

DLG Test Report 7257

Ludwig Bergmann GmbH

Universal Spreader TSW 6240 W with V-Spread

Distribution quality in manure



LUDWIG BERGMANN GMBH
TSW 6240 W WITH V-SPREAD

✓ Distribution quality
in manure

Test Report 7257



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.



**LUDWIG BERGMANN GMBH
TSW 6240 W WITH V-SPREAD**
✓ **Distribution quality
in manure**
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The BERGMANN TSW6240W with V-Spread was submitted to a DLG test that assessed the quality of distribution in cattle manure. The machine’s spreading system consists of two wide-spreading discs and two horizontal beaters. The test examined the quality of distribution as the machine was spreading cattle manure at rates of 10 t/ha and 30 t/ha. The manure had a dry matter content of 29.9% and a bulk density of 736 kg/m³. The criteria tested were the quality of distribution across rows and along rows. Other criteria were not tested.

Assessment in brief

Spreading at rates of 10 t/ha and 30 t/ha in the DLG test, the BERGMANN TSW6240W with V-Spread achieved very good (+ +), good (+) and satisfactory (o) results in distribution quality across and along rows. Table 2 is a synopsis of all results.

*Table 1:
Overview of results*

DLG QUALITY PROFILE	Evaluation ¹
Distribution quality in manure	✓

¹ Evaluation range: Requirements fulfilled (✓) / not fulfilled (✗)

*Table 2:
Parameters defining the distribution quality in manure*

		Cattle manure			
Work width	[m]	17	39	26	36
Target rate	[t/ha]	10	10	30	30
Forward speed	[km/h]	5.0	5.0	1.6	1.6
Distribution across rows					
– Coefficient of variation (CoV)	[%]*	9.9 (+ +)	19.4 (o)	10.0 (+ +)	14.4 (+)
Distribution along rows using ExaRate					
– Coefficient of variation (CoV)	[%]**	5.4 (+ +)		6.7 (+ +)	
– Dilation within the tolerance zone	[%]***	84.3 (+ +)		82.9 (+ +)	

* In line with the DLG assessment scale that has been effective from May 2020 (distribution across rows):
CoV > 15 % to ≤ 20 % = “o”; CoV > 10 % to ≤ 15 % = “+”; CoV ≤ 10 % = “+ +”

** In line with the DLG assessment scale that has been effective from May 2020 (distribution along rows):
CoV > 15 % to ≤ 25 % = “o”; CoV > 10 % to ≤ 15 % = “+”; CoV ≤ 10 % = “+ +”

*** In line with the DLG assessment scale that has been effective from May 2020 (dilation within the tolerance zone):
> 45 % = “o”; > 55 % = “+”; > 75 % = “+ +”

In May 2020, the DLG test commission on fertilisers and spreaders laid down revised and stricter standards for assessing the test results for this type of machinery. The revised standards reflect the technical progress that has been made in this field. These new standards supersede the previous standards applied by DLG in all its tests and in all DLG Test Reports prior to May 2020.

The product

Manufacturer and applicant

Ludwig Bergmann GmbH
Hauptstraße 64-66
49424 Goldenstedt, Germany

Product:

Universal Spreader TSW6240W with V-Spread

Description and technical data

The BERGMANN TSW6240W with V-Spread is a universal spreader that features a moving floor and two spreading discs. The key specifications of the tested spreader are listed below (manufacturer information):

Model	TSW6240W with V-Spread
Year of manufacture	2022
ID no.	W0901414MN1B73106
Gross weight	24,000 kg
Tongue load	4,000 kg
Axle load	20,000 kg
Kerb weight	10,000 kg
Capacity	approx. 19.7 m ³
Running gear	Tandem axle with hydraulic suspension; drawbar with hydraulic suspension and K80 hitch
Brakes	Dual-line air brake with automatic load-sensing control (ALB)
Tyres	800/45 R30.5
Body dimensions	1,320 mm x 2,050 mm x 6,900 mm (h x w x l)
Tractor spool requirement	3 load-sensing couplers (feed, return, control) for the slurry gate, the tailgate, the moving floor and the steered axle (further functions available); 2 (double-acting) lines for the drawbar suspension system;
Electric sockets required	ISOBUS connector; 7-pin light connector;
Spreading system	Two horizontal 609 mm diameter beaters; Two 1,100 mm diameter spreading discs; 6 adjustable vanes per disc; frame-mounted, hard-wearing and interchangeable deflector plates; pto-driven (max. 1,000 rpm); slurry gate separating the load area from the spreading unit
Material feed	Hydraulic moving floor (4 chains with 90 channel-steel slats); (infinitely variable advance speed control)

The method

The test method is based on the DLG test framework “Organic fertiliser spreaders” and the DIN EN 13080 standard “Manure Spreaders – Environmental Protection Requirements and Test Methods”.

The distribution across rows is measured with the help of 50 cm x 50 cm x 10 cm trays that are placed next to each other transversely to the test course. Then the tractor spreader combination travels down this test course, spreading the material. As the next step, the material collected in the trays is weighed and related to the area spread to determine the spread pattern without overlaps. The quality of distribution is expressed by the coefficient of variation (CoV). This reflects the accuracy of spreading the material across the rows, taking into account the rate of overlaps as the machine matches up with the previous pass. The CoV curve shows the point at which the accepted CoV threshold is undercut and also the range of the optimum work widths (smallest possible CoV).

The distribution along rows is assessed by measuring the mass flow. This is done by continuously measuring the load changes on the stationary machine as it is being emptied. These measurements are used to compute the following parameters: typical spreading rate during unloading, dilation within the tolerance zone (percentage of unloading time during which the spreading rate is within the accepted tolerance range), the optimum overlap at match-up and the CoV at optimum overlapping levels.

The smaller the CoV and the greater the dilation inside the tolerance zone, the better the distribution quality.

Detailed account of the test results



*Fig. 2:
The mobile test stand for measuring the distribution across rows*



*Fig. 3:
BERGMANN TSW6240 W with V-Spread is unloading the material during the measurements on application along rows*

Test

The test was carried out in March 2022 on a harvested silage maize field in the Wolgast region (Mecklenburg-Western Pomerania). Figure 2 shows the mobile test stand set up for measuring the distribution across rows by collecting the material in trays placed on the ground. Figure 3 shows the stationary spreader during emptying. This part of the test measures the mass flow changes during the unloading process. This was done using the integral weighing cells of the spreader which were validated by the DLG test engineers before the test. The cattle manure applied had a dry matter content of 29.9 % and a bulk density of 736 kg/m³.

The spreader was operated by a Fendt Vario 936 and filled by a telehandler.

Setting up the spreader

The spreading rate of the BERGMANN TSW6240 W with V-Spread is controlled by three factors: the speed at which the moving floor advances, the degree to which the slurry gate is opened and the forward speed of the tractor. The feed rate of the moving floor is set steplessly between 0.2 m and 5 m per minute. The floor chains are driven by a hydro motor. The aperture of the slurry gate is also con-

trolled steplessly from the operator terminal. A slurry gate that is controlled relative to the distance travelled allows operators to enter the target aperture of the gate to the ISOBUS terminal and then retrieve the setting with a press of a button. The current position of the gate is indicated on the display screen and the information is used for controlling the application rate. If the spreader doesn't have ISOBUS, the operator reads the current position of the gate on a scale which is mounted on a headboard and shows heights from 0 to 1.7 metres (fig. 5).

The spreading system on the BERGMANN TSW6240W with V-Spread is pto powered (max. 1,000 rpm). The distribution across rows is controlled by the spreading discs which are arranged in chevron formation (the so-called V-Spread) (fig. 6). Each disc has six vanes, each of which can be set to one of seven positions or angles.

These adjustments are made manually by refitting an M12 screw in one of the seven holes for each vane. Which setting is suitable for which material is explained in the operators' manual.

The impact point on the discs is set with the help of a pendulum. The position of the pendulum in direction of travel (the impact point) is adjusted on a screw. The height of the pendulum and hence its distance from the discs is also variable. This is done hydraulically (optional) from the ISOBUS terminal and the current setting is indicated on the terminal display screen.

The manual also specifies the base settings for individual materials and various application rates. As the properties of the various materials usually vary greatly, operators are recommended to test the settings in an extra run and adjust them as necessary.

ExaRate

ExaRate is a rate compensating system which is integrated in the Isobus software. Its weighing cells measure continuously the changing load as the machine is being emptied. This information is sent to the software which compares the measurements with the default target application rate (t/ha).

This target rate is maintained by adjusting automatically the feed rate of the moving floor, thereby achieving an exact application rate despite varying conditions. ExaRate is also suitable for precision farming technology applications using application maps.



Fig. 4:
The CCI 1200 terminal for BERGMANN TSW 6240 W with V-Spread

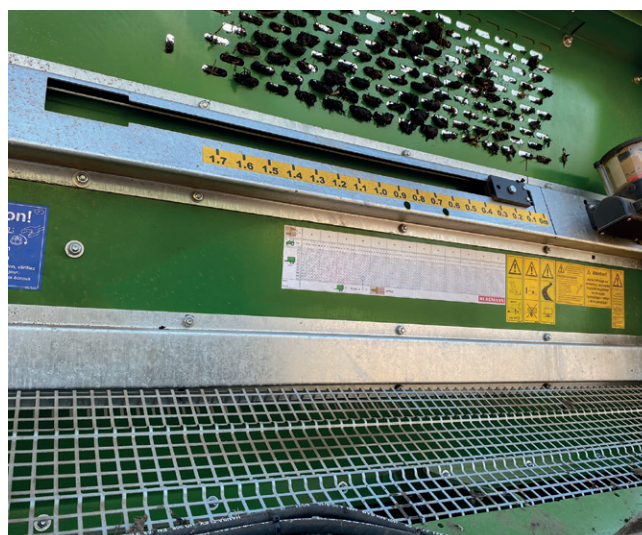


Fig. 5:
This scale on the headboard indicates the current aperture of the slurry gate upstream of the beaters

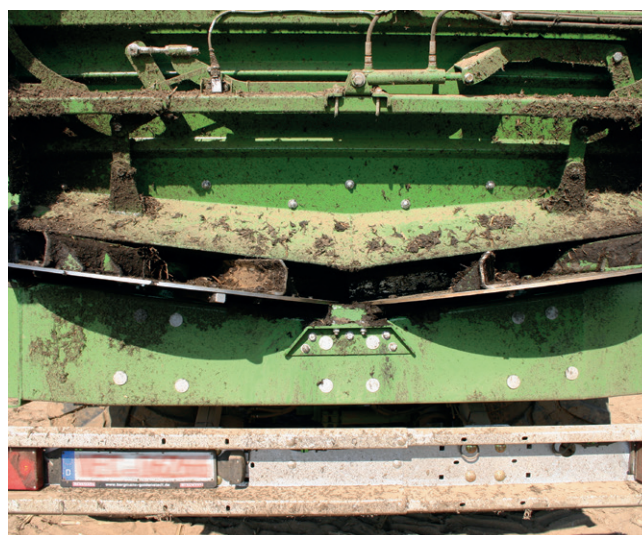


Fig. 6:
The V-Spread discs in chevron-style arrangement

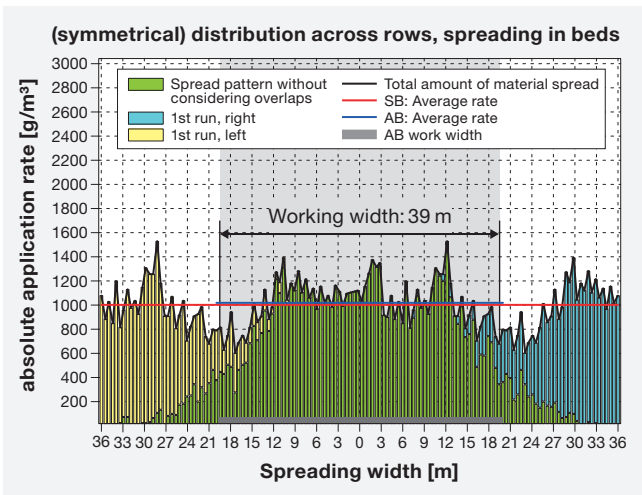
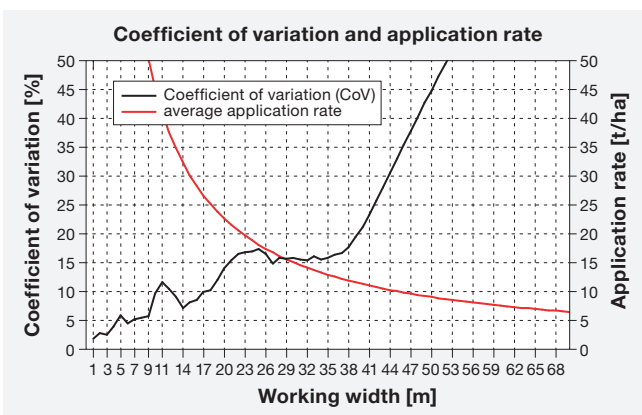


Fig. 7:
Manure spread patterns without and with overlaps;
the application rate is 10 t/ha



Settings
1st test run (no optimisation required)
Feed rate: 0.8 metres per minute
Pendulum: 3 mm/Pendulum position: forward
Vane settings per disc: 4 times in hole 1; 2 times in hole 3

Fig. 8
Coefficient of variation relative to the work width
when applying manure at 10 t/ha

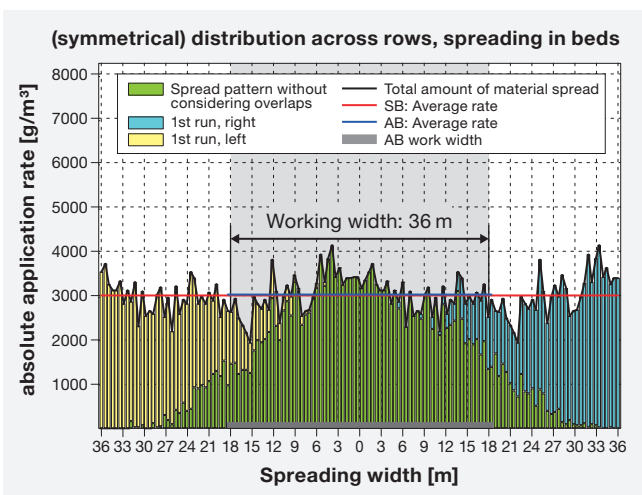


Fig. 9:
Manure spread patterns without and with overlaps;
the application rate is 30 t/ha

Distribution across and along rows spreading cattle manure

To apply manure at a rate of 10 t/ha and a workrate of 5.0 km/h and to accommodate further parameters and properties of the material, the advance rate of the floor chains was set to 0.8 m/min by the BERGMANN control unit. In the first run during which the work width was set to 39 metres, the CoV on the quality of distribution was smaller than 20 %.

Figure 7 shows the spread pattern for cattle manure applied at a rate of 10 t/ha without considering overlaps (distribution quality after two passes) and with considering overlaps.

The graph in figure 8 shows the relationship between the coefficient of variation and the work width for cattle manure spread at a rate of 10 t/ha. The CoV curve shows that the CoV is 9.9 % when the work width is set to 17 m. This CoV percentage is very good (+ +). The CoV is 19.4 % (satisfactory, O) when the machine is spreading at a width of 39 metres Only when the work width increases beyond 40 metres does the CoV exceed the 20 % line.

To apply manure at a rate of 30 t/ha and a workrate of 1.6 km/h and to accommodate further parameters and properties of the spread material, the advance rate of the floor chains was set to 1.0 m/min by the BERGMANN control unit. In the second test run in which the work width was set to 39 metres, the CoV on the quality of distribution was smaller than 20 %.

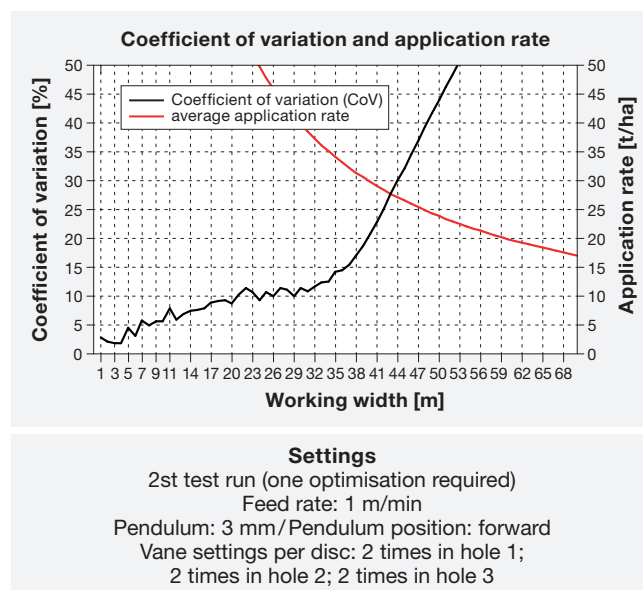


Fig. 10:
Coefficient of variation relative to the work width
in muck spread at a rate of 30 t/ha

Figure 9 shows the spread pattern for cattle manure applied at a rate of 30 t/ha without considering overlaps (distribution quality after two passes) and with considering overlaps.

The graph in figure 10 shows the relationship between the coefficient of variation and the work width for cattle manure applied at a rate of 30 t/ha. The CoV curve shows that the CoV is 10 % when the work width is set to 26 metres. This CoV percentage is very good (+ +). The CoV is 14.4 % (good, +) when the machine is spreading at a width of 36 metres. Only

when the work width increases beyond 40 metres does the CoV exceed the 20 % line.

Assessing the quality of distribution of muck along rows, the computed coefficients of variation at both rates were 5.4 % at 10 t/ha (very good (+ +)) and 6.7 % at 30 t/ha (very good, + +). The dilation within the tolerance zone was 84.3 % (very good, + +) when spreading muck at 10 t/ha and 82.9 % (very good, + +) when spreading muck at 30 t/ha. The results in the test on application along rows are shown in figures 11 and 12.

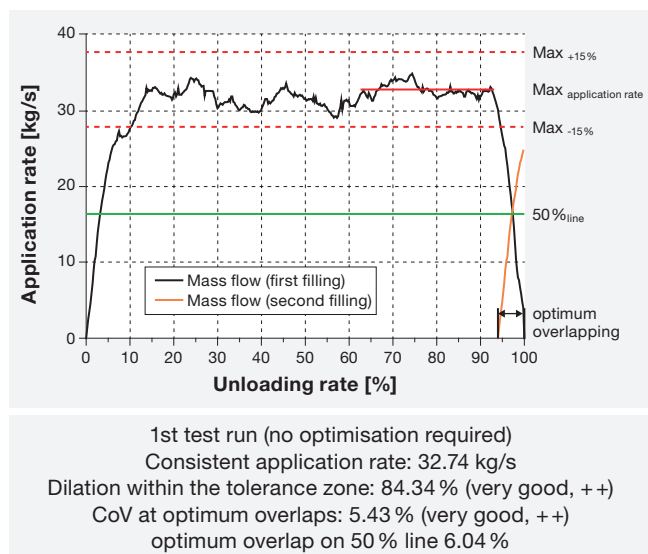


Fig. 11:
Application of cattle manure along rows (10 t/ha) using ExaRate

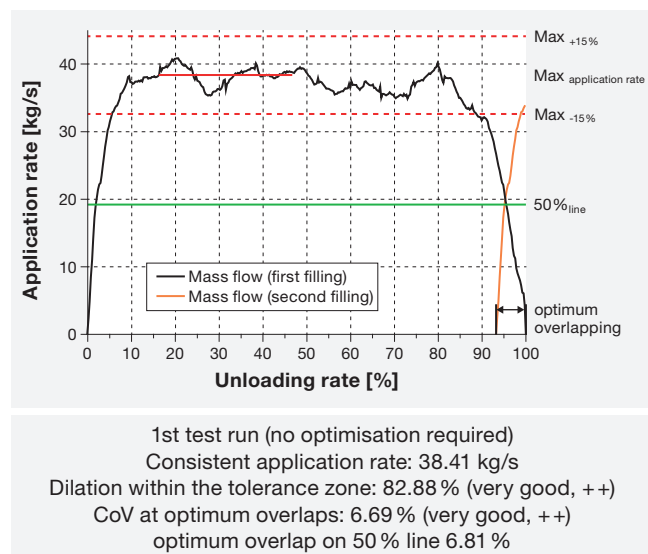


Fig. 12:
Application of cattle manure along rows (30 t/ha) using ExaRate

Summary

The DLG test measured the universal spreader BERGMANN TSW6240W with V-Spread in cattle manure applying the material at rates of 10 t/ha and 30 t/ha. All tests on the accuracy of distribution across rows produced coefficients of variation of less than 20 %. Spreading cattle manure at a rate of 10 t/ha, the quality of distribution across rows was very good (+ +) when the work was 17 m and satisfactory (○) when the work width was 39 m. Spreading cattle manure at a rate of 30 t/ha, the distribution across rows was very good (+ +) at a work width of 26 m and good (+) at a work width of 36 metres.

The results in the DLG tests on the quality of distribution of cattle manure along rows at rates of 10 t/ha and 30 t/ha are all very good (+ +). The dilation within the tolerance zone was 84.34 % (very good (+ +)) when the application rate was 10 t/ha. The coefficient of variation was 5.43 % (very good, + +) when overlapping was optimal. The dilation within the tolerance zone was 82.88 % (very good (+ +)) when the application rate was 30 t/ha. The coefficient of variation was 6.69 % (very good, + +) when overlapping was optimal.

The manual specifies the base settings for various materials and application rates. As the properties of the various materials usually vary greatly, operators are recommended to test the settings in an extra run and adjust them as necessary.

Based on the above test results, the BERGMANN TSW6240W with V-Spread universal spreader is awarded the DLG APPROVED quality mark after passing the partial test 'Quality of distribution in cattle manure' in 2022.

Further information

Testing agency

DLG TestService GmbH,
Gross-Umstadt test site, Germany

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

DLG test framework

Manure spreaders and secondary nutrient fertiliser
spreaders (effective from May 2020)

The DLG panel of experts

Prof. Hans W. Griepentrog, University of Hohenheim

Prof. Nils Fölster, University of Osnabrück

Dr. Harm Drücker, Chamber of Agriculture of Lower
Saxony

Dr. Horst Cielejewski, Chamber of Agriculture of
North Rhine-Westphalia

Dr. Fabian Lichti, State Institute of Agriculture Bavaria

Peter Seeger (farmer), Otzberg

Frank Reith (farmer), Groß-Umstadt

Sven Schneider (farmer and contractor), Brensbach

Department

Agriculture

Division head

Dr. Ulrich Rubenschuh

Test engineer(s)

Dipl.-Ing. agr. Georg Horst Schuchmann *

* Author

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.

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Internal test code DLG: 2204-0005

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DLG TestService GmbH
Groß-Umstadt location

Max-Eyth-Weg 1 • 64823 Groß-Umstadt • Germany

Phone: +49 69 24788-600 • Fax: +49 69 24788-690

Tech@DLG.org • www.DLG.org

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