

Kuhn S.A.

Sitera 3000 20DS mechanical mounted seed drill

Work quality

DLG Test Report 6149 F



Manufacturer and applicant

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Brief description

- Sitera mechanical seed drill (working width: 3.00 m), mounted on an HR 304 rotary harrow
- Suitable for sowing in ploughed areas and areas with conservation tillage
- 20 double disc coulters with parallelogram mounting, arranged in two rows with rubber pressure rollers, coulters clearance: 35 cm, row spacing: 15 cm
- Centralised, mechanical coulters-pressure adjustment can be adjusted at the right and left via the height of the coulters bars, as well as individually for each coulters in five stages using a spring
- Quick to change from large to small seeds and allows adaptation to various seed quantities through adjustment of the metering opening and continuous adjustment of the gear ratio on the variable speed gearbox
- Driven by a land wheel on the left side
- Two-section metering shaft with half-width shut-off
- Seed hopper with 780 l volume, volume of seed hopper can be expanded to 1,080 l with a hopper extension
- Covering harrow
- Machine is available with pre-emergence marking (this was not tested, however)
- Standard lighting installation
- Four red/white-striped marker boards (two signs pointing backwards, two facing forwards) (this equipment was not tested, however)
- Quantron SV electronic control and monitoring unit with B/W display

Assessment – summary

Test stand results with wheat, barley and oilseed rape

Test criterion	Test result
Seed rate reliability for wheat	deviation of actual application rate from calibrated rate: low to very low
Lateral distribution for wheat	good to very good
Seed rate reliability for barley	deviation of actual application rate from calibrated rate: very low
Lateral distribution for barley	good
Seed rate reliability for oilseed rape	deviation of actual application rate from calibrated rate: very low
Lateral distribution for oilseed rape	very good

Field results of wheat sowing

Test criterion	Test result
Field emergence	very good
Longitudinal distribution of plants	very good
Seed rate reliability	deviation of actual application rate from calibrated rate: very low

Field results for oilseed rape sowing

Test criterion	Test result
Field emergence	very good
Longitudinal distribution of plants	good
Seed rate reliability	deviation of actual application rate from calibrated quantity: very low

DLG ASSESSMENT SCALE

Field emergence	[%]	Quantity reliability	Deviation from the desired quantity [%]
Very good	> 90	Very low	up to 2.5
Good	> 80 to 90	Low	up to 5
Satisfactory	> 70 to 80	Acceptable	> 5 to 10
Adequate	> 60 to 70	High	> 10 to 15
Inadequate	> 60	Very high	> 15

Longitudinal distribution	Variation factor for grain and oilseed rape
Very good	< 0.9
Good	> 0.9 to 1.1
Satisfactory	> 1.1 to 1.3
Adequate	> 1.3 to 1.5
Inadequate	> 1.5

Transverse distribution	CV for grain, peas, grass	CV for oilseed rape
Very good	< 2.0	< 2.9
Good	2.0 to 3.2	2.9 to 4.7
Satisfactory	3.3 to 4.5	4.8 to 6.6
Adequate	4.6 to 6.3	6.7 to 9.4
Inadequate	> 6.3	> 9.4

Machine description and test criteria

The Sitera seed drill is intended to be mounted on a soil cultivation implement. In the test, the Sitera was mounted on the three-metre HR 304 rotary harrow with the integrated "STEELLINER" steel packer roller.

According to the manufacturer's information, the Sitera is suitable for sowing normal and small seed on ploughed areas and areas where conservation tillage has been applied. For the DLG Focus Test, the machine was tested for sowing oilseed rape and wheat with conservation tillage and on the test stand.

The tested drill has 20 seed rows with a row spacing of 15.0 cm over a working width of 3.0 metres. The machine was equipped with double disc coulters, mechanical coulters-pressure adjustment, trailing pressure rollers, mechanical harrow adjustment, a 780-litre seed hopper and the Quantron SV operator terminal. The Quantron SV operator

terminal provides numerous functions, such as assistance in calibration tests, level monitoring of the seed hopper and monitoring of the metering shaft rotation.

Both side markers are attached to the rotary harrow.

The test was conducted from July 2013 to October 2013.

For the oilseed rape, a Fendt Vario 716 with an engine power of 118 kW (160 PS) was used as the towing vehicle. Wheat, on the other hand, was sown using a Fendt Vario 724 with a power of 174 kW (237 PS).

Required tractor

It is essential to observe the permissible axle loads and to ensure sufficient ballast on the front axle. With an empty seed hopper, the total weight determined for the drill combination was 2,870 kg (with track eradicator tines, without pre-emergence markers).

Based on the DLG testing framework for seed drills, the seed rate reliability and lateral distribution were determined on the test stand for:

- wheat (on a slope and on level ground),
- barley (on level ground),
- oilseed rape (on level ground).

The volume of the seed hopper was also determined on the test stand.

Furthermore, the field emergence, uniform depth placement of the seeds, seed soil coverage, longitudinal plant distribution and seed rate reliability were tested during field operations with conservation seeding of rape and winter wheat.

The following varieties were used in the field test:

- "Basalti" oilseed rape (thousand grain weight: 6.8 g)
- "Colonia" winter wheat (thousand grain weight: 42.9 g)

Test stand results

Lateral distribution

The lateral distribution was determined on the DLG test stand with a stationary machine. For this purpose, the seed drill's land wheel is turned using an external drive. In accordance with the DLG testing framework, the application of oilseed rape was simulated over 1/10 ha at a driving speed of 8 km/h and the application of barley and wheat over 1/40 ha each (also at a speed of 8 km/h). The test is carried out in a level position for oilseed rape and barley. For wheat, sowing is additionally carried out on a simulated slope. To achieve this, the seed drill is moved into a tilted position on the test stand.

The measured distribution accuracy transverse to the direction of travel (lateral distribution) is characterised by the coefficients of variation (CVs). The calculated CVs are listed

in the right-hand column of Table 1 (Page 4). All tested varieties are assessed as "good" or "very good". Even with the machine on a slope of 11° (20%), the lateral distribution for wheat is assessed as "good" or "very good".

Seed rate reliability

The seed rate reliability is also determined on the DLG test stand.

In accordance with the DLG testing framework, the application is simulated with oilseed rape to 1/10 ha and with barley and wheat to 1/40 ha. Here, the seed drill's land wheel is turned using an external drive. Speeds of 8 km/h and 12 km/h are simulated. For wheat, the seed hopper is partially filled with 100 kg and 300 kg. For barley it is filled with 70 kg of seed and for oilseed rape with 7 kg. For oilseed rape and barley, the test is

conducted in a level position. For wheat, the seed drill is additionally moved into a tilted position. This simulates driving on a slope.

For oilseed rape and barley, the deviation from the calibrated rate was very low. For wheat, the deviation was mainly very low. The individual results are shown in Table 2 (Page 4).

Volume of the seed hopper

In addition to the lateral distribution and seed rate reliability, the actual volume of the seed hopper is also determined on the test stand. For this purpose, the hopper is filled with a granular material of known density. The volume of the hopper is calculated using the mass difference (mass of the machine with empty/full hopper) and the density of the granular material. The volume was found to be 784 litres.

Table 1:
Seed distribution accuracy transverse to the direction of travel (lateral distribution) on the test stand
(driving speed: 8 km/h)*

Distribution accuracy (lateral distribution)						
Seeds	Thousand grain weight [g]	Hopper fill level [kg]	Area [ha]	Calibrated application rate [kg/ha]	Position and slope of the machine	Coefficient of variation (CV)** [%]
Wheat	55.0	100	1/40	165.0	level	2.4
Wheat	55.0	100	1/40	165.0	20% to the right	2.0
Wheat	55.0	100	1/40	165.0	20% to the left	2.2
Wheat	55.0	100	1/40	165.0	20% forwards	1.9
Wheat	55.0	100	1/40	165.0	20% backwards	2.8
Barley	41.0	70	1/40	125.0	level	2.8
Oilseed rape	5.3	7	1/10	2.7	level	2.4

Table 2:
Application accuracy of the seeds (seed rate reliability) in the laboratory (driving speeds: 8 km/h and 12 km/h)*

Seed rate reliability (application accuracy in relation to slope, driving speed and hopper fill level)							
Seed	Speed [km/h]	Hopper fill level [kg]	Area [ha]	Calibrated application rate [kg/ha]	Position and slope of the machine	Actual application rate [kg/ha]	Deviation [%]
Wheat	8	100	1/40	165.0	level	162.2	-1.7
Wheat	12	100	1/40	165.0	level	162.2	-1.7
Wheat	8	300	1/40	165.0	level	165.0	0.0
Wheat	12	300	1/40	165.0	level	165.8	0.5
Wheat	8	100	1/40	165.0	20% to the right	160.6	-2.7
Wheat	12	100	1/40	165.0	20% to the right	162.0	-1.8
Wheat	8	300	1/40	165.0	20% to the right	163.8	-0.7
Wheat	12	300	1/40	165.0	20% to the right	165.6	0.4
Wheat	8	100	1/40	165.0	20% to the left	165.6	0.4
Wheat	12	100	1/40	165.0	20% to the left	161.6	-2.1
Wheat	8	300	1/40	165.0	20% to the left	162.8	-1.3
Wheat	12	300	1/40	165.0	20% to the left	164.8	-0.1
Wheat	8	100	1/40	165.0	20% forwards	161.0	-2.4
Wheat	12	100	1/40	165.0	20% forwards	165.4	0.2
Wheat	8	300	1/40	165.0	20% forwards	162.0	-1.8
Wheat	12	300	1/40	165.0	20% forwards	166.0	0.6
Wheat	8	100	1/40	165.0	20% backwards	170.4	3.3
Wheat	12	100	1/40	165.0	20% backwards	166.4	0.8
Wheat	8	300	1/40	165.0	20% backwards	170.0	3.0
Wheat	12	300	1/40	165.0	20% backwards	167.8	1.7
Barley	8	70	1/40	125.0	level	123.9	-0.9
Barley	12	70	1/40	125.0	level	126.4	1.1
Oilseed rape	8	7	1/10	2.7	level	2.745	1.7
Oilseed rape	12	7	1/10	2.7	level	2.700	0.0

* See assessment scale on Page 2

** The coefficient of variation (CV) is a measure of how strongly the grain quantity delivered by the individual coulters deviates from the average. The smaller the CV, the more uniform the distribution.

Field results of wheat sowing

The wheat was sown on 27th September at a location where the soil type is characterised as "sandy loam". The previous crop was oilseed rape. Following the oilseed rape harvest, the oilseed rape stubble was mulched and the area was then shallow-cultivated with a disc harrow (to a depth of approx. 5 to 8 cm). Three days before sowing, the soil was cultivated again with a seedbed combination (also to a depth of approx. 5 to 8 cm). Sowing was performed at a driving speed of approx. 9 km/h. The soil surface had dried out on the day of sowing; moist soil layer approx. 2 centimetres below the surface. Four days after sowing, 12 mm of precipitation fell. This meant that sufficient moisture was available for the wheat seeds to germinate and for shoots to emerge.

Field emergence

The field emergence was determined three weeks after sowing.

To determine the field emergence, the plants are counted at 20 positions on the plot (in each case over one square metre). Then, the average is calculated from the 20 individual values and the field emergence is determined. The field emergence (%) is calculated by dividing the calculated average by the total number of grains deposited per square metre, multiplied by 100.

The field emergence was determined at 97 per cent, which is assessed as "very good" according to the DLG assessment scale (see Page 2, assessment scale for field emergence).

Figure 2 shows the field emergence three weeks after sowing.

Depth placement of the seeds and seed coverage

During sowing, a grain placement depth of approx. 2.5 cm is configured on the seed drill. In order to assess the uniform depth placement of the grains, 50 consecutive plants are uncovered three weeks after sowing. Then, the length of the

hypocotyl below the soil surface is measured.

The measured values lay between 1.1 cm and 3.3 cm. The standard deviation is 0.6 cm. All measurements, including the standard deviation, are listed in Table 3 (Page 6).

At the time of sowing, all seeds were covered with sufficient soil.

Longitudinal distribution

The distribution of the plants along the row in the direction of travel (longitudinal distribution) was determined three weeks after sowing.

For this purpose, a tape measure is laid out along a row of seeds that is representative of the machine's mode of operation. Then, the plants that lie in the respective 5 cm long sections are counted. The plants are counted in this way over a length of 15 metres. The values for the plants counted in sections are then used to calculate the so-called variation factor (dispersion index), which allows a recognised statement to be

made of the uniformity of the plants in the row.

The variation factor was 0.81 in the DLG test. According to the DLG assessment scale, this variation factor, which describes the quality of the longitudinal distribution, is assessed as "very good" (see Page 2, assessment scale for longitudinal distribution).

Seed rate reliability

The seed rate reliability of the "Sitera" seed drill was checked during the sowing of wheat.

To check the seed rate reliability, the seed present in the seed hopper is weighed before each plot is started and after it is completed. Then, the percentage deviation is calculated between the actual application rate and the calibrated desired rate.

The deviation was 1.2%. According to the DLG assessment scale, this deviation is assessed as "very low". All results are shown in detail in Table 4.



Figure 2:
Emerging wheat, 3 weeks after sowing

Table 3:
Length of hypocotyl below soil surface for the individual plants

Plant no.	Length [cm]	Plant no.	Length [cm]	Plant no.	Length [cm]	Plant no.	Length [cm]
1	1.1	14	2.3	27	2.7	40	2.5
2	1.4	15	3.0	28	3.3	41	2.4
3	2.0	16	1.4	29	3.0	42	2.1
4	1.6	17	1.6	30	3.0	43	2.7
5	1.7	18	2.6	31	2.6	44	2.0
6	1.6	19	1.9	32	2.9	45	2.7
7	1.7	20	2.1	33	1.9	46	2.7
8	2.1	21	1.9	34	1.1	47	2.8
9	2.7	22	1.5	35	2.2	48	3.1
10	1.9	23	1.6	36	2.6	49	2.5
11	2.0	24	1.6	37	2.5	50	2.7
12	1.8	25	2.8	38	2.1	Standard deviation [cm] 0.6	
13	2.7	26	2.6	39	2.6		

Table 4:
Application accuracy of the wheat seed (quantity reliability) in the field test*

Application accuracy of the seed (quantity reliability) in the field test								
Seed	Thousand grain weight [g]	Speed [km/h]	Hopper fill level [kg]	Area [ha]	Calibrated application rate [kg/ha]	Slope of machine	Actual application rate [kg/ha]	Deviation [%]
Wheat	42.9	approx. 9	250	1.67	128	level	126.5	-1.2

* See assessment scale on Page 2

Field results for oilseed rape sowing

Winter oilseed rape was sown on 30th August. The location is characterised by the soil type "slightly loamy sand". The plots were previously used for triticale. The straw from the previous crop was removed and the plots were then cultivated once to a shallow depth (approx. 8 cm) and once to a greater depth (approx. 12 cm). Sowing was performed at a driving speed of approx. 8 km/h. During sowing, the soil surface had dried out. Moisture was still present at a depth of approx. 2 cm. Six days after sowing, 8 mm of precipitation fell. Sufficient moisture was therefore available in the soil for germination and emergence.



Figure 3:
Field emergence of oilseed rape four weeks after sowing

Field emergence

Four weeks after the oilseed rape was sown, the field emergence was determined according to the method described above. It was found to be 90.4 per cent and is therefore assessed as "very good" according to the DLG assessment scale. Figure 3 shows the oilseed rape's field emergence four weeks after sowing.

Depth placement of the seeds and seed coverage

During sowing, the placement depth of the seeds and the seed coverage were determined. For this purpose, the seed drill is configured to a placement depth of 2 centimetres. The placement depth is then checked with a ruler.

In this check, it was determined that the seeds were predominantly placed at a depth of approx. 2 cm.

All of the sown oilseed rape grains were covered with sufficient soil.

Longitudinal distribution

The distribution of the plants along the row in the direction of travel (longitudinal distribution) was determined four weeks after sowing.

For this purpose, a tape measure is laid out along a row of seeds that is representative of the machine's mode of operation. Then, the plants that lie in the respective 15 cm long sections are counted. The plants are counted in this way over a length of 30 metres. The values for the plants counted in sections are then used to calculate the so-called variation factor (dispersion index), which allows a recognised statement to be made of the uniformity of the plants in the row.

The variation factor was 1.05 in the DLG test. This variation factor,

which describes the quality of the longitudinal distribution, is assessed as "good" according to the DLG assessment scale.

Seed rate reliability

The seed rate reliability was checked while sowing oilseed rape.

To determine the seed rate reliability, the seed present in the seed hopper is weighed before each plot is started and after it is completed. Then, the percentage deviation is calculated between the actual application rate and the calibrated desired rate. The deviation between the calibrated rate and actual application rate was 0.0%.

According to the DLG assessment scale, this deviation is assessed as "very low". The results are shown in Table 5.

Table 5:
Application accuracy of the oilseed rape seed (quantity reliability) in the field test*

Application accuracy of the seed (quantity reliability) in the field test								
Seed	Thousand grain weight [g]	Speed [km/h]	Hopper fill level [kg]	Area [ha]	Calibrated application rate [kg/ha]	Slope of machine	Actual application rate [kg/ha]	Deviation [%]
Oilseed rape	6.8	approx. 8	21.2	5.06	3.7	from level up to 9°/16%	3.7	0.0

* See assessment scale on Page 2

Test execution

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