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

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

- Available options: 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

  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	540 580	2143 2300	-
540 E*)	3.1185	540 738	1684 2300	
1000	2.2080	1000 1042	2208 2300	-

*) "economic speed"

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

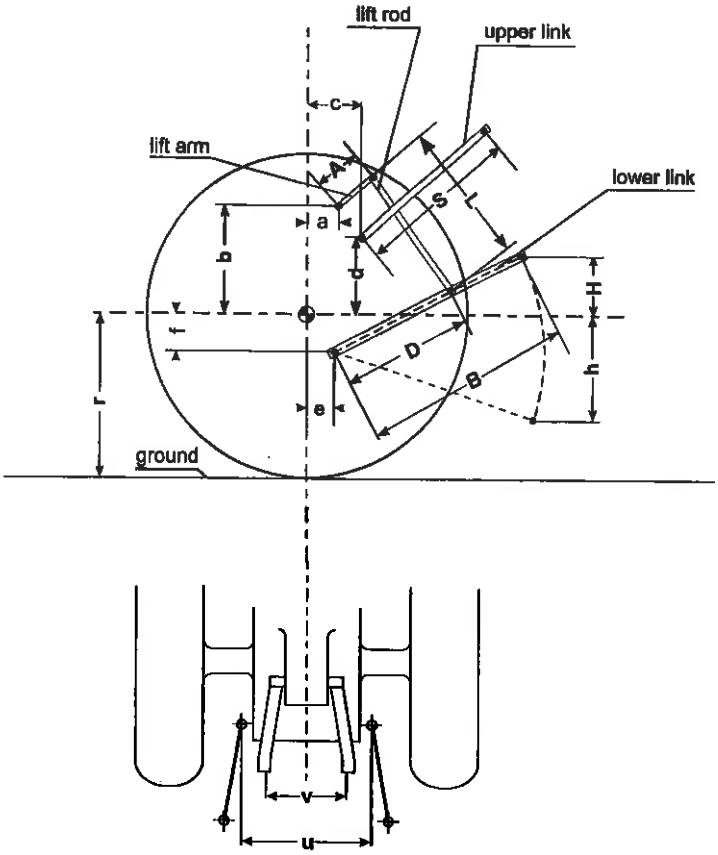
1.4.1.2 Power take-off proportional to ground speed: None

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^3stationary 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	page
Rear tyres 540/65 R 38 Front tyres 480/65 R 24		(r) *) (r') *)	795 590		
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 vertical	(a) (b)	170 475	170 475	170 475
Horizontal distance between lower link pivot points		(u)	478	478	4
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 vertical	(c) (d)	432, 442, 452 183, 253, 323	452 183	432 322
Distance of lower link pivot points from rear wheel axis	horizontal vertical	(e) (f)	135 225	135 225	135 225
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 28 420/70 R 24	480/70 R 38
12.4 – 28 (D/R)	14.9 – 38 (D/R)
420/70 R 28 14.9 – 28 (D/R) 380/85 R 28 16.9 – 24 (D/R) 420/85 R 24 13.6 – 28 (D/R) 340/85 R 28 14.9 – 24 (D/R) 380/85 R 24	18.4 – 38 (D/R) 460/85 R 38
480/65 R 24	540/65 R 38
540/65 R 28 480/65 R 28	600/65 R 38
420/70 R 28 480/70 R 24 380/70 R 28 420/70 R 24	520/70 R 38
13.6 – 28 (D/R) 340/85 R 28 12.4 – 28 (D/R) 320/85 R 28 14.9 – 24 (D/R) 380/85 R 24	16.9 – 38 (D/R) 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 partially	35 mm 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 mm	Size mm	Distance from outside edge of lights to median plane of tractor 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	Width	Height at top of	
		protective structure	exhaust silencer pipe
mm	mm	mm	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 Viscosity Classification	 engine oil SAE 20W40, 15W40, 10W40, 5W30, 0W40 API CG-4 or CF-4	 FUCHS TITAN SAE 15W40 API CF-4
Transmission oil: Used in gearbox, rear axle, hydraulic- and steering system Type Viscosity Classification used in front axle and front final drives Type Viscosity Classification	 Transmission oil SAE 75 JDM J 20 C or J 20 D Transmission oil SAE 80W/90 JDM J 20 C or J 20 D	 JOHN DEERE HY-GARD J 20 C SAE80W/90

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	-	-

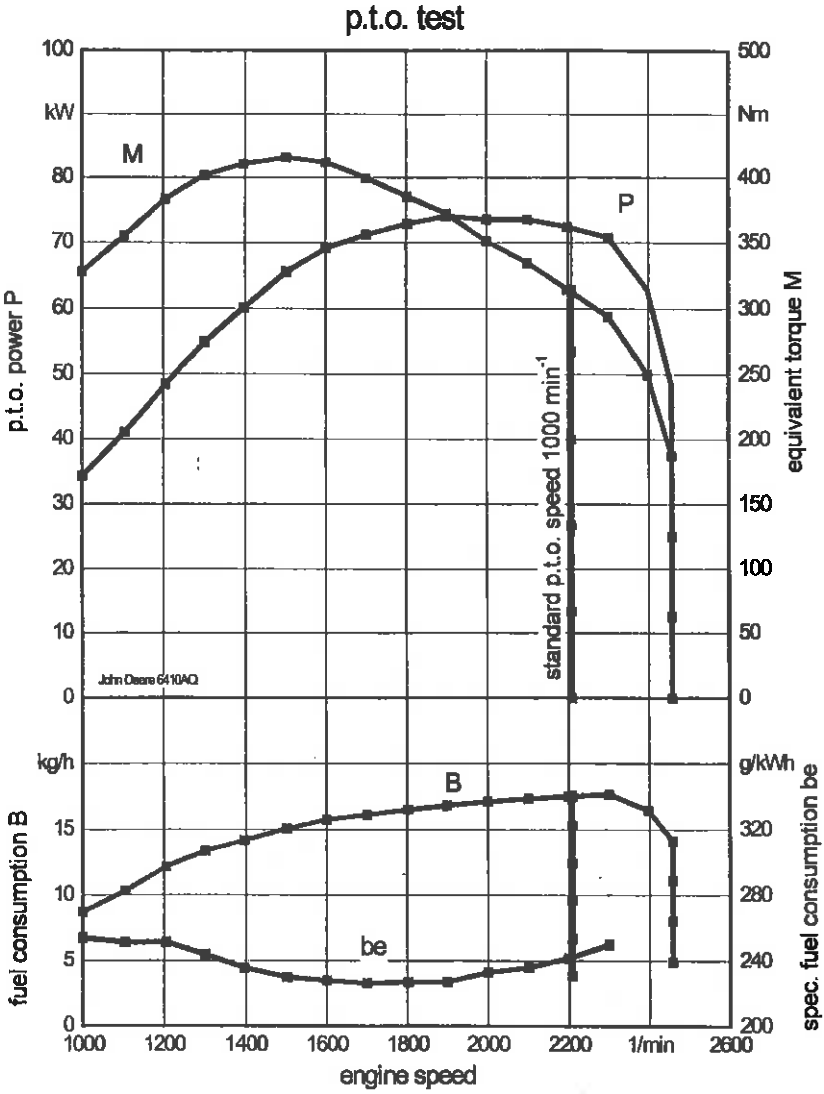
No load maximum engine speed:	2457 min⁻¹
Equivalent flywheel torque at rated engine speed:	294 Nm
Equivalent flywheel torque at 2-hour test:	372 Nm
at engine speed:	1900 min⁻¹
Maximum equivalent flywheel torque:	416 Nm
at engine speed:	1503 min⁻¹

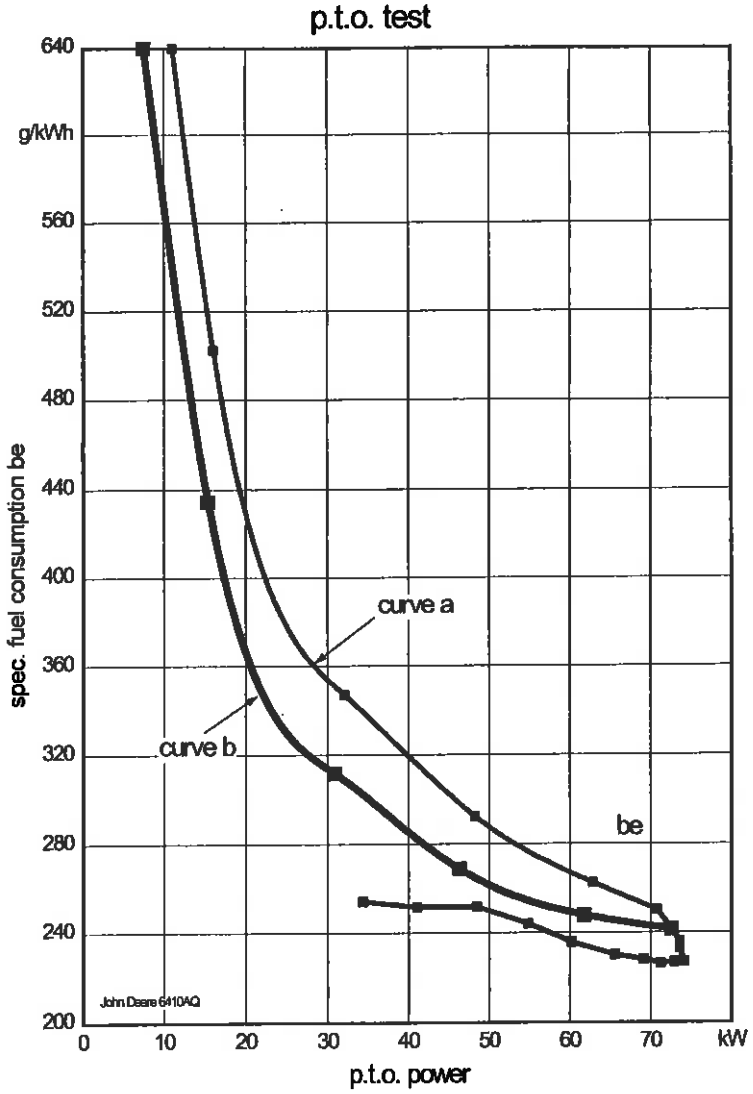
Mean atmospheric conditions

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
kW
Nm
M
P
B
be
p.t.o. power P
equivalent torque M
fuel consumption B
spec. fuel consumption be
kg/h
g/kWh
standard p.t.o. speed 1000 min-1
John Deere 6410AQ
engine speed
1/min
100
80
70
60
50
40
30
20
10
0
500
400
350
300
250
200
150
100
50
15
5
320
280
240
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 dm^3/min

	Hydraulic power kW	Flow rate dm^3/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 with lifting forces	660 mm 620 mm	860 mm 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 with lifting forces	570 mm 541 mm	685 mm 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

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Test carried out by

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Date: 16.09.99



Impulse für den Fortschritt

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