Test program for stretch films made of linear polyethylene of low density (PE-LLD)

(Status 11-2017)

Application area:

Mechanical wrapping of bales manufactured using square and round balers forsilage preparation.

The number of layers should be so large that a low gas exchange (anaerobic conditions in the bale) and mechanical strength are implemented. Depending on the ensiled material (stem-like material, very high DM content, long storage time) and the film material mused (19 to 35 µm), there are possibly different numbers of layers (4 to 12) necessary.

During initial testing, all properties are examined; during the annual monitoring tests, point 3.5 as well as point 4 can be dropped.

Properties	Requirements	Testing method
1. Material characteristics	Even colouring, free of streaks and pores; smooth web, in un-stretched and stretched condition Evaluation of the supplied roll for even winding (uniform core protrusion, >example photo) Evaluation of the film during wrapping and on the finished bale (cut-off film loose or fixed)	Optical
2. Dimensions		
2.1 **Film thickness**	Minimum nominal thickness manufacturer specification; mean value ≧ Nominal thickness; permissible distribution of the individual values around the mean value ± 15 % (rounded up to the nearest whole µm value)	DIN 53370 : 2006-11, method P,at 23° C (take over EN Standard 14932)
2.2 **Film width**	Minimum nominal width Manufacturer specification 250 to 750 mm; width ≥ nominal width	
2.3 **Film length**	≥ Nominal length at 5 % pretension	Roller test bench without additional pretension (take over EN standard 14932)
2.4 **Roll weight**	Data: gross weight (kg) (weight with core)	Gravimetric
3. Mechanical properties		
3.1 **Tension**	>10,0 N/mm² (longitudinally)	

at 65 % elongation square bales, 70% elongation round bales	(take over EN standard 14932)	DIN EN ISO 527-3 : 2003-07 for +23 °C; test speed 500 mm/min; test specimen type 2; Deformation measurement between measure marks (take over EN standard 14932)
3.2 **Elongation at break**	≥400 % (longitudinal and across) (take over EN standard 14932)	
3.3 **Tensile strength**	≥10,0 N/mm² (longitudinal and across) (take over EN Standard 14932)	
3.4 **Push-through force** at 80% tension	≥ 10.0 N (from inside and outside)	according to DIN EN ISO 12236 : 2006-11; mandreldiameter 12.5 mm, with the tip chamfered to 60 ° (take over EN standard 14932)
3.5 **Continuing tearing strength**	≥ 1.8 N (longitudinal)	DIN ISO 34-1 : 2004-07 Method B, procedure (b) (take over EN standard 14932)
3.6 **Relaxation behaviour** Drop in force after 6 min at 80% elongation	≤ 40%	according to DIN EN ISO 527-3: 2003-07 following point 3.1 (take over EN standard 14932)
3.7 Adhesion force - for films with adhesive coating - for films with integrated for films with adhesive proportions, e.g. polyisobutylene (PIB)	≥ 0,10 N ≥ 0,05 N	Peel test; film inner side on film external side; unstretched at +23 °C; test specimen width 50 mm; test speed 50 mm/min (or take over EN standard 14932)
4. Physical properties		
Oxygen permeability	≤ 1.800 cm³/m² in 24 h	DIN 53380-3 : 1998-07 with oxygen at +23 °C and 0.2 bar; single layer, unstretched (or take over EN Standard 14932, 1,400 cm³/m² with 6 layers)
5. Ageing behaviour		
Weather resistance Elongation at break	≥ 350 % and also ≤ 30 % decrease with regard to new state according to 3.2 (longitudinal)	DIN EN ISO 4892-2, Process A, synchronous operation with irrigation 102/18 up to 2,000 MJ/m², black standard-Temperature 60±3 °C, relative air humidity 65±3%, EUV = 60 W/m2 Tensile test according to point 3.2 and 3.3

6. Practical usage

With initial tests, the stretch films are used in practice under the following conditions: (Square bale wrappers 70x120, e.g. Mc Hale 998, Kuhn 4004, Göweil, round bale wrapper several processes: Combined device, wrapper; settings on the wrapper 70% prestretching, 65% with square bales; Ensiled material: 1 growth at least 40%-50% TM; one set of film is used / tested during the test.
The constriction characteristics are measured on the wrapped bale (5 bales)(measuring point see standard 14932).

Requirements according to 14932 (if necessary, reduction to 20%). On a log sheet, the environmental conditions (e.g. temp.) are recorded.

Test completion
When all conditions are fulfilled during the test, the board of examiners can award the “DLG quality seal “continuously checked” if the manufacturer carries out the following, on-going tests:

- Film thickness (every hour)
- Elongation at break (per shift, one check in longitudinal direction with check of thickness over the entire film width)
- Adhesive properties (prior to delivery of a product batch)

A stretch film which does not fulfill the DLG requirements during these checks must not be placedon the market with the DLG quality seal.

All test reports must be kept and held accessible for a period of 5 years.

Following initial testing, the stretch films have to be subjected to a yearly, chargeable monitoring testby the DLG.

The DLG test mark “DLG quality seal “continuously checked” can be transferred to identical products. Special regulations apply for this.

Marking on packaging

Test mark
furthermore, the following information by the manufacturer:

- Manufacturer or distributing company
- Designation of the film
- Type of plastic used
- Nominal dimensions of the film (thickness, width, length)
- Colour
- Minimum net weight per coil
- Year and month or calendar week of manufacture (open or encrypted)

With black coloured films, the following text on packaging or information sheet:
Under direct, intense sunlight it has to be reckoned with an increased heating of the outer layer of liningbelow the bale surface exposed to the sunlight.

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Annex

Determination of the adhesion force of stretch films

Test specimen:	stripe-shaped test specimen (length approx. 200 mm, width 50 mm)
Removal direction:	longitudinal
Test:	in a 180° peel test in a universal test machine of accuracy class 1 according to DIN EN ISO 7500-1: 1999-11
Test speed:	50 mm/min
Clamping length:	40 mm
Peeling path:	approx. 150 mm
Clamping jaws:	mechanical fixing beam-shaped jaws with plastic coating
Load cell:	10 N
Test climate:	23/50-2 according to DIN 50014
Evaluation:	Capture of length changes over crosshead travel, Recording of the force over crosshead travel, Determination of the mean adhesion force according to DIN EN 28510-2: 1993-05