1.

1.2 Requirements specified are relative to:

- Glass fibre content,
- Sheet thickness,
- Acceptable visual characteristics,
- Verification of polymerisation,
- Bonding of glass fibres and resins,
- Verification of the application and adhesion of surface coatings.

Test methods are indicated as appropriate.

**2 Normative references**

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendment to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.



EN 59 : 1977	Glass reinforced plastics - Measurement of hardness by means of a Barcol impressor
EN 60 : 1977	Glass reinforced plastics - Determination of loss of ignition
EN 62 : 1977	Glass reinforced plastics - Standard atmospheres for conditioning and testing
EN 63 : 1977	Glass reinforced plastics - Determination of flexural properties - Three point method
EN 1013-1 : 1997	Light transmitting profiled plastic sheeting for single skin roofing - Part 1: General requirements and test methods

### 3 Materials

**3.1** The sheet shall be composed of a thermo-setting polyester resin system reinforced with glass fibre.

**3.2** The system shall include curing agents, catalysts and light stabilizers.

NOTE : Additives such as fillers, fire retardant and colouring matter may be included.

**3.3** To retard surface erosion and exposure of glass fibres, surface protection on exposed weather surfaces is required.

The manufacturer shall state the method of protection used and the side which is protected.

NOTE: A surface gel coat will normally provide such protection. This consists of a polyester resin incorporating a high percentage of UV light stabilizers. The gel coat is applied to the sheet during manufacture to provide a durable resin-rich surface. When sheets are to be installed in zones where excessively harsh environmental conditions exist and a more durable surface protection may be needed, the use of a polyvinyl fluoride (PVF) surface film should be considered. Other forms of surface protection include adherable polyethylene terephthalate films.

### 4 Classification

#### 4.1 General

Sheets are graded into four categories. These grades are based on minimum thickness and minimum weight of glass fibre per square metre.

#### 4.2 Glass fibres

4.2.1 The minimum weight of glass fibres shall not be less than 25 % by weight of the sheet.

4.2.2 The weight of glass fibres shall be determined by the test method detailed in clause 11.1.

NOTE: When the density of the resin can be readily established, the "Glass content by laminate density" detailed in Annex A may be used as a quality control test.

4.2.3 The minimum weight of glass fibres per m<sup>2</sup> shall be based on the extended sheet area. The minimum weight for each category shall not be less than those values specified in Table 1.

Table 1 - Glass fibre content

Category	Minimum weight of glass fibres in g/m <sup>2</sup> based on extended area of sheet
1	270
2	350
3	450
4	580 <sup>1)</sup>

<sup>1)</sup> The minimum weight of glass fibres in Category 4 sheets shall be quoted by the manufacturer. It shall not be less than 580 g/m<sup>2</sup>.

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4.3 Sheet thickness

The individual and mean thickness of the sheet when measured in accordance with Clause 11.2 shall comply to the values given in Table 2.

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Table 2 - Sheet thickness

Dimensions in mm

Category	Mean Thickness	Thickness at any point
1	0,8 ± 0,09	0,8 ± 0,3
2	1,0 <sup>+0,14</sup> <sub>-0,1</sub>	1,0 ± 0,3
3	1,3 ± 0,14	1,3 ± 0,3
4	1,7 ± 0,25 <sup>1)</sup>	1,7 ± 0,4 <sup>1)</sup>

1) In the case of Category 4 sheets with a minimum glass fibre weight in excess of 580 g/m<sup>2</sup>, the nominal thickness shall be given by the manufacturer. The mean thickness shall not vary by more than 15 % of this stated value.

## 5 Visual characteristics

### 5.1 Surface faults

Visual or tactile examination shall not reveal the following faults:

- any hole, pin hole, dent or projection,
- any cracking or splitting,
- any defects such as resin ribs, glass folds, or glass knots, exceeding 5 mm in size.

### 5.2 Faults revealed by transparency

Examination by transparency to daylight shall not reveal the following fault:

- Any air bubbles greater than 1 mm diameter outside the zone of the overlap.

### 5.3 Local geometrical defects at edges

The edges of the sheet shall be straight and clean.

## 6 Barcol hardness

When the sheet is tested in accordance with Clause 11.3, the Barcol hardness shall not increase by more than 10 % of its initial value.

NOTE: This test is only to check the correct cure of the resin during production.

## 7 Determination of tensile property

When the sheet is tested in accordance with the test procedure given in EN 63, the breaking stress shall not be less than 150 N/mm<sup>2</sup>.

NOTE: The figure 150 N/mm<sup>2</sup> is not representative of the resistance of profiled sheets but only for the bonding between the resin and the glass fibres.

## 8 Presence of protective coatings

The presence of protective coatings shall be confirmed in accordance with the "Acid Immersion Test" described in Clause 11.4. The immersion times and descriptive effects of immersions are detailed in Table 3.

Table 3 - Surface coatings

Surface Coatings	Immersion time in min	Effect on immersed area
Polyvinyl fluoride films (PVF)	30	no effect
Gel coats	7,5	Slight matt finish, no exposed glass fibres
Polyethylene terephthalate films	1	White residue coating

These tests only confirm the presence of surface coatings. The durability of such coatings shall be established according to subclause 5.4 "Variation of yellowness index and light transmission after ageing procedure" of EN 1013-1.

## 9 Adhesion of surface coatings

The adhesion of surface coatings, determined in accordance with the "Adhesion peel test" detailed in Clause 11.5, shall be considered satisfactory when the film cannot be pried up or peeled more than 3 mm.

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## 10 Classification of tests

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Type tests are the following:

- Measurement of glass fibre contents by burning,
- Determination of tensile properties.

Routine tests are carried out to control the following:

- Glass fibre contents by laminate density,
- Thickness,
- Visual characteristics,
- Barcol hardness,
- Adhesion of surface coating,
- Acid immersion test.

## 11 Test methods

### 11.1 Determination of glass content by burning off resin

#### 11.1.1 General

The apparatus, conditioning of test samples and test procedures shall be in accordance with EN 60.



### 11.1.2 Test specimens

Test 4 specimens, each approximately 100 g, to be taken from across the full width of the sheet.

### 11.1.3 Method of measurement

The extended width of the specimen shall be measured by an inelastic adhesive tape applied over the corrugation or ribs over the full width of the specimen. Remove the tape to measure the extended width.

### 11.1.4 Procedure

- Note the extended width and length of each specimen,
- weigh each specimen,
- ash the specimen,
- ensure all carbon black residue is oxidized,
- wash the residue in water,
- filter through a sieve to retain only glass fibres,
- repeat washing procedure three times,
- drain off excess water and allow residue to dry for 2 h at  $(120 \pm 2)$  °C,
- re-weigh glass residue.

### 11.1.5 Expression of results [\(standards.iteh.ai\)](https://standards.iteh.ai/)

- Weight of glass fibre per m<sup>2</sup> of extended sheet area,
- percentage of glass fibre by weight of the original specimen.

NOTE: After measuring the size and weight of the specimens they may be cut into several pieces for testing. When ashing specimens toxic fumes may be evolved. Suitable safety precautions are to be taken.

## 11.2 Measurement of sheet thickness

### 11.2.1 Apparatus

The sheet thickness shall be determined at any point using a micrometer screw with hemispherical anvils of 5 mm in diameter and with an accuracy of 0,01 mm.

### 11.2.2 Method of measurement

Sheet thickness shall be checked by nine measurements taken at random in the crowns, valleys and flanks across the total sheet width at a distance of 20 mm from the one end. First and last measurements to be within 25 mm of the sheet edges.

### 11.2.3 Expression of results

Record the nine values and calculate the mean of the nine recorded values to the nearest 0,01 mm.