SLOVENSKI STANDARD
SIST EN 13655:2018

01-maj-2018

Nadomešča:
SIST EN 13655:2003

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

Kunstoffe - Nach Gebrauch abnehmbare 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: **EN 13655:2018**

ICS:

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

SIST EN 13655:2018 **en,fr,de**

EUROPEAN STANDARD

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Supersedes EN 13655:2002

English Version

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

Kunstoffe - Nach Gebrauch abnehmbare thermoplastische Mulchfolien für den Einsatz in Landwirtschaft und im Gartenbau

This European Standard was approved by CEN on 10 December 2017.

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

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European foreword

This document (EN 13655:2018) has been prepared by Technical Committee CEN/TC 249 “Plastics”, the secretariat of which is held by NBN.

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of an identical text or by endorsement, at the latest by August 2018 and conflicting national standards shall be withdrawn at the latest by August 2018.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 13655:2002.

The following technical changes have been made in comparison to EN 13655:2002:

— the Scope has been extensively specified and enlarged to installation, use and removal conditions of mulch films;

— the standard is only applicable to thermoplastic mulch films recoverable after use;

— modification of the minimum nominal thickness of the mulch films which conform to this standard, 20 µm instead of 10 µm;

— the types of mulch films have been redefined;

— the Table 2-Classification according to artificial weathering, has been modified;

— the paragraphs for requirements, test methods, acceptance, storage and handling have been drafted in a new frame;

— the paragraphs on functions and factors of degradability, instructions disposal of mulch films and end-of-life, have been added.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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 this application are in the scope of EN 17098-1[1].

It 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 also defines installation, use and removal conditions of mulch films.

NOTE Mulch films are considered as highly contaminated by soil and vegetal residues: the observed rates (or levels) of contamination of mulch films can vary from 70 % to 90 %. Therefore the film thickness is a key factor on the rate of contamination, the thinnest films (e.g. less than 25 µm) will be the mostly contaminated, 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 ISO 527-1, *Plastics - Determination of tensile properties - Part 1: General principles (ISO 527-1)*

EN ISO 527-3:1995, *Plastics - Determination of tensile properties - Part 3: Test conditions for films and sheets (ISO 527-3:1995)*

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

EN ISO 7765-1:2004, *Plastics film and sheeting - Determination of impact resistance by the free-falling dart method - Part 1: Staircase methods (ISO 7765-1:1988)*

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 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*

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 terminological databases for use in standardization at the following addresses:

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

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[2]]

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 order to limit 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 standard are usually manufactured from polyolefins.

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) 0,51 W/(m²·nm)
N	280
A	1 400
B	2 450
C	4 070
D	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 (informative).

In case of dispute, the exposure to xenon-arc lamps 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 (informative).

7 Requirements

7.1 General requirements

Transparent films, black films, reflective films and films of other colour(s) for weed control shall fulfil the requirements of Tables 3, 4, 5 and 6, respectively.

Table 3 — Requirements for transparent films

Characteristics	Unit	Nominal thickness		Test method Subclause
	µm	≥ 20[a]	≥ 35	
Appearance	-	Shall conform to 7.2		7.2
Dimensional characteristics				
Tolerance of average thickness/nominal thickness	%	±5		8.1
Tolerance of single point thickness/nominal thickness	%	from - 20 to 25	from –15 to 25	8.1
Width tolerance/ nominal width	%	±2		8.2
Tolerances of the roll length/nominal length	%	−1		8.3
Mechanical characteristics of unexposed film				
Tensile stress at yield (MD, TD)	MPa	≥ 9		8.4
Tensile stress at break (MD, TD)	MPa	≥ 20		
Tensile strain at break MD TD	% %	≥ 250 ≥ 350		
Impact resistance Flat area Fold area	g g	≥ 75 ≥ 50	≥ 80 ≥ 60	8.5
Optical characteristic of unexposed film				
Total luminous transmittance	%	≥ 90		8.6
[a] 20 µm ≤ nominal thickness < 35 µm.				

Table 4 — Requirements for black films

Characteristics	Unit	Nominal thickness			Test method Subclause
	µm	≥ 20[a]	≥ 50[b]	≥ 100	
Appearance	-	Shall conform to 7.2			7.2
Dimensional characteristics					
Tolerance of average thickness/nominal thickness	%	±5			8.1
Tolerance of single point thickness/nominal thickness	%	from - 20 to 25	±15	±15	8.1
Width tolerance/ nominal width	%	±2			8.2
Tolerances of the roll length/nominal length	%	−1			8.3
Mechanical characteristics of unexposed film					
Tensile stress at yield (MD, TD)	MPa	≥ 9			8.4
Tensile stress at break (MD, TD)	MPa	≥ 20			
Tensile strain at break					
MD	%	≥ 250			
TD	%	≥ 350			
Impact resistance					8.5
flat area	g	≥ 75	≥ 120	≥ 250	
fold area	g	≥ 50	≥ 60	≥ 120	
Optical characteristic of unexposed film					
Relative light transmission	%	≤ 10^{-2}	≤ 10^{-2}	≤ 10^{-3}	8.9

[a] 20 µm ≤ nominal thickness < 50 µm.

[b] 50 µm ≤ nominal thickness < 100 µm.

Table 5 — Requirements for reflective films (white, black/white, black/silver)

Characteristics	Unit	Nominal thickness		Test method
	µm	≥ 25[a]	≥ 60	Subclause
Appearance	-	Shall conform to 7.2		7.2
Dimensional characteristics				
Tolerance of average thickness/nominal thickness	%	±5		8.1
Tolerance of single point thickness/nominal thickness	%	from - 20 to 25	±15	8.1
Width tolerance/ nominal width	%	±2		8.2
Tolerances of the roll length/nominal length	%	−1		8.3
Mechanical characteristics on unexposed film				
Tensile stress at yield (MD, TD)	MPa	≥ 9		8.4
Tensile stress at break (MD, TD)	MPa	≥ 20		
Tensile strain at break				
MD	%	≥ 250		
TD	%	≥ 350		
Impact resistance				8.5
Flat area	g	≥ 80	≥ 150	
fold area	g	≥ 40	≥ 80	
Optical characteristic of unexposed film				
Relative light transmission (for film with at least one black layer)	%	≤ 1	≤ 0,1	8.9
Relative light transmission (for film without black layers)	%	≥ 60	≥ 50	8.9
Solar reflectance (for film with at least one white layer)	%	≥ 55	≥ 60	8.8
Solar reflectance (for film without white layers)	%	To be declared by the manufacturer	To be declared by the manufacturer	8.8

[a] 25 µm ≤ nominal thickness < 60 µm.