

# DLG Test Report 7105

BÖCK Silosysteme GmbH

## Silofolie BLUE 9

light blue/black, oxygen barrier,  
UV-stabilized, 80 microns



**CONTINUOUS  
MONITORING**

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## Overview

The DLG QUALITY SEAL for operating equipment and consumables encompasses products, which are subjected to extensive testing of their value-determining and advertised characteristics. The tested criteria and the requirements to be fulfilled are specified by independent commissions and are designed – over and above legal requirements – to prove the product's fitness for purpose, its advertised characteristics and practical requirements. Testing contents and requirements are developed further by the responsible specialist departments of the DLG e.V. in line with the applicable legislation, as well as with technical and scientific progress. Successful testing is concluded with the assignment of the DLG QUALITY SEAL. The approved products are then published.



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The DLG quality seal test included technical measurements in the laboratory. The test basis was the DLG test frame for reernate-free and reernate-containing silo films made of low-density polyethylene (PE-LD) with and without barrier shifts, as of November 2016.

No other criteria were examined.

## Assessment in brief

The silo film Blue 9, light blue/black, UV-stabilized, 80 microns tested here, was tested in the DLG quality seal test in the laboratory on mechanical, physical, chemical and aging properties.

Table 1:

Assessment in brief

DLG QUALITY PROFILE	Requirement	Evaluation*
Film dimensions	$\geq$ nominal length, $\geq$ 98 % nominal width	✓
Film thickness	$0,076 \leq d \leq 0,084$ mm	✓
Material condition	evenly coloured, free of streaks and pores	✓
Tearing force in new condition	longitudinally, transversely, over folds: $\geq$ 25 N/cm	✓
Elongation of tears in new condition	longitudinally, transversely, over folds: $\geq$ 400 %	✓
Tear resistance in new state	longitudinally, transversely, over folds: $\geq$ 17 MPa	✓
Dart drop resistance in new condition	compliance with the manufacturer's declaration	✓
Elongation of tear transversely after acid storage	reduction: $\leq$ 15 %	✓
Tear resistance transverse after acid storage	reduction: $<$ 10 %	✓
Elongation of tears transversely after aging (weathering)	$>$ 350 %; reduction in new condition: $<$ 30 %	✓
Change in size after warm storage after aging	longitudinal: $\leq$ 2 % / transverse: $<$ 2 %	✓
Oxygen permeability in 0,2 bar	$<$ 250 cm <sup>3</sup> /(m <sup>2</sup> · d)	✓

\* Evaluation range: requirements fulfilled (✓) / requirements not fulfilled (✗)

## The Product

### Applicant

BÖCK Silosysteme GmbH, Stefan-Flötzl-Straße 24, D-83342 Tacherting

Produkt:

Silofolie BLUE 9, light blue/black, oxygen barrier, UV-stabilized, 80 microns

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### Description and Technical Data

Light blue/black oxygen barrier silo foil polyethylene (PE) and ethylene vinyl alcohol copolymer (EVOH), UV-stabilized, nominal thickness 80 microns.

The silo foil Blue 9 is produced in meters of webs up to 4 meters wide and produced with high-frequency welding technology to the desired width. The rollers are fitted with a protective case combination wrapped in foil with welded fleece. This is to avoid transport damage.

Table 1:

Technical data (company information)

Main dimensions	
Nominal thickness	80 µm
Length	35, 50, 150, 200 m
Width	bis 64 m

Individual widths and sizes available on request.



## The Method

### Suitability

The suitability of the silo film was determined on the basis of the laboratory results judged.

### Film dimensions

The length and width of the silo foil are calibrated band measurement.

### Film thickness

The film thickness is calculated in accordance with DIN 53370:2006-11, method P at +23 °C (stay with regenerate film the stalks are not taken into account).

### Material quality

It is visually checked whether the film has a evenly has opaque colouring and is free of smears and pores.

### Strength

Important parameters for the strength of a silo film are tearing force (per cm film width), tear resistance (based on the cross-section of the sample body) and the elongation of the rip (elongation of the specimen to the breaking).

Tear force, elongation and tear resistance longitudinal, transverse and over folds are measured in accordance to DIN according to DIN EN ISO 527-3:2003-07 at +23 °C; test speed 500 mm/min; Type 2 sample body; deformation measurement between measuring marks, in new condition measured by acid storage.

Acid storage: 10 days storage in mixed acid from 3 % milk, 1.5 % vinegar, 0.5 % butyric acid.

The penetration resistance of the film is applied in surface, fold and the weld based on DIN EN ISO 7765-1:2004-10, procedure A performed. In doing so, the values specified by the manufacturer are checked.

### Aging behaviour/weather resistance

The weathering of the material is controlled with xenon arc lamps according to DIN EN ISO 4892-2, method A, synchronisation with irrigation 102/18 to 2000 MJ/m<sup>2</sup>, black standard temperature 60 ±3 °C, relative humidity 65 ±3 %, EUV=60 W/m<sup>2</sup>. After that, the elongation of the tear is 527-3:2003-07 measured in transverse direction.

### Change in measure after hot storage

The dimensional measured is changed in accordance with DIN 53377:2007-10 Change in moderation after 1/2 hour storage in +80 °C hot air.

### Gas permeability

The gas permeability is determined according to DIN 53380-3: 1998-07 with oxygen at +23 °C; 0.2 bar, investigated.

### Continuous monitoring audit

The product quality is determined according to the annually by a DLG monitoring audit controlled. In addition, the manufacturer must measures of self-control in production obliged.

## Detailed account of the test results

### Suitability

The silo foil Blue 9, light blue/black, UV-stabilized, 80 microns, is suitable for silage cover.

### Film dimensions

The measured film dimensions corresponded to film length and film width of the declaration.

### Film thickness

As an average value for the film thickness, 0.078 mm was determined. The measured microvalue was 0.074 mm and the measured maximum value was 0.082 mm.

As a result, the requirements for the mean for the film thickness and the permissible deviations are of the average value have been complied with.

### Material quality

The film was uniformly opaquely coloured, free of streaks and pores.

### Strength

#### *In new condition*

The tearing force was 38.4 N/cm, transverse 36.2 N/cm and over folds 35.5 N/cm (minimum value 25 N/cm each). Taking into account the film thickness resulting in a tear resistance longitudinally of 49.9 MPa, across 46.7 MPa and over folds 44.5 MPa (minimum value 17 MPa each).

The elongation at the break was 668 %, transversely 691 % and over folds at 656 % above the required minimum value of 400 %. The film thus fulfilled the requirements.

#### *After acid storage*

After ten days of storage in a mixed acid (3 % milk, 1.5 % vinegar and 0.5 % butyric acid) reduction in tear resistance transversely was 4.1 % (permissible  $\leq 10$  %); the reduction of the elongation of the transversely was 2.2 % (allowed  $\leq 15$  %). Acid resistance was thus given.

#### *Dart drop resistance*

When checking the penetration resistance in the surface, fold and weld are Manufacturer specified values area  $\geq 650$  g, fold  $\geq 450$  g and weld  $\geq 650$  g.

### Aging behaviour/weather resistance

After simulation of a one-year natural outdoor weathering with 2000 MJ/m<sup>2</sup>, the elongation of the 686 % (minimum value 350 %), i.e. equivalent to a reduction in elongation of 0.7 % (permissible 10 %) related to the new state. Weather resistance was thus given.

### Change in measure after hot storage

The dimensional changes after hot storage at 80 °C of warm air was longitudinally at -0.83 % and transversely -0.34 % below the permitted limit of  $\leq 2$  %. The temperature resistance was thus given.

### Gas permeability

Oxygen permeability at 0.2 bar was film with 2.0 cm<sup>3</sup>/(m<sup>2</sup>·d) and at the weld with 2.1 cm<sup>3</sup>/(m<sup>2</sup>·d) lower than the maximum permissible value 250 cm<sup>3</sup>/(m<sup>2</sup>·d).

## Summary

The criteria tested in this DLG quality seal test are evaluated on the basis of laboratory tests the mechanical, physical, chemical and aging properties of the Blue 9 silo film, light blue/black, UV-stabilized, 80 microns.

The tested silo film Blue 9, light blue/black, UV-stabilized, 80 microns, has met the requirements of the test frame with regard to the criteria examined.

## Further information

### Testing agency

DLG TestService GmbH, Gross-Umstadt location  
The tests are conducted on behalf of DLG e.V.

### DLG test framework

DLG quality seal test "for regenerate-free and regenerate-containing silo films made of polyethylene of low Density (PE-LD) with and without barrier layers", (current as of 11/2016)

### Department

Betriebsmittel

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## DLG – the open network and professional voice

Founded in 1885 by the German engineer Max Eyth, DLG (Deutsche Landwirtschafts-Gesellschaft – German Agricultural Society) is an expert organisation in the fields of agriculture, agribusiness and the food sector. Its mission is to promote progress through the transfer of knowledge, quality standards and technology. As such, DLG is an open network and acts as the professional voice of the agricultural, agribusiness and food sectors.

As one of the leading organisations in the agricultural and food market, DLG organises international trade fairs and events in the specialist areas of crop production, animal husbandry, machinery and equipment for farming and forestry work as well as energy supply and food technology. DLG's quality tests for food, agricultural equipment and farm inputs are highly acclaimed around the world.

For more than 130 years, our mission has also been to promote dialogue between academia, farmers and the general public across disciplines and national borders. As an open and independent organisation, our network of experts collaborate with farmers, academics, consultants, policymakers and specialists in administration in the development of future-proof solutions for the challenges facing the agriculture and the food industry.

### Leaders in the testing of agricultural equipment and input products

The DLG Test Center Technology and Farm Inputs and its test methods, test profiles and quality seals hold a leading position in testing and certifying equipment and inputs for the agricultural industry. Our test methods and test profiles are developed by an independent and impartial commission to simulate in-field applications of the products. All tests are carried out using state-of-the-art measuring and test methods applying also international standards.

Internal test code DLG: 2002-021

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