

Kverneland

# Qualidisc compact disc harrow

Power requirements and work quality

## DLG Test Report 6110F



### Applicant and manufacturer

Kverneland Group  
Deutschland GmbH  
Coesterweg 25  
59494 Soest  
Germany  
Telephone: +49 (0)2921 3699-0  
Fax: +49 (0)2921 3699-408  
info.de@kvernelandgroup.com  
www.kverneland.com



DLG e.V.  
Test Center  
Technology and Farm Inputs

### Brief description

Mounted compact disc harrow for shallow and deeper stubble cultivation, seedbed preparation after ploughing, as well as for the incorporation of catch crops, with the following characteristics:

- 2-beam frame, 90 cm row spacing;
- Serrated, conical discs (diameter: 573 mm), 24 discs: 12 in the front, 12 in the rear, with individual suspension using rubber bearings;
- Total length: 2.74 meters;
- Parallelogram-guided side panels;
- Steel roller "Actipack" with an outer diameter of 560 mm, with a built-in knife bar;
- Three-point linkage cat. II/III;
- Working width: 3 meters

## Test Content

The tested tillage machine is offered by the manufacturer as a universal implement for shallow stubble cultivation, deeper stubble cultivation, seedbed preparation after ploughing, as well as for incorporation of catch crops.

In our test the Qualidisc was used in the following three processing stages: for shallow stubble tillage (at 12 km/h and 17 km/h), for deeper stubble tillage (at 12 km/h and 15 km/h) and for seedbed preparation after ploughing (at 14 km/h).

During the DLG FokusTest "Power requirements and work quality" the following parameters were determined with reference to the DLG test program for drawn tillage equipment:

- Traction power requirement
- Driving speed;
- Fuel consumption;
- Working depth;
- Profile of the ground surface

before and after the cultivation, as well as from the exposed cultivation horizon of the discs;

- Crumbling;
- Re-compacting;
- Straw incorporation.

Other criteria were not tested or evaluated.

The traction power requirement, operating speed and fuel consumption were measured with the modular measurement system of the DLG Test Center. A Fendt Vario 820 with 140 kW/190 hp (rated power) was used as the towing vehicle.

To depict the crumbling effect of the implement, the aggregate size distribution was measured and displayed in the cultivation layer.

The re-compacting was determined by the degree of the soil density. The soil density was calculated for each repeated cultivation pass at six positions using soil core samples.

For shallow stubble cultivation, soil core samples were collected down to a depth of 4.1 cm. For deeper stubble cultivation as well as for seedbed preparation, soil core samples were collected down to a depth of 8.2 cm.

The straw incorporation was repeated three times and evaluated in the middle of the cultivation track of the exposed soil profiles. The evaluation included a 5 x 5 cm grid in the cultivation horizon over a width of about 2 meters.

During the test days the soil moisture was also continuously measured through the evaluation of extracted soil samples.

The measuring trips were performed on a harvested wheat plot (soil type: silty loam). The straw was chopped by the straw walker combine.

## Description and technical data

Table 1:  
Technical data of the compact disc harrow

Technical data*	
Working width	3.00 m
Transport width	3.00 m
Number of discs – front	12
Number of discs – rear	12
Disc diameter	573 mm
Disc spacing	245 mm
Row spacing	900 mm
Frame height	794 mm
Weight with Actipack-Roller	2,096 kg
Number of double-acting hydraulic connections	1
Hitch	cat. II & III
Min. HP	90
Max. HP	200

\* Manufacturer's specifications

### Discs

The machine has two successive rows of 24 maintenance-free mounted discs with elastic rubber buffers, which cultivate the soil (12 conical discs in the first row, 12 conical discs in the second row). The cutting angle is fixed, but the offset between the front and rear disc row is variable and can be adjusted depending on the wear of the discs.

### Roller

The re-compacting of the cultivated soil is carried out by the "Actipack" trailing roller. The depth guidance of the discs is also performed via this roller, which is equipped with 24 rings. Between these rings there are strippers to remove any adherent soil, and there is also an adjust-

able knife bar to cut clods. The working depth can be adjusted hydraulically (Fig. 2). Working depths from 2 to 15 cm are possible according to the manufacturer.

### What is particularly striking

After hydraulically changing the working depth, several spacers (1 spacer = 1 cm working depth) are attached to the two lifting rods of the hydraulic cylinders (Fig. 2). Through this technique, a certain working depth can be easily adjusted again at a later point in time.

A plastic tube (to accommodate the manual) and a wrench are attached to the headstock. With the wrench, for example, it is possible to adjust the disc displacement. The plastic tube also contains an Allen wrench to adjust the knife bar on the roller.

The compact disc harrow is equipped as standard with vehicle lights. These include the rear lights and two white marker lights that



Figure 2:  
*Hydraulic adjustment of the working depth*

are attached on the front. All four lights are mounted on red and white striped warning signs. In addition, two warning signs are turned

to the side, one facing to the right and one to the left. A yellow reflector (cat's eye) is mounted on each side of the compact disc harrow.

## Test results

The testing of the Qualidisc compact disc harrow was conducted in August 2012. The test plot is very homogeneous and, according to the map of the official soil appraisers consists of the soil type "silty loam" with 72 soil points. On the two days before the measurements in total about 11 mm of rain fell. However, since the soil

was very dry before precipitation, the rain could be absorbed very well.

During the measurements, the soil moisture was between 17.1 % and 22.8%. Figure 3 shows the tilled soil after shallow stubble cultivation. Figure 4 shows the cultivated surface after the seedbed preparation on ploughed soil.

### Shallow stubble cultivation

The shallow stubble cultivation (average working depth in the three repetitions: 3.9 cm, 2.9 cm and 4.8 cm) was performed at an average working speed of 11.7 km/h. For this, the Qualidisc compact disc harrow required a traction performance of 51.2 kW.



Figure 3:  
*Cultivated surface attained with the Qualidisc with shallow stubble cultivation*



Figure 4:  
*Cultivated surface attained with the Qualidisc with seedbed preparation on ploughed soil*

For the stated speed this amounts to a ground coverage performance of 3.5 ha/h, excluding the turn-around time. The corresponding fuel consumption of the utilized measuring tractor was 6.5 l/ha.

The second type of shallow stubble cultivation (average working depth in the three repetitions: 3.4 cm, 6.3 cm and 3.1 cm) was performed at an average working speed of 16.6 km/h. For this, the Qualidisc required a traction performance of 91.5 kW. For the stated speed this amounts to a ground coverage performance of 5 ha/h, excluding the turn-around time. The corresponding fuel consump-

tion of the utilized measuring tractor was 7 l/ha.

Figure 5 shows the acquired profiles from the soil surface prior to cultivation and after cultivation, as well as from the exposed cultivation horizon of the discs. On the test plot with the heavy soil (silty loam, 72 soil points, soil moisture from 17.1 to 22.8%) small soil chunks occurred at regular intervals in the cultivation horizon of the discs (blue line) which were not cut off. The distance between the blue and the green line shows that after a pass, loose soil was distributed across the entire working width of the unit.

Densities of 0.96 g/cm<sup>3</sup> (at a driving speed of 11.7 km/h) and 0.97 g/cm<sup>3</sup> (at a driving speed of 16.6 km/h) were measured in the upper soil layer after cultivation.

At the time of cultivation the straw yield on the test area was 4.2 metric tons per hectare (dry weight). The straw distribution quality of the combine was assessed visually. It was discovered that there was more straw in the middle of the combine track than at the edge.

The assessments regarding the straw incorporation were performed centrally within the combine track. Figure 6 shows the straw incorporation. In the upper culti-

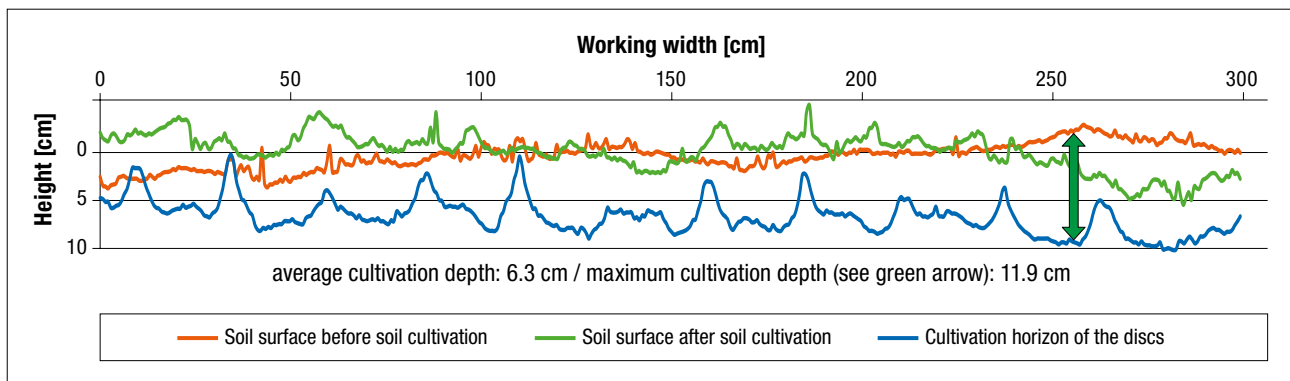


Figure 5: Measured values of the soil surface and the cultivation horizon with repetition of the shallow stubble cultivation

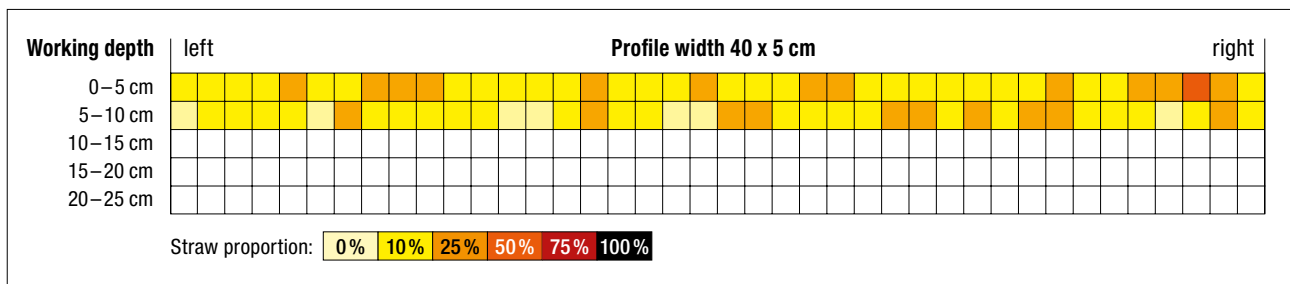


Figure 6: Evaluation of the straw incorporation with shallow stubble cultivation

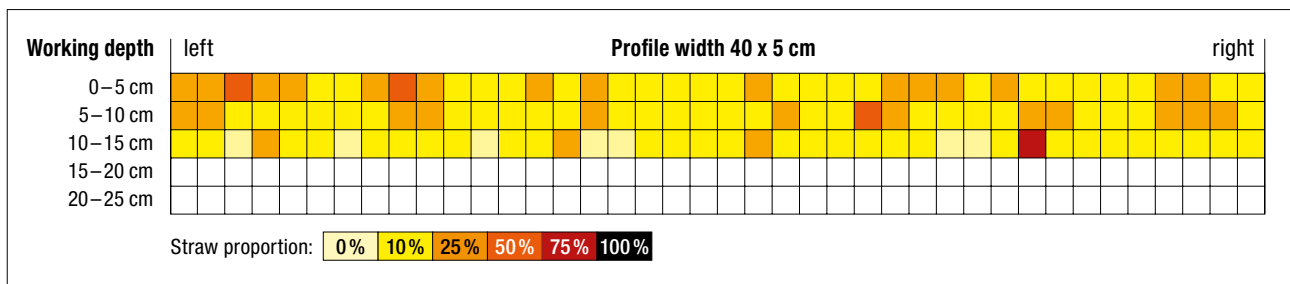


Figure 7: Evaluation of the straw incorporation with deep stubble cultivation

vation layer, within the boxes of the grid, evaluations were made with straw values of 10%, 25% and 50%. In the lower cultivation layer, evaluations were made with straw values of 0%, 10% and 25%.

In the shallow cultivation variant with the higher driving speed, a greater amount of straw could be detected in the second horizon. The reason for this is that due to the higher velocity there is a tendency for more intensive mixing of straw and soil.

### Deep stubble processing

For the deep stubble cultivation (average working depth in the three repetitions: 6.6 cm, 5.8 cm and 5.4 cm) the Qualidisc from Kverneland required traction power of 70.5 kW at an average working speed of 12 km/h. The theoretical ground coverage performance reached a value of 3.6 ha/h. The fuel consumption of the utilized DLG measuring tractor was 7.9 l/ha.

For deep stubble cultivation (average working depth in the three repetitions: 5.1 cm, 8.0 cm and 8.2 cm) passes at a speed of 14.8 km/h were additionally included. For this the mounted implement required traction power of 93.6 kW. The theoretical ground coverage performance for this variant was 4.4 ha/h. The measuring tractor consumed a fuel amount of 7.8 l/ha.

Figure 7 shows the straw incorporation during deeper stubble cultivation.

In the upper cultivation layer, evaluations were made with straw values of 10%, 25% and 50%. In the middle layer, evaluations were made with straw values of 10%, 25% and 50%. In the lower horizons, evaluations were made with values of 0%, 10%, 25% and 75%.

The soil density, which was determined by means of soil core sampling and at a speed of 12 km/h, was 0.94 g/cm<sup>3</sup> in the upper cultivation layer and 1.13 g/cm<sup>3</sup> in the lower cultivation layer (5 to 8 cm). At speed of 14.8 km/h soil density in the upper cultivation layer was at 0.93 g/cm<sup>3</sup>, and in the lower cultivation layer 1.17 g/cm<sup>3</sup>.

### Seedbed preparation after plowing

For seedbed preparation after plowing, the compact disc harrow requires traction power of 75 kW at an average speed of 13.8 km/h. At the operating speed specified here, a ground coverage performance of 4.1 ha/h was achieved. The fuel consumption under these circumstances was 8.2 l/ha.

The density of the soil during seedbed preparation was measured as 1.02 g/cm<sup>3</sup> in the upper cultivation horizon (0 to 4.1 cm) and 1.12 g/cm<sup>3</sup> in the lower cultivation horizon (4.1 to 8.2 cm).

For the seedbed preparation the compact disc harrow was used immediately after plowing. The

relatively heavy tractor left slight tracks on the highly loosened soil. Figure 8 shows the driving tracks (green line) in the two troughs. Due to these circumstances, the determined values should be considered as relative.

Directly after ploughing, the soil surface displays a height difference of 9.6 cm (distance between the highest peak and lowest trough, see blue arrow). Cultivation with the compact disc harrow levels the plough ground. The height difference after cultivation was 7.7 cm (green arrow). The re-compacting of the soil after ploughing (plough furrow 25 cm deep), is stated in terms of sagging. During the three repetitions of the seedbed preparation the sagging in terms of sagging 4.0 cm, 4.1 cm and 4.4 cm.

In table 2, the aggregate sizes of the different cultivation variants are shown. The weighted average diameter (WAD) of the crumbs for the plough variant was 25.2 mm before the seedbed preparation. The vast majority of the clods (18.87%) were of a size ranging between 10 to 20 mm. After the pass with the compact disc harrow the WAD dropped to only 11.43 mm. After cultivation, 68% of all clods had a size of up to 10 mm. Thus, there would have been sufficient fine-grained soil available for subsequent sowing (see also Figure 4).

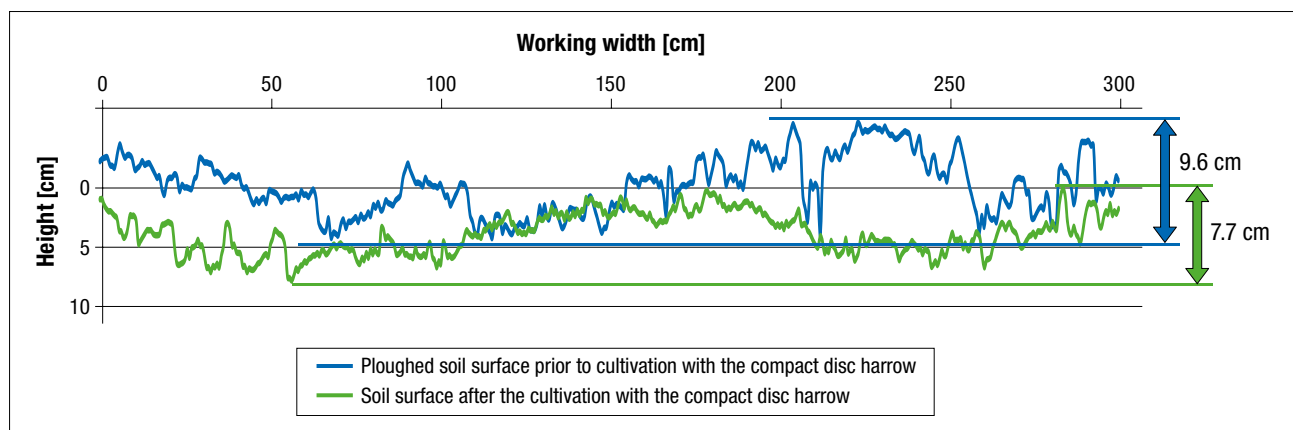


Figure 8: Surface appearance of the soil before and after cultivation with the Qualidisc

Table 2:

Aggregate size distribution and WAD on the test plot with the soil type "silty loam" and 72 soil points

Aggregate size	Plough variant		Shallow stubble cultivation		Deep stubble cultivation	
	before*	after*	11.7 km/h	16.6 km/h	12.0 km/h	14.8 km/h
< 2.5 mm	13.38 %	25.52 %	22.60 %	28.08 %	19.89 %	25.03 %
2.5 – 5 mm	16.46 %	22.90 %	19.15 %	21.00 %	18.69 %	20.36 %
5 – 10 mm	18.27 %	20.13 %	14.75 %	15.34 %	14.67 %	15.39 %
10 – 20 mm	18.87 %	16.22 %	13.82 %	13.36 %	13.38 %	13.18 %
20 – 40 mm	12.70 %	9.40 %	11.95 %	10.42 %	11.28 %	9.99 %
40 – 80 mm	9.80 %	5.82 %	9.48 %	7.88 %	11.21 %	10.05 %
> 80 mm	10.53 %	0.00 %	8.26 %	3.92 %	10.90 %	6.01 %
WAD**	25.20 mm	11.43 mm	21.71 mm	16.07 mm	25.06 mm	19.24 mm

\* before and after cultivation with the compact disc harrow

\*\* attained weighted average diameter

## Test

The test was conducted in August 2012 at the test center Tachenhausen of the Nürtingen-Geislingen University in collaboration with the Institute of Technology.

### Author of the report

Dipl.-Ing. agr.  
Georg Horst Schuchmann

### Project director

Dr. Ulrich Rubenschuh

### Test execution

DLG e.V. –  
Test Center Technology  
and Farm Inputs,  
Max-Eyth-Weg 1,  
D-64823 Gross-Umstadt



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DLG e.V. – Test Center Technology and Farm Inputs

Max-Eyth-Weg 1, 64823 Gross-Umstadt, Germany  
Telephone: +49 69 24788-600, Fax: +49 69 24788-690,  
Email: [Tech@DLG.org](mailto:Tech@DLG.org), Internet: [www.DLG.org](http://www.DLG.org)

Download all DLG test reports free of charge at: <http://www.dlg.org/testsagriculture.html>