

# DLG Test Report 6259

## Bevepro Comfort Cubicle Mattress BV pro Favorit



Test Center  
Technology and Farm Inputs

[www.DLG-Test.de](http://www.DLG-Test.de)

# Overview

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The SignumTest is DLG's comprehensive utility value test based on independent and recognized assessment criteria for agricultural machinery and equipment and related products.

The DLG-SignumTest provides a neutral assessment of the essential features of the product, from performance capability and animal welfare, via stability, to work safety and functional safety. These aspects are examined and evaluated on test rigs and under various operating conditions of use, and in the same way the product is put to the test in practical operation on a user farm.

The precise testing conditions and methods as well as the assessment of the test results are defined in corresponding test schedules by the respective independent Test Commissions and are continuously adapted to the recognized state of the art, scientific findings and agricultural requirements. The tests are conducted using methods that allow objective assessment on the grounds of reproducible values. A successful test closes with publication of a Test Report and award of a test certification mark.

The DLG SignumTest comprised technical measurements on test



stands, examinations in use, behavioural observations, joint evaluations, and a survey of user farms.

On the test stands the deformability and the material hardness were examined by means of a ball impression test, the permanent elasticity by means of alternating loads, the slip resistance via slide pulling tests, and the acid resistance was examined too. The tests were conducted in accordance with the DLG test schedule for elastic animal housing floor coverings, last amended in April 2010.

## The Product

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### Manufacturer and Applicant

Bevepro Comfort,  
Davidlivingstonestraat 21,  
NL 7825 AE Emmen

Product:  
BV pro Favorit

Contact:  
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### Description and Technical Data

The Bevepro BV pro Favorit cubicle mattress tested here serves to provide a resting area for cattle in cubicle housing, thickness approx. 9.8 cm.

Cover

- black woven top cover in polypropylene
- approx. 3 mm thick

Mattress underlay

- consists of approx. 9.5 cm thick granulated PE panel

Intended for installation as sheet material.

# Assessment – Brief Summary

In this DLG-SignumTest, the Bevepro BV pro Favorit cubicle mattress was tested on test stands for stability and comfort properties.

The installation and dimensional stability were assessed in the practical tests, and behavioural observations and joint evaluations were conducted.

On the user farms examined, the joint health in particular was distinctly better than the standard level.

Table 1: Overview of results

Test criteria	Test result	Evaluation*
<b>Suitability</b>		
	Suitable as elastic floor covering in resting areas of high cubicles in cubicle houses. Small additional quantities of litter recommended.	
<b>TECHNICAL CRITERIA (Test stand tests)</b>		
<b>Permanent tread load test</b>	clear lasting deformation	--
	no notable wear of the top cover	+
<b>Abrasion test</b>	good wear resistance of the top cover	+
<b>Acid resistance test**</b>		
– Feed acid resistance	resistant	+
– Uric acid	resistant	+
– Sulfurous acid	resistant	+
– Ammonia	resistant	+
– Animal housing disinfectant	resistant	+
– Peracetic acid	resistant	+
<b>Dimensional stability</b>	no alteration in length or width	+
	formation of depressions	–
<b>Handling, installation, maintenance</b>		
– Installation by the owner	reasonable work input	○
– Installation instructions	detailed and understandable	+
<b>Cleaning</b>		
– Self-cleaning	good	+
– Daily cleaning	does not cause any difficulties	+
<b>Warranty</b>	10 years (first 5 years full warranty and then 5 years pro-rated system)	
<b>Recycling</b>	no recycling concept	--
<b>ANIMAL-RELATED CRITERIA</b>		
<b>Animal observations</b>	no deviation from specific behaviour noticeable	
<b>Slip resistance***</b>		
– in slide tests	good on dry and wet cover without litter	
– foothold of the animals	good	
<b>Injuries</b>		
<b>Joint evaluation</b>	88.2% with no pathological findings	+
<b>Deformability and elasticity</b>		
– in new condition	25.2 mm, very good	++
– after endurance testing	12.6 mm, good	+
<b>Toxicological safety</b>	confirmed by the manufacturer	

\* Evaluation range: ++ / + / ○ / – / -- (○ = standard)

\*\* Evaluation range: + = resistant / ○ = limited resistance / – = not resistant

\*\*\* Evaluation range + / –

# The Method

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## Suitability

The suitability, the possible use and the fields of application of the cubicle mattress were evaluated with regard to practice.

## Survey

A written survey of farms using the same cubicle mattress was conducted to complete the test results.

## TECHNICAL CRITERIA

### Permanent tread load

The permanent tread load was measured on a test stand using a round steel foot with 100,000 alternating load cycles at 10,000 N (corresponding to approx. 1000 kg). The steel foot serves as an “artificial cow foot” and is adapted to the natural conditions.

The foot has a diameter of 105 mm and thus a contact area of 75 cm<sup>2</sup>. The carrying edge of the hoof is simulated by a 5 mm wide ring at the periphery of the sole that projects 1 mm beyond the rest of the area.

### Abrasion resistance

In the DLG standard abrasion test, the floor covering is rubbed with emery cloth (grain size 280) at a contact pressure of 500 N (= 8.13 N/cm<sup>2</sup> surface pressure).

In order to rule out any influence of the friction heat on the abrasion operation, the friction element is continuously cooled with water.

The area subjected to this abrasion test was 61.5 cm<sup>2</sup>.

### Acid resistance

Test specimens of the top cover were examined in a permanent dipping test to DIN EN ISO 175:2000 (Behaviour of plastics on immersion in liquid chemicals). Feed and excrement acids

frequently occurring in animal housing and standard commercial disinfectants were used as test solutions. Test samples of the top cover, size 30 mm x 30 mm, were immersed completely in the test medium for periods of 24 hours and 28 days at a room temperature of 20°C. In the 28-day test the test solutions were changed weekly. After the end of the test, the test bodies were rinsed with distilled water and dried for 24 hours. The weight and dimensions of the test samples were measured before and after dipping. In addition, the surface was assessed for visible changes such as loss of shine, colour changes, swelling or destruction and crystal formation. All test samples were evaluated by comparison with the water standard.

### Dimensional stability

The form stability (depression formation) of the cubicle mattress was assessed on the user farms after installation in accordance with the manufacturer's regulations. In addition, the test measured whether there had been any change in length or width.

### Handling, installation and maintenance

The manner of installing the cubicle mattress, the installation instructions and the necessary maintenance were assessed with regard to practical operation.

### Cleaning

The cleaning of the cubicle mattress was assessed with regard to practical operation.

### Warranty and Recycling

The manufacturer should state whether a warranty is given, how long it lasts and what it covers. The manufacturer should also state whether there is a recycling concept for the cubicle mattress.

## ANIMAL-RELATED CRITERIA

### Animal observations

During practical use, various behavioural observations in the form of direct observations were conducted and documented. It was examined whether any deviations from the specific behaviour patterns (e.g. typical moving processes when getting up and lying down, lying positions) that were attributable to the cubicle mattress could be ascertained.

In order to examine the foothold of the animals, 20 getting up processes were examined by direct observation on each of two user farms

### Injuries

On three farms that had only installed this cubicle mattress, cows (where possible from the start of the second third of lactation) were examined for externally visible signs of damage to joints. The cubicle mattress had been in use for at least three months.

Only animals that had been in the housing system for the said period were examined. Cows that did not satisfy these conditions (e.g. new purchases) or that are or were sick were excluded from the examination. The examination concentrated on the areas exposed during lying (see Figure 2) and took both the right and left sides of the body into account. In addition, relevant data such as type of litter, resting cubicle dimensions, height of the dung step, arrangement of the control facilities (brisket board, neck rail), nature of the resting cubicle partitions and data relevant to operations (average performance, management) were recorded.

The examination was always carried out by the same person. Harm/damage was assessed on the basis of the following assessment schedule:

## Deformability and elasticity

The deformability was measured in new condition and after the permanent tread load test by means of ball impression tests with a calotte ( $r = 120 \text{ mm}$ ) at a penetration force of 2000 N (corresponding to approx. 200 kg).

## Slip resistance

The measurements were conducted using the mobile Comfort Control slip resistance test stand at the DLG Test Center. A plastic polyamide foot (diameter 105 mm, contact area about  $70 \text{ cm}^2$ , 3 mm wide ring at the periphery of the sole projecting 1 mm beyond the rest of the area) with a load of 10 kg was pulled over the test mattress at a speed of 20 mm/s.

## Toxicological safety

The manufacturer is to confirm the toxicological safety of the cubicle mattress.

Table 2:  
Classification of the findings

Finding	Classification
No particular findings	No alterations
Hairless spots < 2 cm	slight alterations
Hairless spots > 2 cm	slight alterations
Skin abrasions < 2 cm	medium alterations
Skin abrasions > 2 cm	medium alterations
Increased circumference in the bursal area, covered,	medium alterations
Increased circumference in the bursal area, open,	major alterations
Joint participation	major alterations

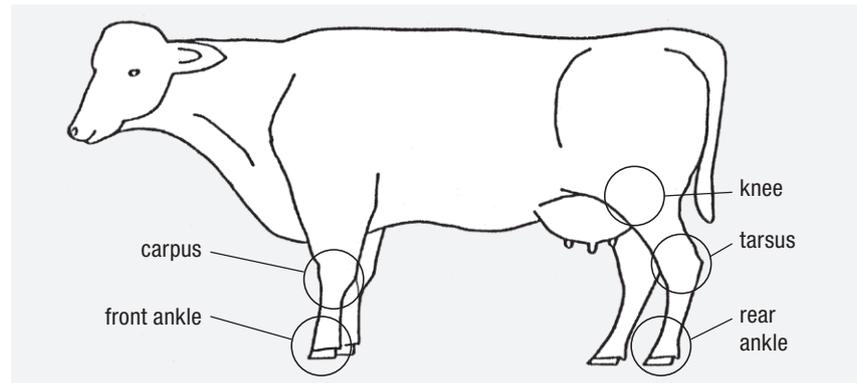


Figure 2:  
The joints shown were examined

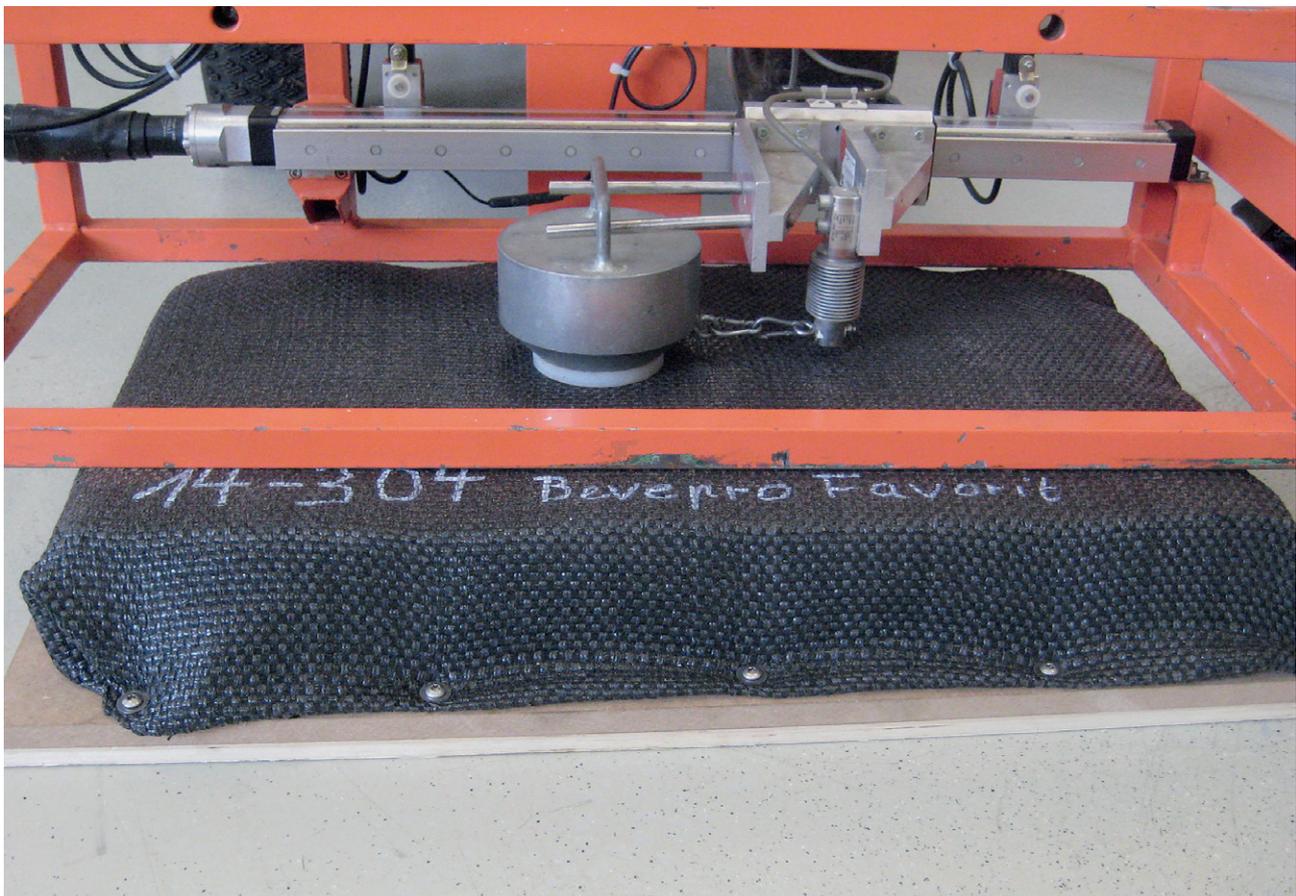


Figure 3:  
Slip resistance measurement

# The Test Results in Detail

## TECHNICAL CRITERIA

### Permanent tread load

Following a permanent tread load test on the test stand with a steel foot (contact area 75 cm<sup>2</sup>) with 100,000 alternating load cycles at 10,000 N (corresponding to approx. 1000 kg), no notable wear was ascertained on the top cover. The mat consisting of pressed PE granulated material was compressed and clear, lasting deformation of about 6.5 cm was ascertained. At a starting thickness of approx. 9.8 cm, this means that the thickness of the floor covering decreased by about 66%. The defined standard is up to 30%.

#### Evaluation

- distinct permanent deformation --
- top cover - no notable wear +

### Abrasion resistance

The abrasion depth after 10,000 double cycles was approx. 0.2 mm, corresponding to about 7% of the floor covering thickness. 0.2 g was rubbed off from the area exposed to abrasion.

#### Evaluation

The low abrasion depth and slight amount of abrasion indicate good abrasion resistance of the top cover +

### Acid resistance of the top cover

The top cover of the cubicle mattress was resistant to the test media examined. The differences in weight and thickness between the treated and untreated test samples were very slight and within the standard range for water. With regard to its material stability

against the test media, the top cover is well suited for the described purpose.

### Dimensional stability

Following proper installation, no change in the length or width of the cubicle mattress occurred during practical use in a test period of over 9 months. Formation of a depression in the cubicle mattress was observed in practical operation.

### Handling, installation and maintenance

The installation instructions are detailed and understandable. The installation can be carried out by the user with reasonable work input. At least two persons are necessary for this. The top cover is secured with a plastic strip in the head area and at the sides.

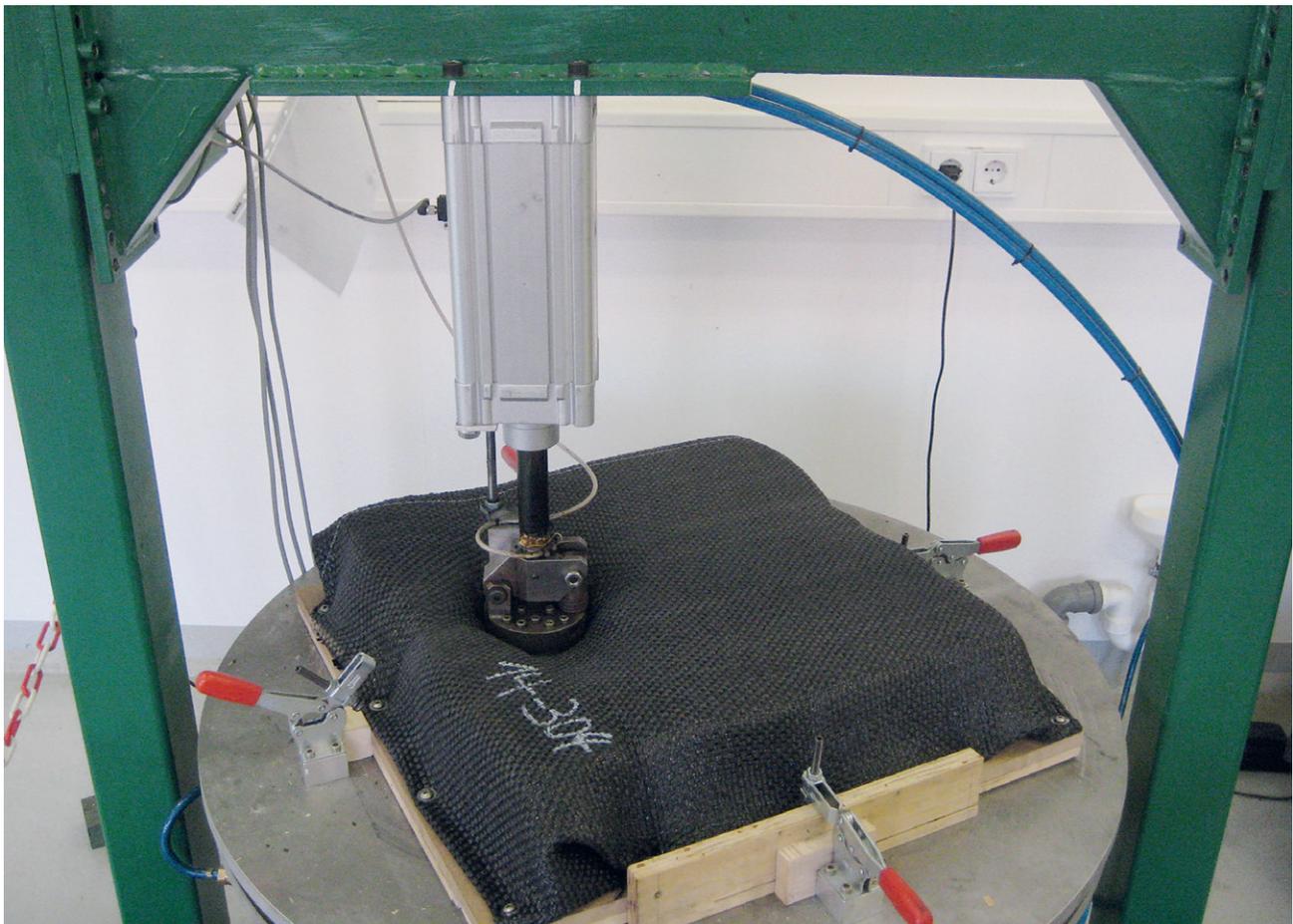


Figure 4:  
Permanent tread load

No maintenance work is necessary to sustain the functionality.

## Cleaning

The self-cleaning effect is good and daily cleaning of the surface presents no difficulties. Slight quantities of litter make it easier to keep the resting cubicle and the animals clean and dry. The permeable surface makes cleaning (e.g. with a high pressure cleaner) more difficult and effective disinfecting is not possible in the installed condition. Moisture can accumulate beneath the floor covering, especially in the granulated underlay. This cannot be avoided (capillary effects) and is unobjectionable for daily management. The floor covering has to be taken up completely for thorough cleaning and disinfecting.

When cleaning the covering, only the cleaning agents named by the manufacturer should be used.

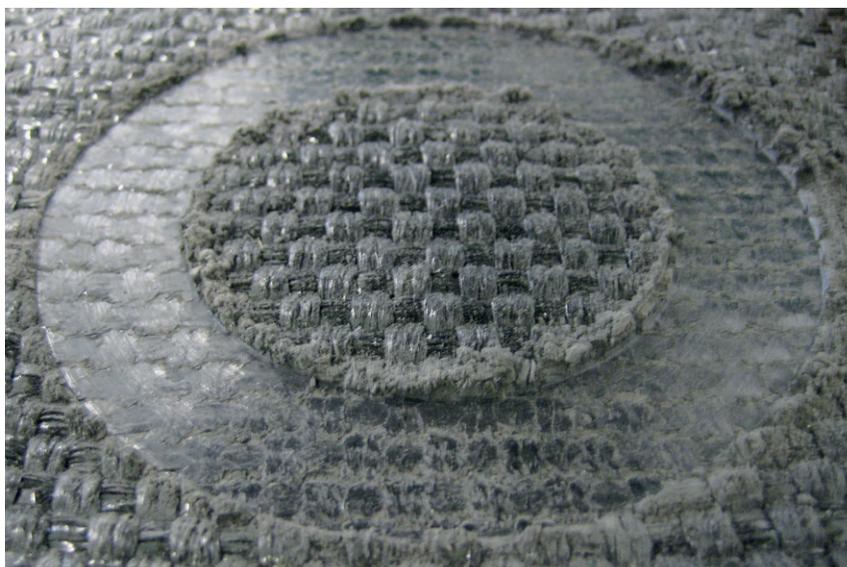


Figure 5:  
Test sample after the acid resistance test

## Warranty and recycling

According to the warranty conditions, the applicant grants a warranty of 10 years (full warranty

for the first 5 years and then 5 years of a pro-rated system). The manufacturer has no recycling concept for future use of the cubicle mattress.

Table 3:  
Test media and results – acid resistance

Test media	Concentration	Result after 24 hours exposure time	Result after 28 days exposure time	Evaluation
<b>Feed acid mixture</b>				
	concentrate, pH 2	no change	no change	resistant
<b>Excrement acids</b>				
Uric acid	saturated solution (0.4%)	no change	no change	resistant
Sulfurous acid	5-6% SO <sub>2</sub>	no change	no change	resistant
Ammonia	32% solution	no change	no change	resistant
<b>Disinfectants</b>				
Animal housing disinfectant	2% solution of a product on the basis of formic acid and glyoxylic acid	no change	no change	resistant
Peracetic acid	3000 ppm	no change	no change	resistant

## ANIMAL-RELATED CRITERIA

### Animal observations

Various behavioural observations in the form of direct observations were conducted during the period of practical use.

No deviations from the species-specific behaviour patterns when getting up and lying down or in lying positions that could be attributable to the cubicle mattress were ascertained. The animals displayed unimpeded movement patterns in direct observations of 20 getting up processes on each of two user farms.

The foothold of the animals on the cubicle mattress was good.

No slipping of the animals was observed.



Figure 6:  
Evaluating the joints

### Injuries

On three farms that had only installed this cubicle mattress, altogether 107 cows were examined from the second third of lactation for externally visible signs of damage to joints (joint evaluation). The evaluation took both the right and left sides of the body into account and concentrated on the 10 areas exposed during lying (see Figure 6). The joint evaluation was carried out by the same person in each case.

The percentage distribution of the findings for the 107 animals examined is shown in the following diagram (Figure 7). 88.2% of the areas evaluated displayed no irregularities. No major changes such as increased circumference in the bursal area and lameness were ascertained.

Slight alterations such as hairless spots were registered on 9.2% of the body regions evaluated. Only 2.6% of the evaluated places displayed medium alterations such as skin abrasion. The findings made were concentrated above all on the hock joint (Tarsus). There were no or only isolated findings relating to the fetlock, knee or carpometacarpal joint (Carpus).

#### Evaluation

88.2% of the joints evaluated displayed no findings +

### Deformability and elasticity of the cubicle mattress

In the ball impression tests with a calotte ( $r = 120 \text{ mm}$ ), the depth of penetration in the new condition of the mattress was 25.2 mm. The contact pressure of  $10.5 \text{ N/cm}^2$ , calculated from this indicates a relatively low load on the carpal joints during lying down and getting up.

The elasticity was measured after a permanent tread load test with a steel foot (contact area  $75 \text{ cm}^2$ ) and 100,000 alternating load cycles at 10,000 N. The depth of penetration of the calotte after the endurance test dropped from 25.2 mm to 12.6 mm. The contact pressure increased from  $10.5 \text{ N/cm}^2$  to  $21.1 \text{ N/cm}^2$  (see Figure 8). This means that the deformability and elasticity decrease.

#### Evaluation

- in new condition ++  
- after the permanent tread load test +

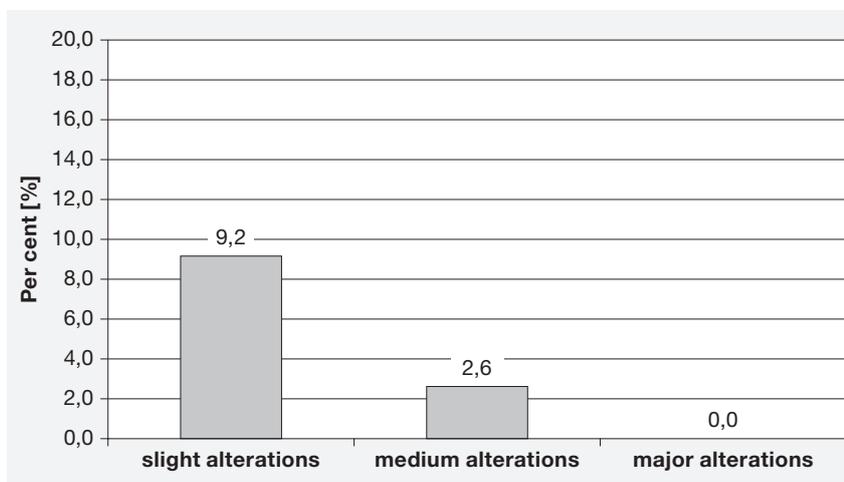


Figure 7:  
Percentage distribution of the findings made

### Slip resistance

The slide pulling tests with the mobile Comfort Control slip resistance test stand of the DLG Test Center revealed good slip resistance on the wet and dry new floor covering. The coefficients of friction ( $\mu$ ) lie above the minimum level of  $\mu = 0.45$ .

#### Evaluation

Slip resistance in sliding tests on wet and dry covering = good +

## Suitability

The cubicle mattress Bevepro BV pro Favorit is suitable as an elastic floor covering in the resting area of high cubicles in cubicle houses. As the material comes in sheets, it can only be installed where there are self-supporting resting cubicle partitions. The requirement for unproblematic use is proper construction of the concrete base with a continuous gradient of at least 3 %, preferably 4 %.

For sound functioning, the addition of slight quantities of litter is highly recommended.

## Survey

A survey conducted among six farms that have been using the cubicle mattress for up to two years confirmed the results achieved by the test.

On the farms altogether 755 resting boxes were equipped with the cubicle mattress. All the farms state that installation is simple. The resting cubicles are accepted well by the animals on all the farms and no familiarization difficulties were encountered. All the respondents stated that no slipping by the animals had been observed and the animals had a safe foothold. All those surveyed reported a decline in visible joint damage since installation of the cubicle mattress. No damage to the cubicle mattress has occurred on any of the farms to date. Five of the farms surveyed rated the cubicle mattress as very good and one farm rated it as good.

All the farms surveyed would purchase the cubicle mattress again should the need arise.

## Summary

The criteria tested in this DLG-SignumTest evaluate the comfort and stability properties of the Bevepro BV pro Favorit cubicle

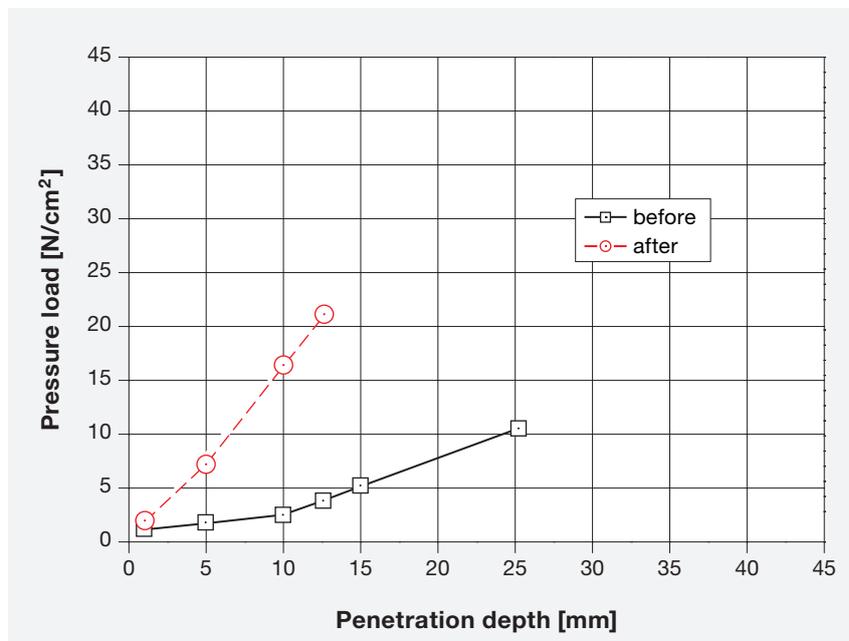


Figure 8:  
Deformability as a function of the contact pressure



Figure 9:  
Measuring the deformability

mattress for use in cubicle houses on the basis of examinations conducted on test stands and in practical use. The tested Bevepro

BV pro Favorit Cubicle mattress satisfied the requirements of the test schedule with regard to the criteria examined.

## Further information

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Further test results for resting cubicle floor coverings can be downloaded at [www.dlg-test.de/stalleinrichtungen](http://www.dlg-test.de/stalleinrichtungen). The relevant DLG Expert Committees have published various pamphlets on the subjects of animal welfare and cattle husbandry. These are available free of charge in PDF format at: [www.dlg.org/merkblaetter.html](http://www.dlg.org/merkblaetter.html)

### Test execution

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### DLG Testing Framework

SignumTest  
"Elastic Animal Housing  
Floor Coverings"  
(last amended 04/2010)

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## The DLG

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In addition to conducting its well-known tests of agricultural technology, farm inputs and foodstuffs, the DLG acts as a neutral, open forum for knowledge exchange and opinion-forming in the agricultural and food industry.

Around 180 full-time staff and more than 3,000 expert volunteers develop solutions to current problems. More than 80 committees, working groups and commissions form the basis for expertise and continuity in technical work. Work at the DLG includes the preparation of technical information for the agricultural sector in the form of instruction leaflets and working documents, as well as contributions to specialist magazines and books.

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The DLG Test Center Technology and Farm Inputs in Groß-Umstadt sets the benchmark for tested

agricultural technology and farm inputs and is the leading provider of testing and certification services for independent technology tests. With the latest measurement technology and practical testing methods, the DLG's test engineers carry out testing of both product developments and innovations.

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