



SLOVENSKI STANDARD
oSIST prEN 13655:2024
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Polimerni materiali - Termoplastične folije za mulčenje, primerne za nadaljnjo predelavo, za uporabo v kmetijstvu in vrtnarstvu

Plastics - Thermoplastic mulch films recoverable after use, for use in agriculture and horticulture

Kunststoffe - Nach Gebrauch rückbaubare thermoplastische Mulchfolien für den Einsatz in Landwirtschaft und im Gartenbau

Plastiques - Films de paillage thermoplastiques récupérables après usage, pour utilisation en agriculture et horticulture

Ta slovenski standard je istoveten z: prEN 13655

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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 mulch films recoverable after use, for use in agriculture and horticulture

Plastiques - Films de paillage thermoplastiques
récupérables après usage, pour utilisation en
agriculture et horticulture

Kunststoffe - Thermoplastische Mulchfolien,
abnehmbar nach dem Einsatz, für die Landwirtschaft
und den Gartenbau

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

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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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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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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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 13655:2018.

prEN 13655:2024 includes the following significant technical changes with respect to EN 13655:2018:

- Clause 5 on materials has been added;
- Clauses 10, 11 and 12 on designation, marking and instructions for storage, installation and use of mulch films, respectively, have been modified;
- Clause 13 on the design-for-recycling of end of life of mulch films has been added;
- Clause 14 on removal and collection instructions of used mulch films has been modified, referring to prEN 18109¹ for additional information;
- the informative Annex E has been modified, and previous Clauses E.3 and E.4 have been transferred to prEN 18109;
- Details on functions and factors of degradability of mulch films have been transferred to Clause 15 in this document;
- the previous Annex F on the guidance for conditions for installation, use and removal of mulch films has been transferred to prEN 18109.

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.

¹ Under preparation

1 Scope

This document specifies the requirements related to dimensional, mechanical, optical and thermal characteristics of thermoplastic films for mulching applications in agriculture and horticulture.

These mulch films are intended to be removed after use and not incorporated in the soil.

These mulch films are not intended to be used for soil disinfection by fumigation. Films for soil disinfection are in the scope of EN 17098-1 and EN 17098-2.

The biodegradable mulch films intended to be incorporated in the soil after used are also not in the scope of this document. They are in the scope of EN 17033.

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

This document is applicable to thermoplastic mulch films, used for agriculture and horticulture in Europe, based on polyethylene and/or ethylene copolymers, of the following types:

- transparent films;
- black films;
- reflective films (e.g. white films, black/white films and black/silver films);
- films of other colour(s) for weed control (e.g. green, brown).

This document defines the criteria for design for recycling of mulch films and refer to prEN 18109 for the product lifecycle, including installation, use, removal and collection for end of life for management of the product after its usage.

NOTE Mulch films can be highly soiled by organic and mineral residues at the end of their use life: the observed rates (or levels) of soilage of mulch films can vary from 70 % to 90 %, therefore the film thickness is a key factor on the rate of soilage, the thinnest films will be the mostly soiled, difficult, expensive to remove, recover and recycle.

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, *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)*

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*

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

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)*

ISO 9845-1, *Solar energy - Reference solar spectral irradiance at the ground at different receiving conditions - Part 1: Direct normal and hemispherical solar irradiance for air mass 1,5*

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**

total 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, μm .

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

longitudinal direction of the film

MD

direction parallel to the roll length corresponding to the extrusion direction

3.6

transverse direction of the film

TD

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

3.7

radiant exposure

H

time integral of irradiance

Note 1 to entry: It is measured in joules per square metre ($J \cdot m^{-2}$).

[SOURCE: ISO 9370:2017, definition 3.27]

3.8

mantle film

net replacement film

film which is by materials and process similar to the stretch film for wrapping bales but has the purpose to hold together the bale instead of a conventional net wrap

3.9

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

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]

3.10

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 recycle.

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

3.11

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.

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

3.12**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.

3.13**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.

3.14**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]

3.15**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 mulch films, their optical characteristics and use are given in Table 1.

Table 1 — Types and use of mulching films

Type	Optical characteristic	Use
Transparent film	Transparent to sunlight radiation	To warm up the soil Not used for weed growth control
Black film	Very low sunlight transmission	When prevention of weeds growth is requested in with a warming effect of the soil
Reflective film ^a	Very low sunlight transmission	When prevention of weeds growth is requested and sunlight reflection prevent young leaves burning and improves photosynthesis by light reflection
Film of other colour(s) for weed control ^b	Selective sunlight transmission in PAR (photosynthesis active radiation) and in near IR	When prevention of weeds growth and warming up of soil are needed

- | | |
|---|---|
| a | E.g. white, black/white and black/silver. |
| b | E.g. green, brown, etc. |

5 Materials

Mulch films according to this document are usually manufactured from polyethylene and polyethylene copolymers and additives in accordance with requirement in Clause 14. If requested, the density shall be declared by the film manufacturer in order to calculate the nominal thickness value.

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 mulch film product, enables unrolling film on field. The core shall be recyclable and clearly marked for which material fraction to be sorted.

6 Durability

The durability of mulch films is characterized by the class N, A, B, C and D. 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 8.10, 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/supplier.

Table 2 — Classification according to artificial weathering

Class	Minimum duration of exposure H	
	At irradiance (narrowband – 340 nm) 0,35 W/(m ² ·nm)	At irradiance (narrowband – 340 nm) 0,51 W/(m ² ·nm)
N	400	280
A	2 000	1 400
B	3 500	2 450
C	5 900	4 070
D	8 160	5 600

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 can 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 0,35 W/(m²·nm) at 340nm according to 8.10 and the classification according to Table 2 shall be used.

NOTE A numerical correlation between durability of mulch films exposed to artificial weathering and natural exposure is given in Annex B.