Sagustu International GmbH

Eldorado puzzle mat for horses

Deformability/Elasticity,
Permanent Tread Load, Abrasion,
Slip resistance, Acid resistance,
Cleaning distance

APPROVED 2025 DLG WWW.DLG.ORG

SAGUSTU INTERNATIONAL ELDORADO PUZZLE MAT FOR HORSES

- ✓ **Deformability/Elasticity**
- ✓ **Permanent Tread Load**
- ✓ **Abrasion**
- ✓ **Slip resistance**
- ✓ **Acid resistance**
- ✓ **Cleaning distance**

DLG Test Report 7556

Overview

A test mark “DLG APPROVED for individual criteria“ is awarded for agricultural products which have successfully fulfilled a scope-reduced usability testing conducted by DLG according to independent and recognised evaluation criteria. The test is intended to highlight particular innovations and key criteria of the test object. The test may contain criteria from the DLG test scope for overall tests, or focus on other value-determining characteristics and properties of the test subject. The minimum requirements, test conditions and procedures as well as the evaluation bases of the test results will be specified in consultation with an expert group of DLG. They correspond to the recognised rules of technology, as well as scientific and agricultural knowledge and requirements. The successful testing is concluded with the publication of a test report, as well as the awarding of the test mark which is valid for five years from the date of awarding.

The DLG APPROVED Test “Deformability/Elasticity, Permanent Tread Load, Abrasion, Slip resistance, Acid resistance, Cleaning distance” includes technical measurements on test stands of the DLG Test Center. The deformability and elasticity, the abrasion resistance, the slip resistance, the acid resistance, the cleaning distance were measured and a permanent tread load was applied. The test was based on the DLG Testing Framework for elastic floor coverings in the movement, rest and lying area of horses, as of April 2024, and DIN 7861:2024-05 (Elastic floorings in the movement, rest and lying area of horses – Requirements and testing).

Other criteria were not investigated.

The product

Applicant

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Product:
Eldorado puzzle mat for horses

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Description and technical data

The tested Sagustu Eldorado puzzle mat is an elastic stable flooring in the movement, rest and lying area for horses.

Black rubber mat

- thickness approx. 16.5 mm
- top side with horse head profile
- underside with groove profile
- Shore A hardness 70

Assessment in brief

The Eldorado puzzle mat tested here, an elastic stable flooring in the movement, rest and lying area for horses, was investigated with regard to durability and comfort properties on test stands in the DLG APPROVED Test. The deformability and elasticity of the cubicle mat, the abrasion resistance, the slip resistance, the acid resistance and the cleaning distance were measured and a permanent tread load was applied.

Requirements of DIN 7861 are fulfilled.

Table 1:
Overview of results

DLG QUALITY PROFIL		Evaluation
Point loading deformability and elasticity in new condition:	3.4 mm	no evaluation
Point loading deformability and elasticity following endurance test:	3.5 mm	no evaluation
Area loading deformability and elasticity in new condition:	1.5 mm	no evaluation
Area loading deformability and elasticity following endurance:	1.5 mm	no evaluation
Lasting deformation following endurance test		■■■■■ *
No noticeable wear/ no damage after endurance test		■■■■□ *
Slip resistance		■■□□□ **
Resistance to feed acid mixture		■■■□□ ***
Resistance to uric acid		■■■□□ ***
Resistance to sulfurous acid		■■■□□ ***
Resistance to ammonia		■■■□□ ***
Resistance to barn disinfectans		■■■□□ ***
Resistance to rapeseed oil		■■■□□ ***
Abrasion		■■■■□ *
Cleaning distance with flat jet noozle		■■■□□ *
Cleaning distance with a coarse dirt remover		■■■□□ *

DLG Evaluation range:

* ■■■ or better = meets, exceeds or significantly exceeds the established DLG standards, □□ = meets the legal requirements for marketability, ■ = failed

** Single criteria slip resistance: ■■ = passed, ■ = failed

*** Single criteria acid resistance: ■■■ = resistant, □□ = limited resistant, ■ = failed

The method

Deformability and elasticity

Point load

The deformability is measured in new condition and following permanent tread load using ball penetration tests with a calotte (r = 120 mm) and a penetration force of 2,000 N (corresponding to approx. 200 kg).

Area load

The deformability is measured in new condition and following permanent tread load using a horseshoe size 4 and a penetration force of 2,000 N (corresponding to approx. 200 kg).

Permanent tread load

The permanent tread load is measured on a test stand with a horseshoe size 4 in the standard test programme with 250,000 alternating loads at 5,000 N (corresponding to approx. 500 kg).

Abrasion test

In a standardised abrasion test with 10,000 cycles the top cover was grinded with an emery cloth (granulation 280) and a grinding pressure of 500 N (= 8.1 N/cm^2 surface pressure). The friction element was cooled continuous with water to prevent an influence of the generated heat during the abrasion test. The size of the grinded area was 61,5 cm^2.

Slip resistance

The measurements were carried out with the ComfortControl test rig of the DLG test centre.

A loaded (10 kg) slide piece was pulled with a velocity of 20 mm/s across the mat.

Used sliding pieces
a) Plastic hoof (bare hoof version),
   width 140 mm, length 150 mm, thickness 12 mm,
   hardness Shore C: 80 (+5)
b) Horseshoe, size 4 (shod version)

Acid resistance

A permanent dipping test in accordance to DIN 7861 was carried out. Test samples (size 30 mm x 30 mm) were completely dipped into different test liquids for 24 hours and 28 days (room temperature 20° Celsius).

In the 28 days test the liquids were changed weekly. After the 28 days the samples were washed with distillate water and dried for 24 hours. Before and after the dipping the weight, the dimensions and the shore hardness (shore A) of the test samples were measured.

Additional visual evaluation was done for alterations like colour changing, swelling, destruction or crystallisation. All samples were evaluated in comparison to the standard water.

Cleaning Distance

During test stand investigations with high-pressure cleaners, the spray distance is determined at which no damage can occur to the surface. (High-pressure cleaner: pump output approx. 1000 l/h at about 145 bar with a 25° flat nozzle and dirt cutter, exposure time 1 min).

Detailed account of the test results

Deformability and elasticity

Point load

In the ball penetration tests in new condition with a calotte (r = 120 mm), penetration depth was 3.4 mm. The resulting calculated bearing pressure of 78.0 N/cm².

Elasticity was measured following a permanent tread load exerted by a horseshoe size 4 at 5,000 N.

Following the endurance test, the penetration depth of the calotte increased from 3.4 mm to 3.5 mm. The bearing pressure decreased from 78.0 N/cm² to 75.8 N/cm² (see Fig. 2).

This means that deformability and elasticity slightly increase.

Area load

In penetration tests in new condition with a horseshoe size 4, penetration depth was 1.5 mm. The resulting calculated bearing pressure of 34.8 N/cm².

Elasticity was measured following a permanent tread load exerted by horseshoe size 4 with 250.000 alternating loads at 5.000 N.

Following the endurance test, the penetration depth stays at 1.5 mm (see Fig. 3).

Permanent tread load

No noticeable wear was observed following exposure to permanent tread load on a test stand with 250,000 alternating loads at 5,000 N.

No lasting deformation was observed.

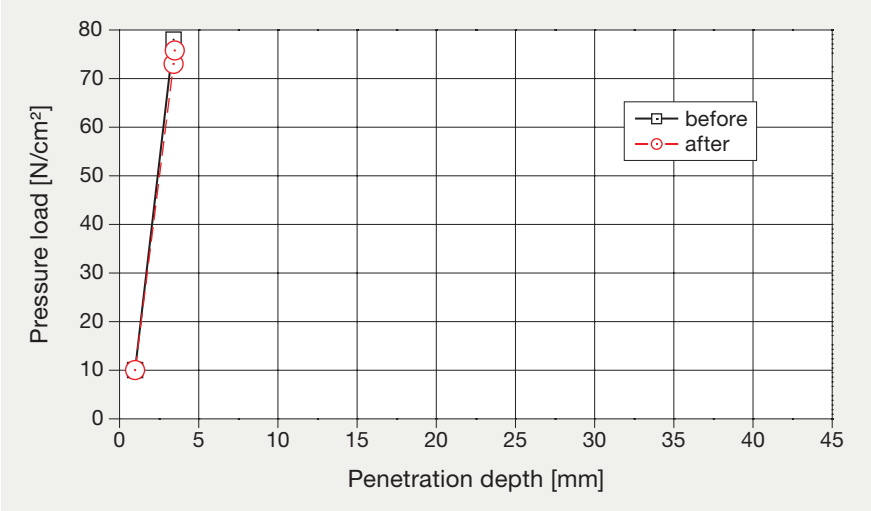

Figure 2:
Point load – Deformability as a function of bearing pressure

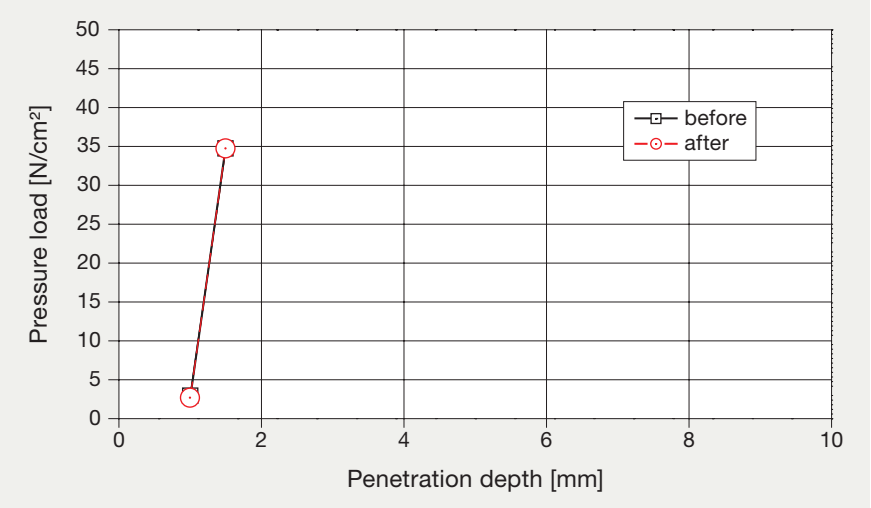

Figure 3:
Area load – Deformability as a function of bearing pressure

Figure 4:
Deformation measurement with calotte

Figure 5:
Deformation measurement with horsshoe

Figure 6:
Test sample after abrasion test

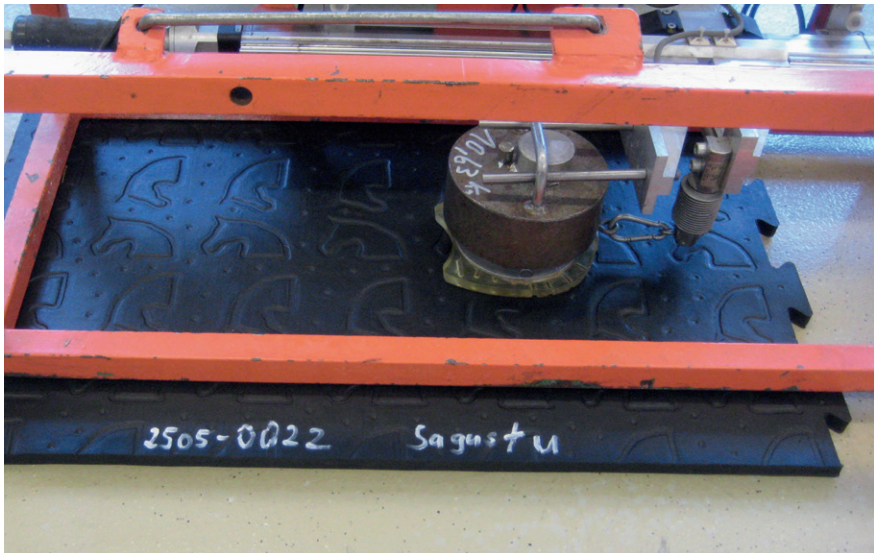

Figure 7:
Slip resistant measurement

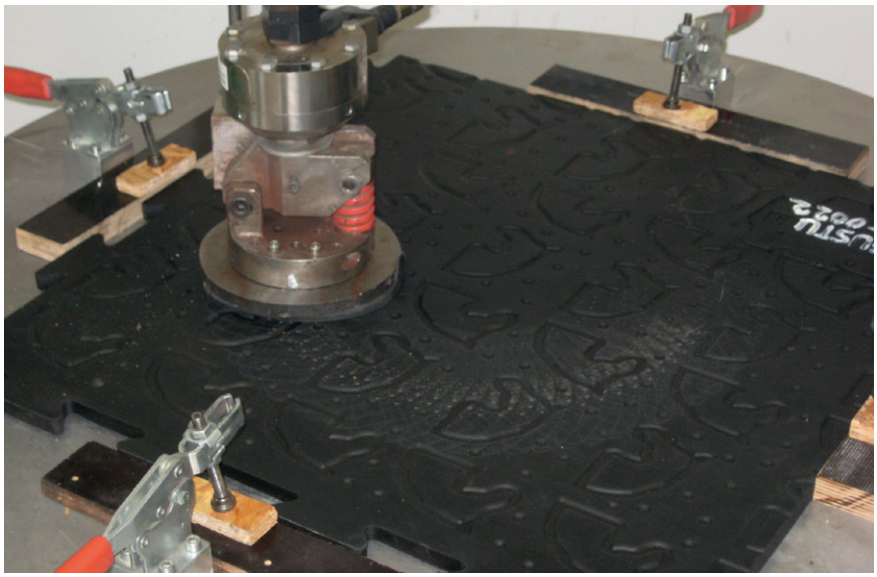

Figure 8:
Permanent Tread Load

Abrasion test

The abrasion depth after 5,000 cycles amounted to 0.2 mm, this corresponds to approximately 1.2 % of the rubber thickness. Of the ground surface 0.3 grams were rubbed off.

The abrasion depth after 10,000 cycles amounted to 0.3 mm, this corresponds to approximately 1.8 % of the rubber thickness. Of the ground surface 0.5 grams were rubbed off.

The abrasion depth and the slight grit implicate a good wear resistance of the mat.

Slip Resistance

The slide pulling tests showed a good slip resistance on the dry or wet rubber mat surface in new condition. The measured friction coefficients (μ) surpassed the minimal value of μ = 0,40 (DIN 7861) and μ = 0.45 (DLG test program).

Acid resistance

The rubber mat was resistant against the used test liquids

The differences in weight, thickness and Shore A hardness between the acid treated and not acid treated samples were minor and lay in the range of water as standard.

Against the used liquids the rubber mat seems to be suited for the described use.

Table 4:
Test liquids and results – acid resistance

Test liquid	Concentration	Result after 24 hours residence time	Result after 28 days residence time	Evaluation
Feed acid mixture				
	concentrate, pH 2	no changing	no changing	resistant
Excrement acids				
Uric acid	saturated urea solution (0,4 %)	no changing	no changing	resistant
Sulfurous acid	5-6 % SO_2	no changing	no changing	resistant
Ammonia solution	32 % solution	no changing	no changing	resistant
Disinfection liquid				
Barn Disinfection liquid	2%-solution of a product with formic acid and glyoxyl acid	no changing	no changing	resistant
Rapeseed oil	undiluted	no changing	no changing	resistant

Figure 9:
Measurement of cleaning distance

Cleaning distance

During test stand examinations with high-pressure cleaners, damage to the surface only occurs when a minimum distance of 40 cm is not maintained when using a dirt cutter, or 25 cm when using a flat spray nozzle.

Only the agents permitted by the company for the floor covering should be used for cleaning and disinfecting the surface.

Summary

Based on test-stand investigations, the criteria tested in this DLG APPROVED Test evaluate the comfort and durability properties of Eldorado puzzle mat for horses.

The tested Eldorado puzzle mat met the requirements of DIN 7861 and the DLG Testing Framework with respect to the investigated criteria.

Further information

Testing agency

DLG TestService GmbH,
Gross-Umstadt location, Germany

The tests are conducted on behalf of DLG e.V.

DLG test framework

DLG Testing Framework for elastic stable floor coverings in the movement, resting, and lying areas for horses, as of April 2024

DIN 7861:2024-04 (Elastic floorings in the movement, rest, and lying areas for horses – Requirements and testing)

Department

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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: 2025-0022

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