



**SLOVENSKI STANDARD**  
**oSIST prEN 13206:2024**  
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**Polimerni materiali - Prekrivne plastomerne folije za uporabo v kmetijstvu in vrtnarstvu**

Plastics - Thermoplastic covering films for use in agriculture and horticulture

Kunststoffe - Thermoplastische Abdeckfolien für den Einsatz in der Landwirtschaft und im Gartenbau

Plastiques - Films de couverture thermoplastiques pour utilisation en agriculture et horticulture

**Ta slovenski standard je istoveten z: prEN 13206**

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**ICS:**

65.040.30	Rastlinjaki in druge naprave	Greenhouses and other installations
83.140.10	Filmi in folije	Films and sheets

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## Plastics - Thermoplastic covering films for use in agriculture and horticulture

Plastiques - Films de couverture thermoplastiques  
pour utilisation en agriculture et horticulture

Kunststoffe - Thermoplastische Abdeckfolien für den  
Einsatz in der Landwirtschaft und im Gartenbau

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 249.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

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## Document Preview

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## prEN 13206:2024(E)

### European foreword

This document has been prepared by Technical Committee CEN/TC 249 “Plastics”, the secretariat of which is held by SIS.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 13206:2017+A1:2020.

prEN 13206:2024 includes the following significant technical changes with respect to EN 13206:2017+A1:2020:

- Clause 5 on materials has been added;
- Clauses 10, 11 and 12 on designation, marking and instructions for storage, installation and use of covering films, respectively, have been modified;
- Clause 13 on the design-for-recycling of end of life of covering films has been added;
- Clause 14 on removal and collection instructions of used silage stretch films has been modified, referring to prEN 18109<sup>1</sup> for additional information;
- the normative Annex G has been modified to outline basic guidance for installation, use and disposal of covering films.

This document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

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<sup>1</sup> Under preparation

## 1 Scope

This document specifies the requirements related to dimensional, mechanical, optical and thermal characteristics of thermoplastic films used for covering permanent or temporary greenhouses and walking tunnels and low tunnels used for forcing and semi-forcing vegetable, fruit and flower crops.

Lay-flat perforated cover films are also in the scope of this document.

This specifies a classification for the durability of covering films and the test methods referred to in this document.

This document specifies also test methods for the determination of the chlorine and sulfur contents of films subjected to use.

This document is applicable to thermoplastic covering films used in agriculture and horticulture in Europe, in the thickness range 20 µm up to more than 250 µm, based on polyethylene and/or ethylene copolymers materials, of the following types: non-thermal films, thermal clear films and thermal diffusing films.

This document also defines guidance for installation, use and disposal of covering films. It defines the conventional expected lifetime, as well as rules that allow evaluating the remaining use potential in the event of a failure before the normal end-of-use date.

**NOTE** These rules allow estimating the residual value of the films. These provisions only apply to the film itself and the damage it has undergone. Any other problem falls within the scope of professional practices and the general terms and conditions of sale.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 16472:2014, *Plastics — Method for artificial accelerated photoageing using medium pressure mercury vapour lamps*

prEN 18109:2024, *Plastics — Agricultural plastic products — Installation, use, removal, sorting, collection, preparation for recycling and design-for-recycling guidelines*

EN ISO 527-1, *Plastics — Determination of tensile properties — Part 1: General principles (ISO 527-1)*

EN ISO 527-3, *Plastics — Determination of tensile properties — Part 3: Test conditions for films and sheets (ISO 527-3)*

EN ISO 4892-1, *Plastics — Methods of exposure to laboratory light sources — Part 1: General guidance (ISO 4892-1)*

EN ISO 4892-2:2013, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps (ISO 4892-2:2013)*

EN ISO 4892-3:2016, *Plastics — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps (ISO 4892-3:2016)*

EN ISO 7765-1:2004, *Plastics film and sheeting — Determination of impact resistance by the free-falling dart method — Part 1: Staircase methods (ISO 7765-1:2004)*

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ISO 4591, *Plastics — Film and sheeting - Determination of average thickness of a sample, and average thickness and yield of a roll, by gravimetric techniques (gravimetric thickness)*

ISO 4592, *Plastics — Film and sheeting - Determination of length and width*

ISO 4593, *Plastics — Film and sheeting - Determination of thickness by mechanical scanning*

ISO 22095, *Chain of custody — General terminology and models*

ISO/TR 19032, *Plastics — Use of polyethylene reference specimens (PERS) for monitoring laboratory and outdoor weathering conditions*

ASTM D 1003-13, *Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics*

**3 Terms and definitions**

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp/>
- IEC Electropedia: available at <https://www.electropedia.org/>

**3.1 width**

overall width of a film when laid flat

Note 1 to entry: It is expressed in millimetres, *mm*.

**3.2 nominal width**

width of a film, as declared by the manufacturer/supplier

Note 1 to entry: It is expressed in millimetres, *mm*.

**3.3 nominal thickness**

thickness of a film, as declared by the manufacturer/supplier

Note 1 to entry: It is expressed in micrometres,  $\mu\text{m}$ .

**3.4 roll length**

largest dimension of the film corresponding to the length of the unwinded roll

Note 1 to entry: It is expressed in metres, *m*.

**3.5 nominal length**

length of a film roll or sheet, as declared by the manufacturer/supplier

Note 1 to entry: It is expressed in metres, *m*.



**3.6****nominal mass**

mass of a roll or sheet, as declared by the manufacturer/supplier

Note 1 to entry: It is expressed in kilograms, *kg*.

**3.7****longitudinal direction****MD**

direction parallel to the roll length, corresponding to the extrusion direction

**3.8****transverse direction****TD**

direction parallel to the width, at right angle to the length

**3.9****conventional expected lifetime**

expected lifetime defined by agreement between the manufacturer/supplier and the customer or, by default, the minimum use duration that the film needs to satisfy

Note 1 to entry: It is expressed in years, months or seasons.

**3.10****actual useful lifetime**

time interval defined as beginning from the installation date of a film until its removal or an earlier date in case of its failure

Note 1 to entry: It is expressed in months, years or seasons.

**3.11****use ratio**

ratio of the actual useful lifetime of a film to its conventional expected lifetime

Note 1 to entry: It is expressed as a dimensionless ratio or as a percentage, %.

**3.12****remaining use potential**

difference between the conventional expected lifetime of a film and its actual useful lifetime

Note 1 to entry: It is expressed in months.

**3.13****radiant exposure*****H***

time integral of irradiance, measured in joules per square metre,  $J/m^2$

[SOURCE: ISO 9370:2009, 3.27]

**3.14****design for recycling**

design of product, including the related accessories, in order to ensure its recyclability under the current practices of removal, sorting, collection and recycling systems

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Note 1 to entry: The purpose with the design for recycling criteria is to be able to use the recyclates back in the same product, independent of producer of material.

[SOURCE: prEN 18109]

**3.15****mechanical recycling**

processing of plastic waste into secondary raw materials or products without significantly changing the chemical structure of the material

Note 1 to entry: Plastics secondary raw material is a synonym of recyclate.

[SOURCE: EN ISO 472:2013, 2.1697, modified — Note 1 to entry changed; “plastics waste” changed to read “plastic waste”]

**3.16****post-consumer plastic**

plastic, generated by the end-users of products, that has fulfilled its intended purpose and can no longer be used for its intended purpose

Note 1 to entry: The term “post-use” is sometimes used synonymously.

Note 2 to entry: Often abbreviated as PCR.

[SOURCE: EN 17615:2022, 3.192, *modified*]

**3.17****pre-consumer plastic**

material diverted from the waste stream during a manufacturing process

Note 1 to entry: Excluded is reutilization of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it. [024](https://standards.iteh.ai/catalog/standards/sist/48a6254e-3948-4a14-8927-2d9ef6c4ac59/osist-pren-13206-2024)

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**3.18****recycled content**

proportion, by mass, of recycled plastic in a product or packaging

Note 1 to entry: Only pre-consumer and post-consumer materials shall be considered as recycled content, consistent with the following usage of terms.

**3.19****controlled blending model**

chain of custody model in which materials or products with a set of specified characteristics are mixed according to certain criteria with materials or products without that set of characteristics resulting in a known proportion of the specified characteristics in the final output

Note 1 to entry: The adhered claim may refer to a certain percentage, at batch-level and /or site-level.

[SOURCE: ISO 22095:2020, 3.3.3]

**3.20****national collection scheme****NCS**

voluntary or mandatory national collection system of defined plastic fractions used in agriculture or horticulture applications

## 4 Types and use

The different types of covering films, their optical and thermal characteristics and use are given in Table 1.

**Table 1 — Characteristics and use of covering films**

Type	Optical and thermal characteristics	Use
Non-thermal (NTh)	Low IR effectiveness	Forcing and semi forcing crops
Thermal clear (ThC)	High transparency High IR effectiveness	Same use as normal film, when higher IR effectiveness is requested
Thermal diffusing (ThD)	Diffusing light High IR effectiveness	Same use as normal film, when higher IR effectiveness and diffusing light effect are requested

## 5 Materials

Covering films according to this document are usually manufactured from:

- low density polyethylene (PE-LD), linear low-density polyethylene (PE-LLD) and their blends;
- ethylene vinyl acetate copolymers (EVAC) and their blends with PE-LD or PE-LLD;
- ethylene butyl acrylate copolymers (EBA) and their blends with PE-LD or PE-LLD.

These materials can derive from virgin or recycling sources. The supplier, on request by purchaser, should provide basic information about the history of material.

The product shall be suitable for mechanical recycling as a PE fraction, according to the design for recycling defined in Clause 12.

Recycled content in the film shall be verified with ratio of post-consumer plastic recyclates and/or pre-consumer plastic recyclates following a controlled blending model according to ISO 22095.

The core, which is a part of the covering film product, enables unrolling of covering film. The core shall be recyclable and clearly marked for which material fraction to be sorted.

## 6 Durability

The durability of covering films is characterized by the class N, A, B, C, D, E or F. This classification, given in Table 2, is depending on the duration of exposure of the film to an artificial weathering using xenon-arc lamps according to 8.9, which induces a decrease of the value of tensile strain at break equal or less than 50 % of the initial value.

The class of durability shall be declared by the manufacturer.

**Table 2 — Resistance to weathering classification**

Class	Minimum duration of exposure h	
	At irradiance (narrowband – 340 nm) 0,35 W/(m <sup>2</sup> ·nm)	At irradiance (narrowband – 340 nm) 0,51 W/(m <sup>2</sup> ·nm)
N	400	280
A	2 000	1 400
B	3 500	2 450
C	5 400	4 070
D	6 800	4 670
E	8 500	5 830
F	10 700	7 350
G	To be defined	To be defined

For films intended to be used outside of Europe, longer durations of exposures than this for Class F can be required. In this case, the minimum duration of exposure shall be defined by agreement between the manufacturer/supplier and the customer.

Other light sources may be used provided that a correlation between the test results obtained with these light sources and these obtained after a natural exposure can be demonstrated. This may be useful when the durations of the exposure to xenon-arc lamps as defined in Table 2 are too long. Details of these methods are given in Annex A.

In case of dispute the choice of exposure equipment will be decided by the parties. If no agreement can be found the exposure to xenon-arc lamps with 0,35W/(m<sup>2</sup>·nm) at 340nm according to 8.9 and the classification according to Table 2 shall be used.

NOTE An empirical correlation between durability of covering films for greenhouses exposed to artificial weathering and natural exposure is given in Annex B. The correlation study has been performed with an irradiance of 0,35 W/(m<sup>2</sup>·nm) in narrow band (340 nm).

## 7 Requirements

### 7.1 General requirements

Non-thermal films, thermal clear films and thermal diffusing films shall fulfil the requirements of Tables 3 to 5, respectively.

Table 3 — Requirements for non-thermal films

Characteristics	Unit $\mu\text{m}$	Nominal thickness					Test method Subclause
		$\geq 20^a$	$\geq 60^b$	$\geq 100^c$	$\geq 150^d$	$\geq 200$	
<b>Appearance</b>	-	Shall conform to 7.2					7.2
<b>Dimensional characteristics</b>							
Tolerance of average thickness/nominal thickness	%	$\pm 5$					8.1
Tolerance of single point thickness/nominal thickness	%	— 15 +25 <sup>e</sup>					8.1
Max. Tolerance of single point thickness/nominal thickness at gel	%	+100					8.1
Width tolerance/nominal width	%	0, +4					8.2
Flat film	%	0, +2,4					
Tubular film	%	0, +4					8.12
<b>Mechanical characteristics on unexposed film</b>							
Tensile stress at break (MD, TD)	MPa	$\geq 19$					8.3
Tensile strain at break (MD, TD)	%	$\geq 250$	$\geq 300$	$\geq 350$	$\geq 400$	$\geq 450$	8.3
<b>Impact resistance</b>							
Flat area	g	$\geq 100$	$\geq 150$	$\geq 300$	$\geq 350$	$\geq 450$	8.4.2
Fold area	g	$\geq 75$	$\geq 100$	$\geq 150$	$\geq 200$	$\geq 250$	8.4.3
<b>Optical characteristic on unexposed film</b>							
Visible light transmission	%	$\geq 90$	$\geq 88$	$\geq 88$	$\geq 85$	$\geq 85$	8.6
<p><sup>a</sup> <math>20 \mu\text{m} \leq \text{nominal thickness} &lt; 60 \mu\text{m}</math>.</p> <p><sup>b</sup> <math>60 \mu\text{m} \leq \text{nominal thickness} &lt; 100 \mu\text{m}</math>.</p> <p><sup>c</sup> <math>100 \mu\text{m} \leq \text{nominal thickness} &lt; 150 \mu\text{m}</math>.</p> <p><sup>d</sup> <math>150 \mu\text{m} \leq \text{nominal thickness} &lt; 200 \mu\text{m}</math>.</p> <p><sup>e</sup> Measurement shall be performed outside of any defects, e.g. gel from recycling material.</p>							

Table 4 — Requirements for thermal clear films

Characteristics	Unit	Nominal thickness					Test method Subclause
		≥ 25 <sup>a</sup>	≥ 60 <sup>b</sup>	≥ 100 <sup>c</sup>	≥ 150 <sup>d</sup>	≥ 200	
<b>Appearance</b>	-	Shall conform to 7.2					7.2
<b>Dimensional characteristics</b>							
Tolerance of average thickness/nominal thickness	%	±5					8.1
Tolerance of single point thickness/nominal thickness	%	— 15, +25 <sup>e</sup>					8.1
Max. Tolerance of single point thickness/nominal thickness at gel	%	+100					8.1
Width tolerance/nominal width	%	0, +4					8.2
Flat film	%	0, +2,4					
Tubular film	%	0, +2,4					
Tolerance roll length/nominal length	%	0, +4					8.12
<b>Mechanical characteristics on unexposed film</b>							
Tensile stress at break (MD, TD)	MPa	≥ 20					8.3
Tensile strain at break (MD, TD)	%	≥ 300	≥ 350	≥ 400	≥ 450	≥ 550	8.3
<b>Impact resistance</b>							
Flat area	g	≥ 150	≥ 250	≥ 350	≥ 500	≥ 650	8.4.2
Fold area	g	≥ 75	≥ 100	≥ 200	≥ 350	≥ 400	8.4.3
Elongation under a steady load (MD)	%	≤ 30	≤ 30	≤ 30	≤ 30	≤ 30	8.5
<b>Optical characteristic on unexposed film</b>							
Visible light transmission	%	≥ 92	≥ 90	≥ 90	≥ 88	≥ 88	8.6
Haze	%	≤ 20	≤ 25	≤ 25	≤ 30	≤ 30	8.7
IR effectiveness	%	≥ 40	≥ 50	≥ 55	≥ 65	≥ 75	8.8
<sup>a</sup> 25 µm ≤ nominal thickness < 60 µm. <sup>b</sup> 60 µm ≤ nominal thickness < 100 µm. <sup>c</sup> 100 µm ≤ nominal thickness < 150 µm. <sup>d</sup> 150 µm ≤ nominal thickness < 200 µm. <sup>e</sup> Measurement shall be performed outside of any defects, e.g. gel from recycling material.							