2.

# Prüfstelle für Landmaschinen



***REPORT on test in accordance with OECD STANDARD CODE 2 for the Official Testing of Agricultural Tractor Performance***

**OECD No.2/1842**
***6th September 1999***

Agricultural Tractor

**JOHN DEERE 6410 AutoQuad (4WD)**

Manufacturer

DEERE & COMPANY
Moline, Illinois, USA

This is a report on a tractor test in accordance with OECD STANDARD CODE for the Official Testing of Agricultural Tractor Performance "Yellow Code", January 1998, Code 2 (Restricted Code).

It does not contain an evaluation of the tractor on practical work.

Duration of tests: November 1998 till May 1999

DLG-Testing Station for Agricultural Machinery, Max-Eyth-Weg 1,
D-64823 Groß-Umstadt

This report has been approved by the OECD Co-Ordinating Centre (CEMAGREF, France) as being in accordance with the OECD STANDARD CODE.

Date of approval: 6th September 1999

OECD No. 2/1842
Restricted Code

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In this report all performance characteristics are given corresponding to the International System of Units.

The reference to the former used Technical System of Units is given by the following relations:

| | | | | | |
|---|---|---|---|---|---|
| Forces | 1 kN | = | 1000 N | = | 102 kp |
| Powers | | | 1 kW | = | 1,36 PS |
| Pressures | 1 MPa | = | 10 bar | = | 10,2 kp/cm$^2$ |
| | 100 kPa | = | 1000 mbar | = | 750,10 mm Hg |

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**JOHN DEERE 6410 AutoQuad (4WD)** **DLG-Test No 99-223**

| | |
|---|---|
| Tractor manufacturer: Moline, Illinois, USA | DEERE & COMPANY |
| Location of tractor assembly: | D-68163 Mannheim |
| Submitted for test by: | JOHN DEERE Werke Mannheim D-68163 Mannheim |
| Selected by: | Manufacturer with agreement by DLG |
| Place of running-in: | Mannheim and Groß-Umstadt |
| Duration of running-in: | engine 57 h, tractor 32 h |
| Location of test: | DLG-Testing Station, D-64823 Groß-Umstadt |

## 1 SPECIFICATION OF TRACTOR

### 1.1 Identification

| | |
|---|---|
| - Make/Model/Type: | JOHN DEERE / M / 6410 A / wheel tractor, full frame design |
| - Type denomination: | JOHN DEERE 6410 AutoQuad (4WD) |
| - Number of driving- wheels: | 4 |
| - Serial No.: | 229445 |
| - 1st serial No.: | 202409 |

### 1.2 Engine

| | |
|---|---|
| Make/Model/Type: | JOHN DEERE / 4045TL053 water-cooled 4-stroke Diesel-engine, direct injection, supercharged, antivibration mounted |
| Serial no.: | 534852 |

#### 1.2.1 Cylinders

| | |
|---|---|
| Number/disposition: | 4 / in line |
| Bore/stroke: | 106.5 / 127 mm |
| Capacity: | 4525 $cm^3$ |
| Compression ratio: | 16.9 : 1 |
| Arrangement of valves: | Overhead valves |
| Cylinder liners: | Wet |

#### 1.2.2 Supercharging

| | |
|---|---|
| - Make/Model/Type: | GARRETT / MOD T 35004 / exhaust driven supercharger |
| - Pressure | 75 ± 1 kPa |

| | | |
|---|---|---|
| 1.2.3 | Fuel system | |
| | - Fuel feed system: | VDO electrical vane type fuel supply pump |
| | - Fuel filter | |
| | Make: | JOHN DEERE |
| | Type : | 1 replaceable paper element filter |
| | - Capacity of fuel tank: | 164 dm³ |
| | - Injection pump | |
| | Make/Model: | LUCAS / 8921A680W (JD No. RE 501 227) |
| | Type : | DP 201, distributor injection pump |
| | Serial no.: | 41074 ERG |
| | Manufacturer's production setting: | 72 - 78 mm³/stroke at full load and rated speed; |
| | Flow rate: | 19.9 - 21.5 dm³/h at 2300 min$^{-1}$ and full load |
| | Timing: | Static 0°, dynamic 6.5° before TDC |
| | - Injectors | |
| | Make/Model: | STANADYNE / 28485 |
| | Type : | Multi hole |
| | Injection pressure: | 24.5 ± 0.5 MPa |
| 1.2.4 | Governor | |
| | - Make/Model/Type: | LUCAS / - / electronically controlled variable speed governor with "cruise control", supercharge pressure compensating device |
| | - Governed range of engine speed: | 850 ± 25 to 2460 ± 50 min$^{-1}$ |
| | - Rated engine speed: | 2300 min$^{-1}$ |
| 1.2.5 | Air cleaner | |
| | - Pre-cleaner | |
| | Make/Model: | MANN & HUMMEL / - |
| | Type: | Cyclone type, incorporated in housing of main cleaner |
| | Location of air intake: | In front of engine, below bonnet |
| | - Main cleaner | |
| | Make/Model: | MANN & HUMMEL / PIKLON |
| | Type: | Dry paper element filter with safety cartridge |
| | - Maintenance indicator: | Warning light on dashboard |
| 1.2.6 | Lubrication system: | Pressure lubrication with engine oil/cooling water heat exchanger in engine block |
| | - Type of feed pump: | Gear pump |
| | - Type of filter: | Full flow |
| | - Number of filter: | 1 |

| | | |
|---|---|---|
| 1.2.7 | Cooling system | |
| | - Type of coolant: | Water cooling |
| | - Type of pump: | Impeller pump |
| | - Specification of fan | |
| | Number of fan blades: | 7 |
| | Fan diameter: | 550 mm |
| | - Coolant capacity: | 17.5 dm³ |
| | - Type of temperature control: | Thermostat and by-pass circuit, EATON viscous drive fan model 610, belt driven, variable fan speed controlled by air flow temperature |
| | - Superpressure system: | 70 ± 20 kPa |
| 1.2.8 | Starting system | |
| | - Make/Model/Type: | BOSCH / IF / electrical, solenoid pre-engaged drive starter motor 3.0 kW |
| | - Cold starting aid: | Heating spiral in air intake manifold |
| | - Safety device: | Forward/reverse lever in neutral position at engine shut off |
| 1.2.9 | Electrical system | |
| | - Voltage: | 12 V |
| | - Generator | |
| | Make/Model/Type: | BOSCH / 14V KC 70 - 115 A / 3-phase alternator |
| | Power: | 1680 W |
| | - Battery: | 1 lead acid battery, 110 Ah at 20 hours rating |
| 1.2.10 | Exhaust system | |
| | - Make/Model/Type: | EBERSPÄCHER / AL 82411 / single-chamber absorption type |
| | - Location: | Above engine, below bonnet, vertical stack, mouth showing upwards/forward |
| 1.2.11 | Operating hours meter | Electronic, counts real hours when engine is running |
| **1.3** | **Transmission** | Universally-jointed propeller shaft between engine and gearbox |
| 1.3.1 | Clutch (travel alone) | |
| | - Make/Model/Type: | JOHN DEERE / - / wet multi-plate |
| | - Diameter of discs: | 225 mm |
| | - Method of operation: | By pedal and reverser lever, mechanically, additionally assisted by low pressure hydraulic circuit |

1.3.2 Gear box

- Make/Model/Type: JOHN DEERE / AutoQuad, 40 km/h / mechanical
- Description: Power shifted speed change gear with 4 speeds, automatic shifting selectable, synchronized range gear with 6 ranges (A, B, C, D, E, F) and power shifted forward/reverse gear ("power reverser")
- Number of gears:

| | forward | reverse |
|---|---|---|
| no. of gears | 4 | 4 |
| no. of ranges | 6 | 6 |
| total | 24 | 24 |

1 range shift lever with 2 buttons for powershift, 1additional rocker switch for alternative power shifting, 1 rocker switch for automatic speed shift, 1 lever for power reverser left of steering wheel

- Available options: PowrQuad (16/16) 30 km/h without or with creeper gear (28/28, range D, E is locked)

  AutoQuad (36/36) 40 km/h with creeper gear (range D, E, F is locked)
- Lubrication: Forced-feed lubrication, oil cooler in front of engine's water cooler, 2 filters

1.3.3 Rear axle and final drives

- Make/Model/Type: JOHN DEERE / - / bevel gear drive with bevel gear differential and planetary final drives
- Differential lock
  - Type: Multi-plate
  - Engagement: By foot switch
  - Disengagement: By foot pedal of service brake

1.3.4 Front axle and final drives

- Make/Model/Type: ZF / APL 2035 / bevel gear drive with bevel gear differential and planetary final drives, hydropneumatic suspension, driven by wet multi plate clutch and propeller shaft in tractor's median plane, clutch electro-hydraulically operated by toggle switch through low pressure hydraulic circuit
- Differential lock
  - Type: Limited slip multi-plate type
  - Engagement: Automatic
  - Disengagement: Automatic

1.3.5 Total ratios and travelling speeds

| Range | Gear | Number of engine revolutions for one revolution of the driving wheels | Nominal travelling speed*) at rated engine speed 2300 min$^{-1}$ km/h |
|---|---|---|---|
| Forward Speeds | | | |
| A | 1 | 479.05 | 1.44 |
| | 2 | 397.57 | 1.73 |
| | 3 | 332.16 | 2.08 |
| | 4 | 271.14 | 2.54 |
| B | 1 | 189.71 | 3.63 |
| | 2 | 157.55 | 4.38 |
| | 3 | 131.54 | 5.24 |
| | 4 | 107.38 | 6.42 |
| C | 1 | 117.72 | 5.86 |
| | 2 | 97.70 | 7.06 |
| | 3 | 81.62 | 8.45 |
| | 4 | 66.63 | 10.35 |
| D | 1 | 71.34 | 9.66 |
| | 2 | 59.21 | 11.64 |
| | 3 | 49.47 | 13.93 |
| | 4 | 40.38 | 17.07 |
| E | 1 | 44.49 | 15.50 |
| | 2 | 36.92 | 18.67 |
| | 3 | 30.85 | 22.35 |
| | 4 | 25.18 | 27.38 |
| F | 1 | 30.39 | 22.68 |
| | 2 | 25.22 | 27.33 |
| | 3 | 21.07 | 32.71 |
| | 4 | 17.20 | 40.08 |
| Reverse Speeds | | | |
| A | 1 | 403.92 | 1.71 |
| | 2 | 335.22 | 2.06 |
| | 3 | 280.07 | 2.46 |
| | 4 | 228.62 | 3.02 |
| B | 1 | 159.94 | 4.31 |
| | 2 | 132.83 | 5.19 |
| | 3 | 110.91 | 6.22 |
| | 4 | 90.54 | 7.61 |
| C | 1 | 99.26 | 6.94 |
| | 2 | 82.37 | 8.37 |
| | 3 | 68.82 | 10.02 |
| | 4 | 56.18 | 12.27 |
| D | 1 | 60.16 | 11.46 |
| | 2 | 49.92 | 13.81 |
| | 3 | 41.71 | 16.53 |
| | 4 | 34.05 | 20.25 |
| E | 1 | 37.51 | 18.38 |
| | 2 | 31.13 | 22.14 |
| | 3 | 26.01 | 26.50 |
| | 4 | 21.23 | 32.47 |
| F | 1 | 25.62 | 26.90 |
| | 2 | 21.27 | 32.42 |
| | 3 | 17.77 | 38.80 |
| | 4 | 14.50 | 47.53 |

*) calculated with the radius index (ISO 4251-1:1992) 795 mm

Number of revolutions of front wheels for one revolution of rear wheels: 1.382

## 1.4 Power take-off

1.4.1 Main power take-off

- Type: Independent
- Method of engagement: Driven by wet multi-plate clutch with 197 mm dia; electrically-hydraulically operated by rotary switch through control valve, response of valve automatically controlled;
- Number of shafts: 1
- Method of changing power take-off shaft ends and speeds: Reversible shaft with 2 different stubs, speed shiftable by separate lever

1.4.1.1 Power take-off proportional to engine speed, 540, 540 E and 1000 $min^{-1}$

- Location: At rear of tractor
- Diameter of p.t.o. shaft end: 35 mm
- Number of splines: 6 (540 $min^{-1}$) , type 1
  21 (1000 $min^{-1}$), type 2
- Height above ground: 720 mm
- Distance from the median plane of the tractor: 0 mm
- Distance behind rear-wheel axis: 530 mm

| p.t.o. type | p.t.o. transmission ratio | p.t.o. speed $min^{-1}$ | engine speed $min^{-1}$ | power restriction kW |
|---|---|---|---|---|
| 540 | 3.9685 | 540<br>580 | 2143<br>2300 | - |
| 540 E*) | 3.1185 | 540<br>738 | 1684<br>2300 | |
| 1000 | 2.2080 | 1000<br>1042 | 2208<br>2300 | - |

*) "economic speed"

- Direction of rotation (viewed from behind tractor): Clockwise

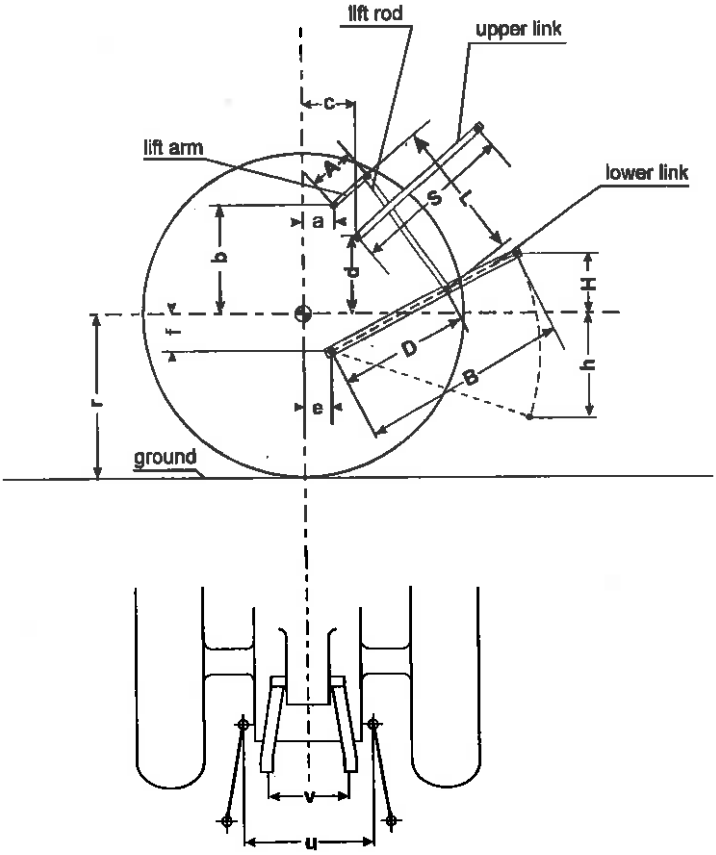
1.4.1.2 Power take-off proportional to ground speed: None

## 1.5 Hydraulic power lift

| | |
|---|---|
| - Make/Model/Type: | JOHN DEERE / - / electronically controlled hydraulic power lift, lower link sensing |
| - Type of hydraulic system: | Closed center, load sensing pressure and flow compensated system |
| - Type and number of cylinders: | 2 external cylinders single acting, 80 mm bore, 175 mm stroke |
| - Type of linkage lock for transport: | Hydraulic, lock of valve lever |
| - Relief valve pressure setting: | 19.2 to 20.7 MPa |
| - Opening pressure of cylinder safety valve: | 20.8 to 22.2 MPa |
| - Lift pump type: | VICKERS PVE 19 variable displacement axial-piston pump with 60 $dm^3$/min delivery at rated speed; optionally available: axial-piston pump with 96 $dm^3$/min delivery at rated speed |
| - Transmission between pump and engine: | Gear driven by transmission |
| - Type and number of filters: | 2 filters, 1 in feeding line of hydraulic pump, 1 on transmission housing |
| - Site of oil reservoir: | Transmission housing |
| - Type, number and location of tapping points: | 2, double acting, quick-action couplers at rear of tractor |
| Maximum volume of oil available to external cylinders: | 25 $dm^3$stationary<br>15 $dm^3$ driving |

**1.6 Three-point linkage:**

- Category: 2, in conformity with category 2 of ISO 730-1/1994, WALTERSCHEID quick couplers
- Category adapter: None



| Dimensions of rear implement linkage | | | projected lengths in mm dimensions (general) | test-dimensions page 25 | test-dimensions page 31 |
|---|---|---|---|---|---|
| Rear tyres 540/65 R 38<br>Front tyres 480/65 R 24 | | (r) *)<br>(r') *) | 795<br>590 | | |
| Length of lift arms | | (A) | 305 | 305 | 305 |
| **Length of lower links** | | **(B)** | **945** | **945** | **945** |
| Distance of lift arm pivot points from rear wheel axis | horizontal<br>vertical | (a)<br>(b) | 170<br>475 | 170<br>475 | 170<br>475 |
| Horizontal distance between lower link pivot points | | (u) | 478 | 478 | 478 |
| Horizontal distance between lift arm end points | | (v) | 535 | 535 | 535 |
| Length of upper link | | (S) | 530 to 725 | 650 | 645 |
| Distance of upper link pivot point from rear wheel axis | horizontal<br>vertical | (c)<br>(d) | 432, 442, 452<br>183, 253, 323 | 452<br>183 | 432<br>322 |
| Distance of lower link pivot points from rear wheel axis | horizontal<br>vertical | (e)<br>(f) | 135<br>225 | 135<br>225 | 135<br>225 |
| Distance of lower link pivot points from lift rod pivot points on lower links | | (D) | 503, 560 | 503 | 560 |
| **Length of lift rods** | | **(L)** | **710 to 865** | **800** | **710** |

Heights (h, H, H') of lower link hitch points relative to rear wheel axis (situated 795 mm above ground), at different adjustments of L and D

These data are valid for unloaded power lift

| Length of lift rods | (L) | 710 | | 800 | 865 | |
|---|---|---|---|---|---|---|
| Linkage distance of lift rods | (D) | 503 | 560 | 503 | 503 | 560 |
| Lowest position | (h) | 400 | 350 | 595 | 795 | 645 |
| Highest position | (H) | 230 | 220 | 65 | -65 | -45 |
| Transport position | (H') | 230 | 220 | 65 | -65 | -45 |

*) Assuming r resp. r' = tyre dynamic radius index of ISO 4251-1/1992

| | | |
|---|---|---|
| **1.7** | **Swinging drawbar** | None, available |
| **1.8** | **Trailer hitch** | |
| | Make/Model/Type | ROCKINGER / 850 R / automatic, remote control |
| | Hole diameter: | 30 mm |
| | - Height above ground: | Centre of clevis adjustable in 9 steps to 443/482/530/593/657/766/820/882/940 mm |
| | - Distance of hitch point from rear-wheel axis, horizontal: | 730 mm |
| | - Distance of hitch point from power take-off shaft end | |
| | Vertical | below 277/238/190/132/63 mm |
| | | above 46/100/162/220 mm |
| | Horizontal | 178 mm |
| | - Maximum vertically permissible load: | 20.0 kN |
| **1.9** | **Holed drawbar** | None, available |

| | | |
|---|---|---|
| **1.10** | **Steering** | |
| | - Make/Model/Type: | JOHN DEERE and DANFOSS / - / hydrostatic |
| | - Method of operation | |
| | Pump: | Steering system connected to main hydraulic circuit |
| | Ram: | 1 integrated cylinder of symmetrical design; 224 mm stroke, 70 mm bore, 36 mm piston rod |
| | - Working pressure: | 18.5 MPa |
| **1.11** | **Brakes** | |
| 1.11.1 | Service brake: | |
| | - Make/Model/Type: | JOHN DEERE / - / power assisted / muscle power braking with hydraulic transmission |
| | - Method of operation: | Pedal operated, acting on rear wheels, front axle drive is automatically engaged when braking, oil-immersed disc brake with 1 ring-piston on each differential half shaft, disc 317 mm dia |
| | - Trailer braking take-off: | None |
| 1.11.2 | Parking brake | |
| | - Type: | Parking lock of transmission |
| | - Method of operation: | Range gear lever in „P"-position |
| | and | |
| | - Type: | Mechanical, separate band brake in gear box |
| | - Method of operation: | Hand lever with ratchet |

**1.12 Wheels**

- Number

| | |
|---|---|
| Front: | 2, driving and steering |
| Rear. | 2, driving |

- Wheelbase: 2400 mm

- Track width adjustment:

| | Minimum mm | Maximum mm | Adjustment method |
|---|---|---|---|
| Front | 1720 | 2016 | adjustable bowl wheels and spacers |
| Rear | 1716 | 1916 | |

1.12.1 - Possible combinations of tyres sizes

| Front | Rear |
|---|---|
| 380/70 R 28<br>420/70 R 24 | 480/70 R 38 |
| 12.4 – 28 (D/R) | 14.9 – 38 (D/R) |
| 420/70 R 28<br>14.9 – 28 (D/R)<br>380/85 R 28<br>16.9 – 24 (D/R)<br>420/85 R 24<br>13.6 – 28 (D/R)<br>340/85 R 28<br>14.9 – 24 (D/R)<br>380/85 R 24 | 18.4 – 38 (D/R)<br>460/85 R 38 |
| 480/65 R 24 | 540/65 R 38 |
| 540/65 R 28<br>480/65 R 28 | 600/65 R 38 |
| 420/70 R 28<br>480/70 R 24<br>380/70 R 28<br>420/70 R 24 | 520/70 R 38 |
| 13.6 – 28 (D/R)<br>340/85 R 28<br>12.4 – 28 (D/R)<br>320/85 R 28<br>14.9 – 24 (D/R)<br>380/85 R 24 | 16.9 – 38 (D/R)<br>420/85 R 38 |

D: diagonal type R: radial type

## 1.13 Protective structure

- Make/Model/Type: JOHN DEERE / SG 048 (1997) with integrated safety frame RG 017 / safety cab
- Manufacturer's name and address: DEERE & COMPANY, Moline, Illinois, USA
- Protective device: Cab, mounted by antivibration silent-blocks, for service (repair) by separate device tiltable to the side
- OECD approval
  - Approval number: 4/0452/1
  - Date of approval: 8th February 1999
  - Minor Modification Certificate: None
- Noise reduction materials

| | | |
|---|---|---|
| Roof: | Foam with perforated vinyl-coating on carrier board | 23 mm |
| Steering column and instrument panel: | Moulded plastics and sheet metal | |
| A-posts, C-posts and upper part of rear wall: | Vinyl foam foil with hard foam substrat | 9 mm |
| B-posts: | Plastics | 6 mm |
| Rear wall, sheet metal: | Composite material and sound barrier | 9 mm |
| Floor: | Moulded rubber mat<br>partially | 35 mm<br>8 mm |
| Seat support: | Moulded rubber mat | 8 mm |
| Bulk head (engine side): | Foam with alu-foil | 10 mm |
| Left hand fender: | Foam with vinyl-coating plus substrate | 5 mm |
| Right hand fender: | Foam with vinyl-coating | 25 mm |

- Heating/ventilation: Combined heating/ventilation system with air conditioner and 4-step blower, cooling-water heat exchanger below cab's floor, air intake at left and right above side windows
  air outlet jets and defroster louvers in the steering console, 2 recirculation louvers behind the seat

## 1.14 Seat

1.14.1 Driver's seat

- Make/Model: Grammer / MSG 95 / 731
- Type: Upholstered seat with back rest
- Seat and steering wheel reversible: No
- Type of suspension: Pneumatic suspension
- Type of damping: Hydraulic
- Range of adjustment

| | | |
|---|---|---|
| Longitudinally: | | 195 mm |
| Vertically: | above platform | 380 to 565 mm |

- Safety belt: Yes

1.14.2 Optional driver's seats: Available

1.14.3 Passenger seat: optionally available with or without suspension

## 1.15 Lighting

Electrical, 12 Volt

| | Height above ground of centre<br>mm | Size<br>mm | Distance from outside edge of lights to median plane of tractor<br>mm |
|---|---|---|---|
| Headlights | 1280 | 162x101 | 225 |
| Additional upper headlights (2 pairs) | 2626 | 130x55 | 440/280 |
| Sidelights | 1665 | 110x35 | 828 |
| Rearlights | 1680 | 210x48 | 884 |
| Reflectors 1st pair | 1680 | 210x48 | 884 |
| Reflectors 2nd pair | 870 | ∅ 72 | 515 |

## 2. TEST CONDITIONS

### 2.1 Overall dimensions

| Length mm | Width mm | Height at top of protective structure mm | Height at top of exhaust silencer pipe mm |
|---|---|---|---|
| 4260 | 2220 | 2700 | 2700 |

### 2.2 Ground clearance 480 mm

- Clearance-limiting part: Bracket of trailer hitch

### 2.3 Tractor mass Unballasted (with cab)

| | Without driver kg | With driver kg |
|---|---|---|
| Front | 1950 | 1960 |
| Rear | 2980 | 3045 |
| Total | 4930 | 5005 |

### 2.5 Tyres and track widths specifications

| | Front | Rear |
|---|---|---|
| Tyres: | MICHELIN | MICHELIN |
| dimensions | 480/65 R 24 | 540/65 R 38 |
| load index speed index | 127 A8 | 142 A8 |
| type | radial ply | radial ply |
| maximum load (tyre manufacturer's) | 17.50 kN | 26.50 kN |
| at travelling speed | 40 km/h | 40 km/h |
| at tyre inflation pressure | 120 kPa | 140 kPa |
| radius index (ISO 4251-1/1992) | 590 mm | 795 mm |
| Chosen track width: | 1800 mm | 1800 mm |
| Technically permissible axle load: | 35 kN | 65 kN |
| Technically permissible total weight: | 80 kN | |

## 2.6 Fuel

| | | |
|---|---|---|
| - Type: | ARAL-Diesel-fuel, in conformity with DIN 51601 | |
| - Density at 15°C: | At p.t.o. tests | 0.843 g/cm³ |
| | At drawbar power tests | 0.836 g/cm³ |

## 2.7 Oils and lubrication

### 2.7.1 Capacity and change interval

| | Capacity dm³ | Oil change h | Filter-change h |
|---|---|---|---|
| Engine | 12 | 250 | 250 |
| Gear box, rear axle, hydraulic system and steering | 49 | 1500 | 750 |
| Front axle | 5 | 1500 | - |
| Final drives at front, each | 0.8 | 1500 | - |

2.7.2 Specifications:

| | Recommended | Used during test |
|---|---|---|
| Engine oil: | | |
| Type | engine oil | FUCHS TITAN |
| Viscosity | SAE 20W40, 15W40, 10W40, 5W30, 0W40 | SAE 15W40 |
| Classification | API CG-4 or CF-4 | API CF-4 |
| Transmission oil: | | |
| Used in gearbox, rear axle, hydraulic- and steering system | | |
| Type | Transmission oil | JOHN DEERE |
| Viscosity | SAE 75 | HY-GARD |
| Classification | JDM J 20 C or J 20 D | J 20 C |
| used in front axle and front final drives | | |
| Type | Transmission oil | |
| Viscosity | SAE 80W/90 | SAE80W/90 |
| Classification | JDM J 20 C or J 20 D | |

2.7.3 Grease

- number of lubrication points: 13

## 3 COMPULSORY TESTS

### 3.1 MAIN POWER TAKE OFF PERFORMANCE (1000 min$^{-1}$)

Date of tests: 16th November 1998

Location of tests: DLG-Testing Station Groß-Umstadt

Type of dynamometer: SCHENCK hydraulic dynamometer U1-40

| Power kW | Speed Engine min$^{-1}$ | Speed P.t.o. min$^{-1}$ | Fuel consumption hourly dm³/h | Fuel consumption hourly kg/h | Fuel consumption specific g/kWh | Specific energy kWh/dm³ |
|---|---|---|---|---|---|---|
| **Maximum power** | | | | | | |
| 3.1.1 At 2-hour test | | | | | | |
| 74.1 | 1900 | 861 | 19.96 | 16.83 | 227 | 3.71 |
| 3.1. At rated speed | | | | | | |
| 70.8 | 2300 | 1042 | 21.00 | 17.70 | 250 | 3.37 |
| 3.1.3 At standard p.t.o. speed | | | | | | |
| 72.6 | 2208 | 1000 | 20.81 | 17.54 | 242 | 3.49 |
| **3.1. 4 Part loads, the governor hand lever in the position corresponding to maximum power at full load (curve a)** | | | | | | |
| 3.1.4.1 the torque corresponding to maximum power at rated speed | | | | | | |
| 70.8 | 2300 | 1042 | 21.00 | 17.70 | 250 | 3.37 |
| 3.1.4.2 85% of the torque obtained in 3.1.4.1 | | | | | | |
| 62.8 | 2398 | 1086 | 19.53 | 16.46 | 262 | 3.22 |
| 3.1.4.3 75% of the torque defined in 3.1.4.2 | | | | | | |
| 48.2 | 2457 | 1113 | 16.73 | 14.10 | 292 | 2.88 |
| 3.1.4.4 50% of the torque defined in 3.1.4.2 | | | | | | |
| 32.1 | 2457 | 1113 | 13.21 | 11.14 | 347 | 2.43 |
| 3.1.4.5 25% of the torque defined in 3.1.4.2 | | | | | | |
| 16.0 | 2457 | 1113 | 9.56 | 8.06 | 502 | 1.68 |
| 3.1.4.6 unloaded | | | | | | |
| - | 2457 | 1113 | 5.86 | 4.94 | - | - |

| Power kW | Speed Engine min⁻¹ | Speed P.t.o. min⁻¹ | Fuel consumption hourly dm³/h | Fuel consumption hourly kg/h | Fuel consumption specific g/kWh | Specific energy kWh/dm³ |
|---|---|---|---|---|---|---|
| 3.1.5 Part loads, the governor hand lever in the position corresponding to standard p.t.o. speed at full load (curve b) | | | | | | |
| 3.1.5.1 the torque corresponding to maximum power | | | | | | |
| 72.6 | 2208 | 1000 | 20.81 | 17.54 | 242 | 3.49 |
| 3.5.1.2 85% of the torque obtained in 3.1.5.1 | | | | | | |
| 61.7 | 2208 | 1000 | 18.15 | 15.30 | 248 | 3.40 |
| 3.1.5.3 75% of the torque defined in 3.1.5.2 | | | | | | |
| 46.3 | 2208 | 1000 | 14.77 | 12.45 | 269 | 3.14 |
| 3.1.5.4 50% of the torque defined in 3.1.5.2 | | | | | | |
| 30.9 | 2208 | 1000 | 11.41 | 9.62 | 312 | 2.71 |
| 3.1.5.5 25% of the torque defined in 3.1.5.2 | | | | | | |
| 15.4 | 2208 | 1000 | 7.94 | 6.69 | 434 | 1.94 |
| 3.1.5.6 unloaded | | | | | | |
| - | 2208 | 1000 | 4.57 | 3.85 | - | - |

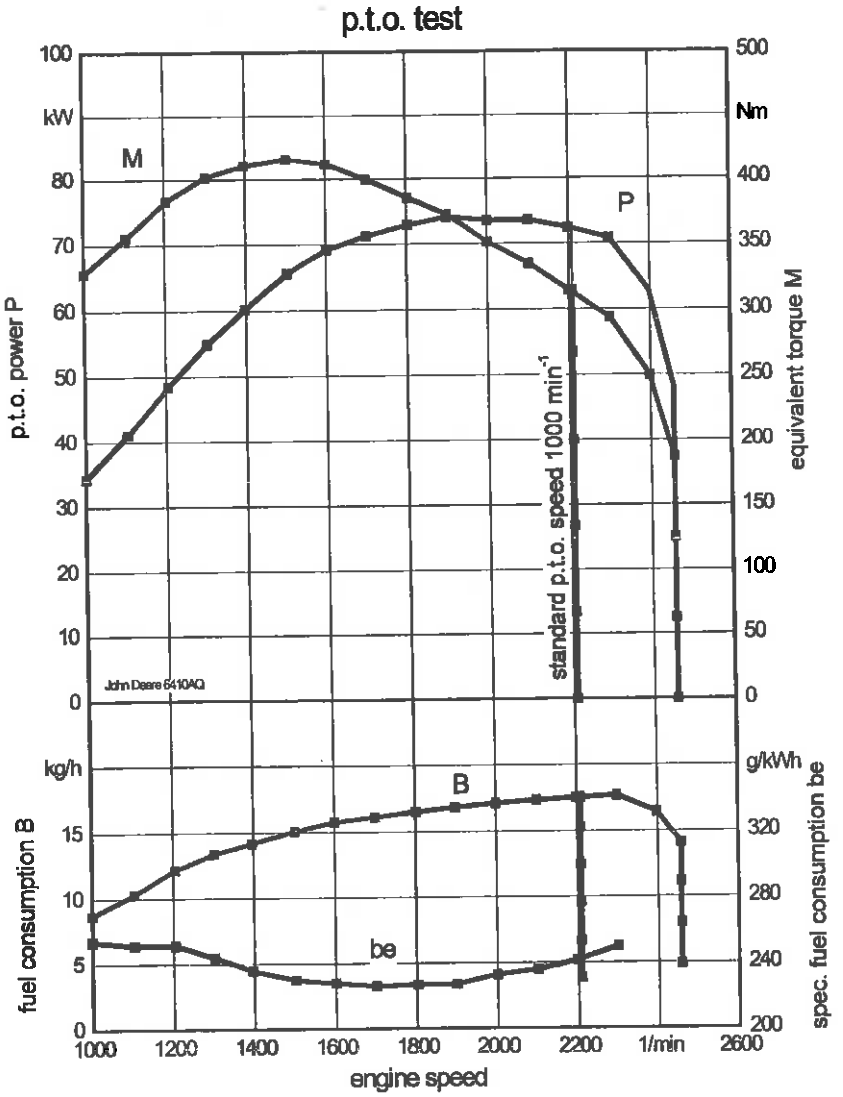
| | |
|---|---|
| No load maximum engine speed: | 2457 min⁻¹ |
| Equivalent flywheel torque at rated engine speed: | 294 Nm |
| Equivalent flywheel torque at 2-hour test: | 372 Nm |
| at engine speed: | 1900 min⁻¹ |
| Maximum equivalent flywheel torque: | 416 Nm |
| at engine speed: | 1503 min⁻¹ |

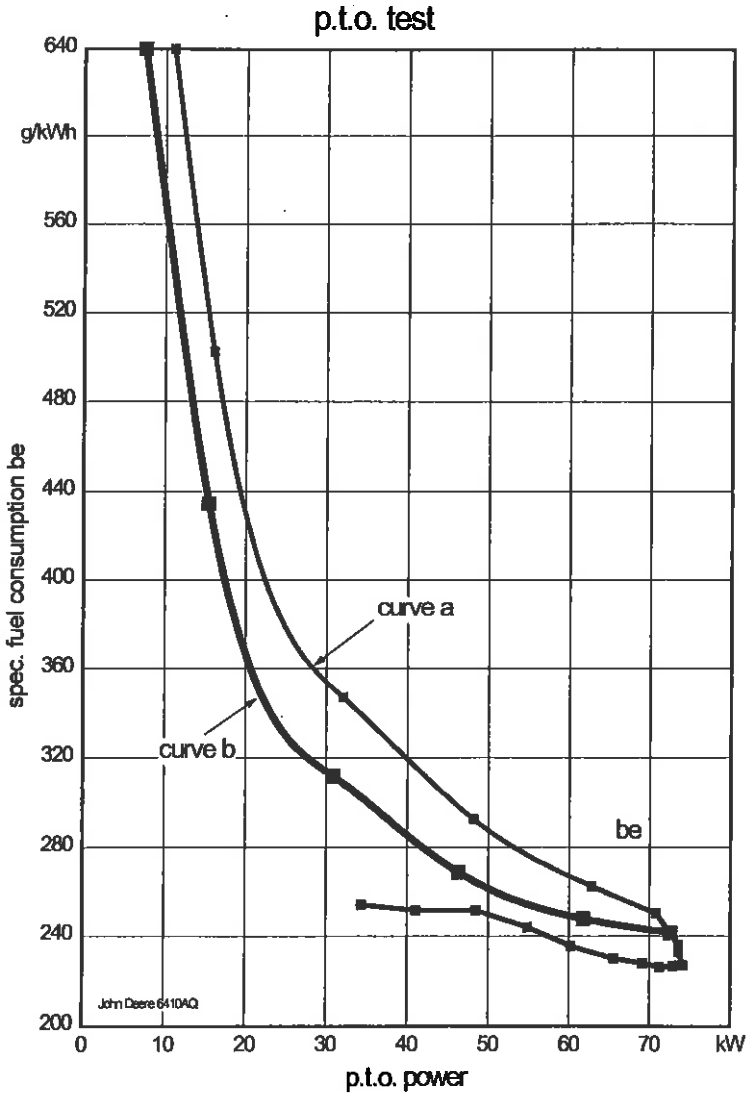
Mean atmospheric conditions

| | |
|---|---|
| temperature: | 21 °C |
| pressure: | 1000 hPa |
| relative humidity: | 40 % |

Maximum temperatures

| | |
|---|---|
| coolant: | 90 °C |
| oil: | 105 °C |
| fuel: | 53 °C |
| air intake: | 21 °C |


p.t.o. test
p.t.o. power P
kW
M
P
equivalent torque M
Nm
standard p.t.o. speed 1000 min-1
John Deere 6410AQ
fuel consumption B
kg/h
B
be
spec. fuel consumption be
g/kWh
engine speed
1/min
100
80
70
60
50
40
30
20
10
0
500
400
350
300
250
200
150
100
50
0
320
280
240
200
15
5
1000
1200
1400
1600
1800
2000
2200
2600


p.t.o. test
640
g/kWh
560
520
480
440
400
360
320
280
240
200
spec. fuel consumption be
curve a
curve b
be
John Deere 6410AQ
0
10
20
30
40
50
60
70
kW
p.t.o. power

## 3.2 HYDRAULIC POWER AND LIFTING FORCE

- Date of tests: 29th April 1999

### 3.2.1 Hydraulic power test

- Sustained pressure with relief valve open 19.7 MPa
- Pump delivery rate at minimum pressure 72.2 dm³/min

| | Hydraulic power kW | Flow rate dm³/min | Pressure MPa | Oil Temperature °C |
|---|---|---|---|---|
| At 90% of the actual relief valve setting | 16.1 | 54.6 | 17.7 | 65 |
| Maximum | 19.4 | 68.3 | 17.0 | 65 |

- Tapping point used for test: At rear of tractor

### 3.2.2 Power lift test

| | At the hitch points | On the frame |
|---|---|---|
| Height of lower hitch points above ground in down position | 200 mm | |
| Vertical movement without lifting forces<br>with lifting forces | 660 mm<br>620 mm | 860 mm<br>815 mm |
| Max. corrected force exerted through full range | 34.20 kN | 29.70 kN |
| Corresponding pressure | 17.7 MPa | |
| Moment about rear axle | | 50.19 kNm |
| Max. tilt angle of mast from vertical | | 11° |

| Lifting heights relative to horizontal lower links | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | -460 | -400 | -370 | -300 | -200 | -100 | 0 | +100 | +200 | +250 | +300 | +355 |
| Lifting forces at hitch points. Corrected to 17.7 MPa | | | | | | | | | | | | |
| kN | | | 34.20 | 38.25 | 42.30 | 44.55 | 47.70 | 50.40 | 52.43 | 52.65 | | |
| Lifting forces at standard frame. corrected to 17.7 MPa | | | | | | | | | | | | |
| kN | 29.70 | 31.05 | | 33.00 | 34.65 | 35.33 | 35.55 | 35.10 | 34.20 | | 33.75 | 32.85 |

## 3.3 DRAWBAR PERFORMANCE

- Date of test: 18th till 24th March 1999
- Type of track: Concrete

| Gear number and range | Power | Drawbar pull | Speed | Engine speed | Slip of wheels | Specific fuel consumption |
|---|---|---|---|---|---|---|
| | kW | kN | km/h | $min^{-1}$ | % | g/kWh |
| 3.3.1 | MAXIMUM POWER IN TESTED GEARS (unballasted tractor) | | | | | |
| 2 B | 54.2 | 50.61 | 3.86 | 2361 | 15.0 | 324 |
| 3 B | 56.2 | 50.21 | 4.03 | 2074 | 15.1 | 308 |
| 1 C | 60.7 | 49.08 | 4.45 | 1894 | 8.7 | 274 |
| 4 B | 61.4 | 44.38 | 4.98 | 1910 | 7.5 | 272 |
| 2 C | 62.2 | 40.40 | 5.54 | 1904 | 5.9 | 271 |
| 3 C | 62.8 | 33.45 | 6.76 | 1900 | 3.7 | 265 |
| 1 D | 62.4 | 28.87 | 7.78 | 1901 | 3.4 | 269 |
| 4 C | 61.6 | 26.59 | 8.34 | 1903 | 3.1 | 272 |
| 3.3.2 | FUEL CONSUMPTION | | | | | |
| 3.3.2.1 | in selected gear, at maximum power at rated speed | | | | | |
| 3 C | 61.9 | 27.16 | 8.21 | 2297 | 3.5 | 284 |
| 3.3.2.1.1 | 75 % of pull at maximum power at rated speed | | | | | |
| 3 C | 49.6 | 20.41 | 8.74 | 2438 | 2.7 | 313 |
| 3.3.2.1.2 | 50 % of pull at maximum power at rated speed | | | | | |
| 3 C | 33.7 | 13.57 | 8.94 | 2459 | 1.8 | 358 |
| 3.3.2.1.3 | next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.1.1 | | | | | |
| 1 D | 49.6 | 20.42 | 8.74 | 2123 | 2.7 | 288 |
| 3.3.2.1.4 | next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.1.2 | | | | | |
| 1 D | 33.9 | 13.62 | 8.96 | 2155 | 1.8 | 329 |
| 3.3.2.2 | in selected gear nearest to 7.50 km/h at rated speed | | | | | |
| 2 C | 61.2 | 32.51 | 6.78 | 2301 | 4.4 | 290 |
| 3.3.2.2.1 | 75 % of pull at maximum power at rated speed | | | | | |
| 2 C | 49.4 | 24.41 | 7.28 | 2431 | 3.2 | 311 |
| 3.3.2.2.2 | 50 % of pull at maximum power at rated speed | | | | | |
| 2 C | 33.7 | 16.33 | 7.44 | 2461 | 2.0 | 356 |
| 3.3.2.2.3 | next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.2.1 | | | | | |
| 3 C | 49.3 | 24.40 | 7.27 | 2028 | 3.0 | 285 |
| 3.3.2.2.4 | next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.2.2 | | | | | |
| 3 C | 33.7 | 16.21 | 7.49 | 2063 | 2.0 | 320 |

| | Height of drawbar above ground | Tyre inflation pressure | |
|---|---|---|---|
| | | Front | Rear |
| unballasted | 440 mm | 80 kPa | 80 kPa |

| Specific energy | Temperature | | | Atmospheric conditions | | |
|---|---|---|---|---|---|---|
| | Fuel | Coolant | Engine oil | Temperature | Relative humidity | Pressure |
| kWh/dm³ | °C | °C | °C | °C | % | kPa |
| 2.59 | 49 | 87 | 100 | 11 | 45 | 100.8 |
| 2.72 | 50 | 89 | 102 | 11 | 45 | 100.8 |
| 3.05 | 53 | 89 | 103 | 12 | 45 | 100.8 |
| 3.08 | 52 | 89 | 103 | 11 | 45 | 100.8 |
| 3.09 | 47 | 91 | 100 | 12 | 45 | 100.8 |
| 3.15 | 49 | 90 | 104 | 8 | 48 | 100.8 |
| 3.11 | 49 | 89 | 102 | 10 | 48 | 100.8 |
| 3.08 | 49 | 89 | 102 | 10 | 48 | 100.8 |
| 2.94 | 69 | 90 | 105 | 18 | 64 | 100.0 |
| 2.67 | 68 | 88 | 104 | 18 | 64 | 100.0 |
| 2.34 | 69 | 84 | 100 | 18 | 64 | 100.0 |
| 2.91 | 64 | 86 | 98 | 18 | 64 | 100.0 |
| 2.54 | 66 | 86 | 99 | 18 | 64 | 100.0 |
| 2.88 | 69 | 90 | 105 | 18 | 64 | 100.0 |
| 2.69 | 69 | 88 | 104 | 17 | 64 | 100.0 |
| 2.35 | 69 | 85 | 102 | 17 | 64 | 100.0 |
| 2.93 | 64 | 86 | 99 | 18 | 64 | 100.0 |
| 2.61 | 67 | 84 | 99 | 18 | 64 | 100.0 |

**4 ADDITIONAL TESTS** under the responsibility of the DLG Testing Station
- Noise test at the driver's ear level (measured acc. to OECD Code 5)
- Lifting force test with modified linkage settings

**4.1 Results of sound level test - "Under load" procedure**
Date of test: 25th March 1999
Type of track: Concrete
Type of sound level meter: BRÜEL & KJAER model 2233

| Gear number | Drawbar pull | Engine Speed | Measured travelling speed | Number of driving wheels | Sound level |
|---|---|---|---|---|---|
| | kN | $min^{-1}$ | km/h | no | dB(A) |
| 4.1.1 | Test with the drawbar pull for which the tractor gives the maximum sound level (gear giving the nearest nominal forward speed to 7.5 km/h and also in any gear with a sound level increase of at least 1 dB(A)) | | | | |
| 4.1.1.1 | All openings closed | | | | |
| 2 C | 32.89 | 2307 | 6.68 | 4 | 72.5 |
| 2 C | 33.19 | 2302 | 6.60 | 2 | 71.5 |
| 4.1.1.2 | All openings open | | | | |
| 2 C | 31.10 | 2306 | 6.65 | 4 | 81.5 |
| 4 C | 19.79 | 2302 | 10.12 | 4 | 82.5 |
| 1 D | 23.32 | 2298 | 9.41 | 4 | 82.5 |
| 2 D | 18.64 | 2304 | 11.53 | 4 | 82.5 |
| 3 D | 14.45 | 2301 | 13.75 | 4 | 83.5 |
| 4 D | 13.21 | 2308 | 16.92 | 4 | 84.0 |
| 1 E | 14.80 | 2310 | 15.46 | 4 | 83.0 |
| 2 C | 33.14 | 2309 | 6.60 | 2 | 81.5 |
| 1 D | 23.52 | 2301 | 9.31 | 2 | 82.5 |
| 2 D | 18.59 | 2308 | 11.38 | 2 | 83.0 |
| 3 D | 14.75 | 2304 | 13.80 | 2 | 83.5 |
| 4 D | 13.01 | 2300 | 16.97 | 2 | 84.0 |
| 1 E | 13.76 | 2300 | 15.11 | 2 | 83.5 |

| Gear number | Drawbar pull | Engine Speed | Measured travelling speed | Number of driving wheels | Sound level |
|---|---|---|---|---|---|
| | kN | $min^{-1}$ | km/h | no | dB(A) |
| **4.1.2** | **Unloaded test in the gear giving the forward speed nearest** to 7.5 km/h | | | | |
| 4.1.2.1 | All openings closed | | | | |
| 2 C | 0 | 2450 | 7.50 | 4 | 70.5 |
| 2 C | 0 | 2459 | 7.55 | 2 | 71.0 |
| 4.1.2.2. | All openings open | | | | |
| 2 C | 0 | 2459 | 7.60 | 4 | 79.5 |
| 2 C | 0 | 2461 | 7.55 | 2 | 80.0 |
| 4.1.3 | Unloaded test in the gear giving the maximum forward speed | | | | |
| 4.1.3.1 | All openings closed | | | | |
| 4 F | 0 | high idle | 42.77 | 2 | 73.5 |
| 4.1.3.2 | All openings open | | | | |
| 4 F | 0 | high idle | 42.77 | 2 | 82.0 |

## 4.2 Results of lifting force test with modified linkage settings

(dimensions see page 12)

Date of tests:30th April 1999

| | At the hitch points | On the frame |
|---|---|---|
| Height of lower hitch points above ground in down position | 445 mm | |
| Vertical movement without lifting forces<br>with lifting forces | 570 mm<br>541 mm | 685 mm<br>642 mm |
| Max. corrected force exerted through full range | 39.60 kN | 37.57 kN |
| Corresponding pressure | 17.7 MPa | |
| Moment about rear axle | - | 63.49 kNm |
| Max. tilt angle of mast from vertical | | 11° |

| Lifting heights relative to horizontal lower links | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| mm | -140 | -125 | -100 | 0 | +100 | +200 | +300 | +400 | +416 | +502 |
| Lifting forces at hitch points. Corrected to 17.7MPa | | | | | | | | | | |
| kN | | 39.60 | 41.85 | 47.93 | 51.75 | 55.13 | 58.28 | 59.18 | 58.73 | |
| Lifting forces at standard frame. corrected to 17.7 MPa | | | | | | | | | | |
| kN | 37.57 | | 40.05 | 42.98 | 44.33 | 44.33 | 43.65 | 41.63 | | 38.48 |

| | | |
|---|---|---|
| **5** | **REPAIRS** | **None** |
| **6** | **REMARKS** | **None** |

Head of tractor test section

Deutsche Landwirtschafts-Gesellschaft

Dipl.-Ing. Manfred Lober

Test carried out by

Dipl.- Landw. Friedrich Uhlig

Date: 16.09.99




*Impulse für den Fortschritt*

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