Report on test in accordance with O.E.C.D STANDARD CODE

Restricted Code

O.E.C.D. No. 1094



Agricultural Tractor
JOHN DEERE 2155 CS (2WD)

Manufacturer

John Deere Werke Mannheim
D-6800 Mannheim

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This bulletin is based on engineering tests in accordance with the O.E.C.D. RESTRICTED STANDARD CODE for the Official Testing of Agricultural Tractor Performance, C (84) 163 (Final), Appendix IV.

Duration of Tests: June till July 1987
DLG-Testing-Station for Agricultural Machinery, Max-Eyth-Weg 1,
D-6114 Groß-Umstadt

This report has been approved by the O.E.C.D. Coordinating Centre (C.E.M.A.G.R.E.F., France) as being in accordance with the O.E.C.D. STANDARD CODE.

Date of Approval: 15th October 1987

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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 daN = 10 N	=	1,02 kp	or 1 kp	= 0,981 daN
Powers	1 kw	=	1,36 PS	or 1 PS	= 0,376 kW
Pressure	1 bar	=	1,02 kp/cm^2	or 1 kp/cm^2	= 0,981 bar
	1000 mbar	=	750,10 mm Hg		

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PRÜFUNGS-ABTEILUNG
JOHN DEERE 2155 CS

Test No. 87-116

Tractor manufacturer:	John Deere Werke Mannheim D-6800 Mannheim
Submitted for test by:	Manufacturer
Selected by:	Manufacturer with agreement by DLG
Place of running-in:	Mannheim and Groß-Umstadt
Duration of running-in:	Engine appr. 50 hours tractor appr. 20 hours

SPECIFICATION OF TRACTOR

Tractor

Make:	JOHN DEERE
Trade denomination:	2155 CS
Type:	Wheel tractor, unit construction, 2WD
Serial No.:	608 512
Start of series:	600 001

Engine

Make:	JOHN DEERE
Model:	3.179 DL 001
Type:	Watercooled 4-stroke Diesel-engine with direct injection
Serial No.:	CD 3.179 D 736 132
Cylinders:	3, vertical in line, bore 106,5 mm, stroke 110 mm, displacement 2940 cm^3; compression ratio 17,8:1; wet cylinder liners, replaceable
Valves:	Overhead
Fuel system:	SOFABEX fuel supply pump; CAV-ROTO DIESEL distributor pump RE 104 37-R 3432 F 830, serial no. 16097 CEG, with injection timing device; manufacturer's production setting 52±2 mm^3 per stroke at rated engine speed and full load; injection timing 13+7° before TDC; STANADYNE multihole injection nozzles 27333, injection pressure 210±3 bar; STANADYNE fuel filter with replaceable two-stage paper element; fuel tank with 67 l capacity

Governor:	CAV-ROTO DIESEL centrifugal variable speed governor, governed range of engine speed 800 to 2630 r/min, rated engine speed 2500 r/min
Air cleaner:	Cyclone precleaner, incorporated in main cleaner, DONALDSON dry paper element filter with main cartridge AR 84228 and safety cartridge AE 31724; maintenance indicator lamp; air intake below bonnet
Exhaust silencer:	EBERSPÄCHER, AL 31552 multi-chamber absorption-expansion type, 160x220 mm oval, 383 mm long, below bonnet; mouth showing upwards, 2470 mm above ground
Lubrication system:	Forced-feed lubrication with gear pump, PUROLATOR oil filter T 19044 in full flow, replaceable; oil capacity 6 l, specified oil quality MIL-L-2104 C resp. API-CD, specified oil viscosities: winter SAE 10W/30; summer SAE 15W/40; tropics SAE 20W/40 or SAE 40 oil and filter change every 200 operating hours; engine oil-cooling water heat exchanger between oil filter and filter socket
Cooling system:	Water cooling with impeller pump, overpressure relief valve set to 0,6±0,1 bar, cooling circuit with thermostat and by-pass; V-belt driven fan, 422 mm dia, 6 blades; water capacity 10 l
Starting system:	Electrical; BOSCH solenoid pre-engaged-drive starting motor 2,7 kW; BERU heating spiral in intake pipe; range gear shift lever in neutral position as safety device

Electrical equipment:	12 Volt, negative earth, BOSCH 3-phase alternator K1-14V 23/55 A, 770 W; 2 lead acid batteries, 55 Ah each at 20 hours rating

Transmission

Clutch:	F & S dry single-plate clutch for travel drive, 280 mm dia, mechanically actuated by pedal
Gear box:	JOHN DEERE, model CST; collar shifted speed change gear with 4 speeds; collar shifted range gear with 2 forward ranges (I and II) and 1 reverse range (R); total 8 forward and 4 reverse speeds, 2 shift levers
Rear axle with final drives:	JOHN DEERE bevel gear, bevel gear differential with lever or pedal operated lock, self-disengaging; planetary final drives
Front axle:	JOHN DEERE, not propelled
Lubrication:	Gear box, rear axle, rear final drives and hydraulic system have oil in common; transmission with forced feed lubrication; internal-gear pump within gear box, 2 oil filters, oil radiator in front of water radiator; filter change every 600 hours

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Transmission oils:

	Oil quality API MIL-L-	Oil viscosity SAE	Oil volume l	Change interval h
Gear box, rear axle, hydraulic system, rear final drives	JOHN DEERE specif. J 20 A	75	41	1200

Total ratios and speeds

Range	Gear	Total ratio engine : driving wheel	Nominal travelling speed *) at rated engine speed km/h
I	1	267,85	2,36
	2	187,49	3,37
	3	126,35	5,00
	4	90,40	6,99
II	1	68,25	9,25
	2	47,78	13,22
	3	32,20	19,61
	4	23,04	27,41
R	1	230,49	2,74
	2	161,34	3,91
	3	108,73	5,81
	4	77,79	8,12

*) calculated with the radius index 670 mm

Main p.t.o.

Independent,
driven by wet multi-plate clutch with 133 mm dia, hydraulically operated by lever and control valve, hydraulically operating p.t.o. brake;
1 p.t.o. shaft at rear of tractor,
599 mm above ground, 25 mm to the left of tractor's median plane;
direction of rotation clockwise, viewed facing tractor's rear;
p.t.o. 422 mm behind rear wheel centre line,
35 mm dia, 6 splines, DIN 9611/ISO 500 type 1

P.t.o. type	P.t.o. speed r/min	Engine speed r/min	Ratio engine : P.t.o.	Power restriction kW
540 A	540 567	2382 2500	4,4118	-

Power lift

JOHN DEERE
hydraulic power lift, unit construction;
draft- and position-control, both mixable in steps, floating position;
lowering throttle; lower link sensing

Hydraulic system:

Closed centre system;
JOHN DEERE RP 2023 COE 0100
variable-capacity radial-piston pump,
directly driven by engine, feeds power lift and steering system,
max. delivery 51 l/min at rated engine speed;
the transmission oil pump (see page 6) offers hydraulic pressure for actuating of p.t.o. clutch and feeds the radial-piston pump;

JOHN DEERE control valve,
relief valve pressure setting 160±3 bar;
single acting cylinder with 133 mm stroke and 92 mm bore;
safety valve set to 230 bar

1 double acting JOHN DEERE additional control valve with 2 couplings at tractor's rear;
up to 10 l oil may be taken off working travelling and 14 l stationary

Hydraulic oil: In common with gear box, see page 6

Implement linkage: See pages 10 and 11

Pull attachments

Trailer hitch: Not fitted

Holed drawbar: Not fitted

Swinging drawbar: Shiftable

height above ground	437 mm
pivot point before rear wheel centre line	51 mm
hitch point behind rear wheel centre line	634, 782 or 824 mm
behind p.t.o. shaft	212, 360 or 402 mm
swingable to both sides about max.	290 mm
hitch hole diameter	33 mm
max. permissible vertical load (fully retracted)	760 kg

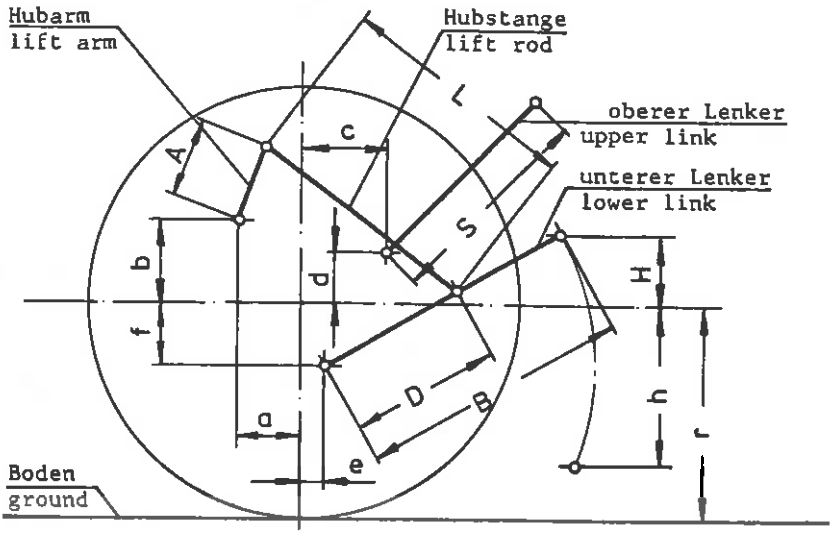
Towing hitch: Not fitted

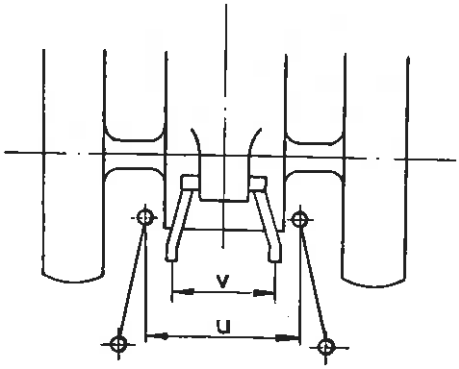
Steering JOHN DEERE, POWER STEERING
mechanically acting,
hydraulically assisted;
connected by sequence valve
to the hydraulic system of the tractor;
max. pressure 160±3 bar

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Implement linkage: Three point linkage
couplers category 2 acc. to ISO 730/I
DIN 9674, category 1 is possible by
turning the lower links





Dimensions of rear implement linkage (projected lengths in mm, underlined dimensions are valid for power lift measurements p. 19)

Rear tyres	radius index	(r)	670
Front tyres	static radius	(r')	376
Length of lift arms		(A)	254
Length of lower links		(B)	830
Distance of lift arm pivot points from rear axle centre	horizontal	(a)	-7
	vertical	(b)	277
Horizontal distance between lower link pivot points		(u)	395
Horizontal distance between lift arm end points		(v)	495
Length of upper link		(S)	540 to 780, 625
Distance of upper link pivot point from rear axle centre	horizontal	(c)	321
	vertical	(d)	163
Distance of lower link pivot point from rear axle centre	horizontal	(e)	115
	vertical	(f)	200
Distance of lower link pivot points from lift rod pivot points on lower links		(D)	445
Length of lift rods		(L)	608 to 726, 700

Height of lower link hitch points relative to rear axle centre line (situated 670 mm above ground), these data are valid for unloaded power lift:

Length of lift rods	(L)	700	608	726
Linkage distance of lift rods	(D)	445		
Lowest position	(h)	470	252	532
Highest position	(H)	165	317	125
Transport position	(H')	165	317	125

Type of transport lock: Lowering throttle and latching of control valve lever

Brakes

Service brake:	JOHN DEERE pedal operated muscle power brake with hydraulic transmission, using oil from gear box, acting on rear wheels; oil-immersed disc brake with 1 ring-piston on each differential half shaft, self readjusting; disc diameter 304 mm
Parking brake:	Mechanical wet V-band brake, acting on bevel wheel of differential, drum diameter 238 mm, width 20 mm, operated by lever with ratchet
Steering brake:	Divided pedal of service brake, for normal use locked together
Trailer braking take-off:	Not provided

Wheels

Steered wheels:	At front, 2 cross-ply tyres 7.50-16 ply GOODYEAR; max. permissible load per tyre 745 kg at 2,8 bar and 30 km/h; track width 1410 mm, adjustable from 1260 to 2020 mm in steps of 50 mm each by extending telescopic front axle and reversing the wheels; rims 5.50 FX16
Driving wheels:	At rear, 2 cross-ply tyres 16.9-28 6 ply GOODYEAR; max. permissible load per tyre 1840 kg at 1,3 bar and 30 km/h; track width 1600 mm, adjustable from 1400 mm to 2000 mm in steps of 100 mm; by gauge bowl wheels, rims W14 Lx28
Wheel base:	1889 mm, at track width 1410 mm at front (depending on track width of front axle)

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Protective frame — JOHN DEERE, model ROLL-GARD
2 post frame, not O.E.C.D. tested

Seat — GRAMMER, model DS 44/2H-4
upholstered seat with back rest and integral arm rests, adjustable spring suspension and hydraulic shock absorber; driver's platform 730 mm above ground, height of unloaded seat above platform steplessly adjustable from 540 to 640 mm, longitudinal adjustment 150 mm;
1 step, 460 mm above ground;

Lighting equipment — Electrical, 12 Volt,
as per US legislation

	Dimensions mm	Height above ground of centre mm	Distance from outside edge of tractor to centre mm
Headlights	100 dia	1475	520
Side-(Warning) lights	100 dia	1513	413
Rearlights *)	100 dia	1250	667
Reflectors (ring-shaped)	135/100 dia	1513	413

additional SMV-sign

*) only 1 rearlight on the left hand side

Running time meter — Electronic, counts real operating hours if engine is running

Overall dimensions

Total length: 3375 mm

Total width: 2015 mm

Total height: 2290 mm to top of frame
2470 mm to top of exhaust

Ground clearance: 365 mm below side stabilizers of lower links

Permissible tyre combinations

x permissible - unauthorized

Rear Tyres	Front Tyres 6.50-16	7.50-16	9.5L-15	27/9.5-15
13.6-28	x	x	x	x
14.9-24	x	x	x	x
14.9-28	x	x	x	x
16.9-24	x	x	x	x
16.9-28	x	x	x	x
16.9-30	x	x	x	x
18.4-16.1	-	-	-	x
21.5L-16.1	-	-	-	x

TEST CONDITIONS

Track setting: 1410 mm at front, 1600 mm at rear

Weights

	without driver	with driver
front	890 kg	900 kg
rear	1425 kg	1505 kg
total	2315 kg	2405 kg

Fuels and lubricants used in tests

Fuel: ARAL Diesel-Fuel DIN 51601
density at 15°C at p.t.o. tests 0,843 kg/l
at drawbar tests 0,845 kg/l

Engine: FUCHS TITAN-UNIVERSAL SAE 15W/40

Transmission, rear axle and hydraulic system: JOHN DEERE RENOGEAR HYDRO J 20A

Grease: Multi-purpose grease

Number of grease points: 13

Repairs and remarks: None

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COMPULSORY TESTS

(1) MAIN POWER TAKE OFF PERFORMANCE (540 r/min)

Date of tests: 25th June 1987
Location of tests: DLG-Testing Station Groß-Umstadt
Type of dynamometer: SCHENCK hydraulic dynamometer U1-40

Power kW	speed engine r/min	speed p.t.o. r/min	fuel consumption hourly l/h	fuel consumption hourly kg/h	fuel consumption specific g/kWh	specific energy kWh/l
Maximum power						
At 2-hour test						
34,0	2500	567	11,26	9,49	279	3,02
At rated speed						
34,0	2500	567	11,26	9,49	279	3,02
At standard p.t.o. speed						
33,3	2382	540	10,77	9,08	272	3,10
Part loads, the governor hand lever in the position corresponding to maximum power at full load (curve a)						
(i) the torque corresponding to maximum power at rated speed						
34,0	2500	567	11,26	9,49	279	3,02
(ii) 85% of the torque obtained in (i)						
29,4	2541	576	10,0	8,43	287	2,94
(iii) 75% of the torque defined in (ii)						
22,3	2572	583	8,31	7,01	314	2,68
(iv) 50% of the torque defined in (ii)						
14,9	2583	585	6,83	5,76	385	2,19
(v) 25% of the torque defined in (ii)						
7,6	2615	593	5,45	4,59	608	1,39
(vi) unloaded						
-	2630	596	4,04	3,41	-	-

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Power kW	speed engine r/min	speed p.t.o. r/min	fuel consumption hourly l/h	fuel consumption hourly kg/h	fuel consumption specific g/kWh	specific energy kWh/l
Part loads, the governor hand lever in the position corresponding to the standard p.t.o. speed at full load (curve b)						
(i) the torque corresponding to maximum power						
33,3	2382	540	10,77	9,08	272	3,10
(ii) 85% of the torque obtained in (i)						
28,7	2414	547	9,45	7,97	277	3,04
(iii) 75% of the torque defined in (ii)						
21,8	2437	552	7,86	6,63	305	2,77
(iv) 50% of the torque defined in (ii)						
14,7	2473	561	6,44	5,42	369	2,29
(v) 25% of the torque defined in (ii)						
7,4	2493	565	5,09	4,29	579	1,46
(vi) unloaded						
-	2520	571	3,70	3,12	-	-

Standard specific fuel consumption (g/kWh): 287/385/277/369

No load maximum engine speed: 2630 r/min
Equivalent flywheel torque at rated engine speed: 130 Nm
Maximum equivalent flywheel torque: 163 Nm at 1199 r/min of the engine

Mean atmospheric conditions

temperature	25 °C
pressure	1000 mbar
rel. humidity	45 %

Maximum temperatures

coolant	87 °C
oil	97 °C
fuel	24 °C
air intake	27 °C

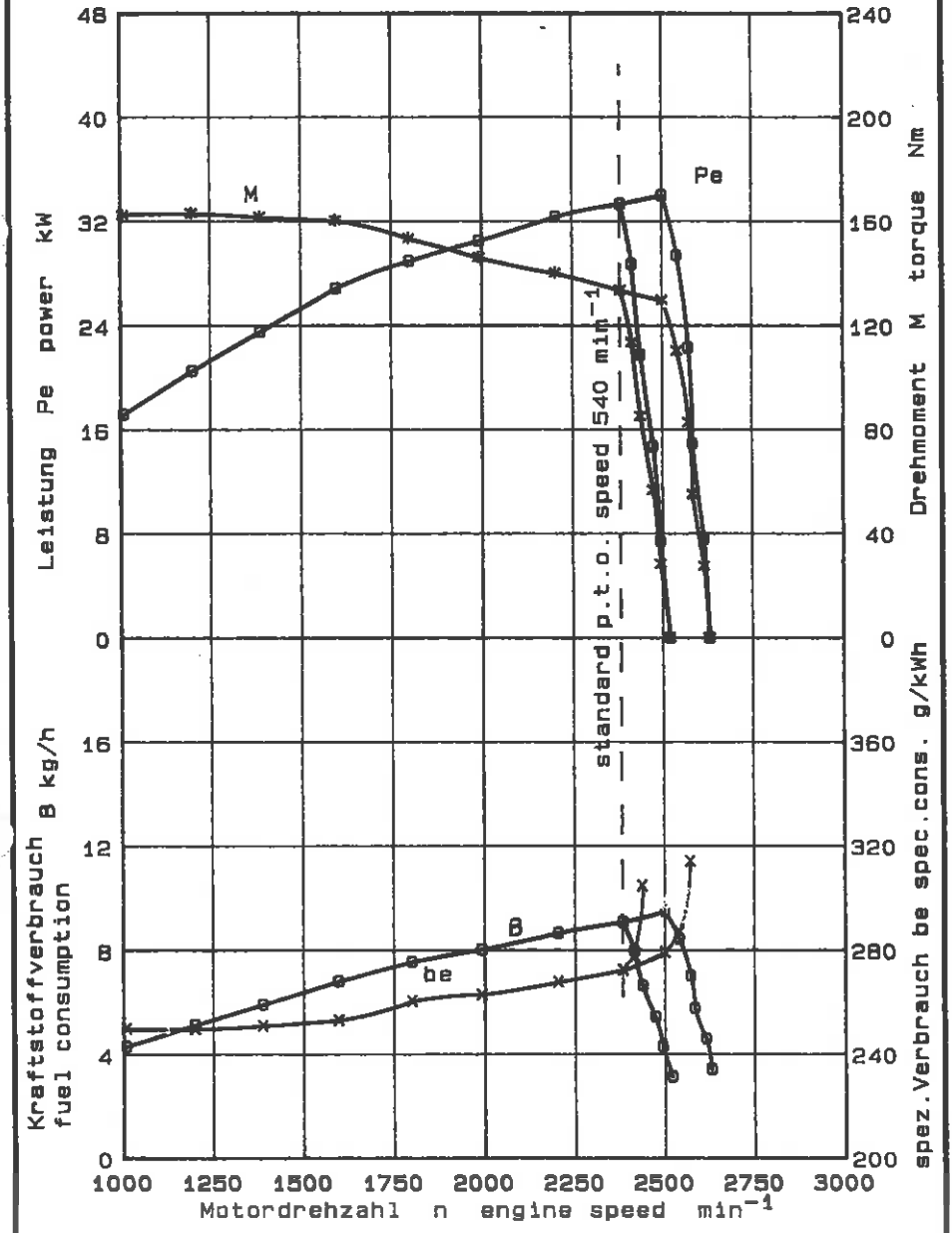
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Zapfwellenmessung

p.t.o. test



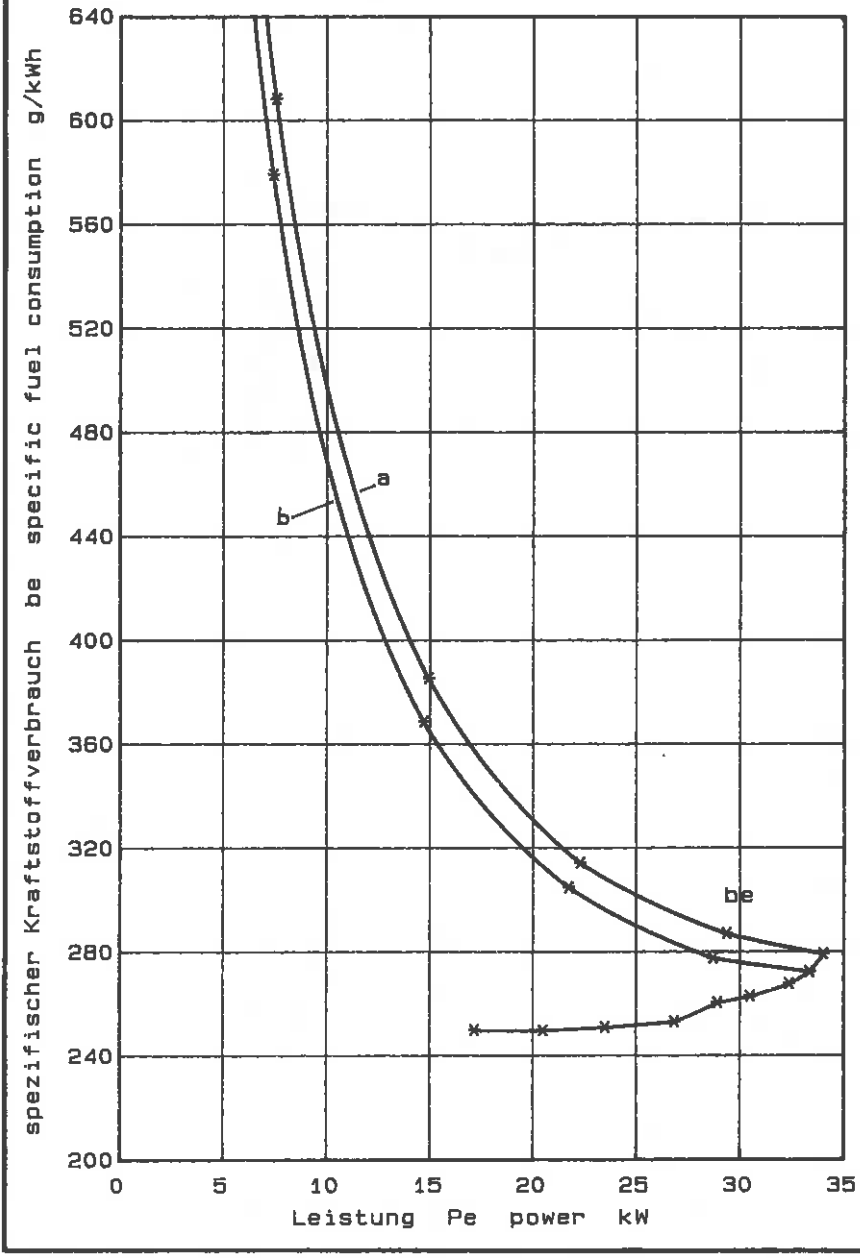
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Zapfwellenmessung

p.t.o. test



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(8) LIFTING FORCES AND HYDRAULIC POWER

Date of tests: 1st July 1987

Lifting Forces (Linkage dimensions: see pages 10 and 11)

	Height of lower hitch points above ground in down pos. mm	Vertical movement mm	Max. force exerted through full range daN	Corresp. pressure of hydraul. fluid bar	Moment about rear axle daNm	Max. tilt angle of mast over range of lift degrees
At hitch points	200	620	1090	132	-	-
On the frame	200	782	1000	132	1555	16,5

Temperature of hydraulic fluid at start of test 65 °C

Lifting heights relative to horizontal lower links

mm	-307	-300	-270	-200	-100	0	+100	+200	+300	+350	+400	+475
Lifting forces at hitch points												
daN			1090	1250	1470	1640	1760	1880	1960	2000		
Lifting forces at test frame												
daN	1000	1020		1160	1270	1310	1370	1370	1370		1310	1250

Hydraulic Power

Sustained pressure with pump stalled 159 bar
Pump delivery rate at minimum pressure 53,3 l/min

	Hydraulic power kW	Flow rate l/min	Pressure bar	Oil temperature °C
at 90% of the actual relief valve setting	6,7	28,2	143	65
maximum	11,1	50,6	132	65

Tapping point used for test: At rear of tractor
Return: At gear oil filter housing
(supply into pressure line of transmission oil pump)

(3) DRAWBAR POWER AND FUEL CONSUMPTION (unballasted tractor)

Date of tests: 23rd July 1987
Type of track: Concrete
Height of drawbar above ground: 430 mm

Gear	Driving speed km/h	Power kW	Drawbar pull daN	Engine speed r/min	Slip of wheels %
1	MAXIMUM POWER IN TESTED GEARS				
2 I	2,98	14,7	1780	2576	15,1
3 I	4,37	21,5	1769	2550	15,1
4 I	6,11	26,8	1581	2497	13,4
1 II	8,37	27,6	1188	2499	10,3
2 II	12,42	27,9	808	2499	6,7
2	FUEL CONSUMPTION				
2.1	In selected gear at maximum power				
2 II	12,42	27,9	808	2499	6,7
2.1.1	75% of pull at maximum power				
2 II	12,93	21,8	606	2559	5,1
2.1.2	50% of pull at maximum power				
2 II	13,24	14,9	406	2574	3,4
2.1.3	Next higher gear at reduced engine speed; same pull and				
3 II	13,05	21,8	602	1734	5,2
2.1.4	Next higher gear at reduced engine speed; same pull and				
3 II	13,18	14,8	403	1721	3,5
2.2	In selected gear nearest to 7,5 km/h				
4 I	6,11	26,8	1581	2497	13,4
2.2.1	75% of pull at maximum power				
4 I	6,50	21,3	1181	2561	10,2
2.2.2	50% of pull at maximum power				
4 I	6,81	14,9	789	2583	6,7
2.2.3	Next higher gear at reduced engine speed; same pull and				
1 II	6,57	21,6	1185	1961	10,3
2.2.4	Next higher gear at reduced engine speed; same pull and				
1 II	6,88	15,0	785	1974	6,7

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	Tyre size	Inflation pressure
Front:	7.50-16	1,8 bar
Rear:	16.9-28	1,0 bar

Tread bar height at the beginning of drawbar tests:
Rear tyres 86% of the value when new

Specific fuel consumpt. g/kWh	Specific energy kWh/l	Temperatures Fuel °C	Coolant °C	Engine-oil °C	Atmospheric conditions Tempe-rature °C	Relative humidity %	Pressure mbar
444	1,91	26	79	87	21	86	998
385	2,20	24	79	86	20	90	998
354	2,40	27	80	91	21	86	998
346	2,45	28	81	90	21	78	998
340	2,50	30	80	91	23	81	998
340	2,50	30	80	91	23	81	998
368	2,31	30	80	89	23	74	998
430	1,98	30	80	89	23	74	998
travelling speed as in 2.1.1							
319	2,66	31	80	88	24	72	998
travelling speed as in 2.1.2							
340	2,47	31	80	88	24	72	998
354	2,40	27	80	91	21	86	998
367	2,31	28	80	90	21	79	998
423	2,01	28	80	90	21	79	998
travelling speed as in 2.2.1							
327	2,60	28	81	89	21	78	998
travelling speed as in 2.2.2							
357	2,38	28	81	89	21	78	998

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ADDITIONAL TESTS

(4) NOISE AT THE DRIVER'S EAR

Date of tests: 22nd July 1987
Type of track: Concrete
Type of sound level meter: BRÜEL & KJAER model 2209

Tractor fitted with JOHN DEERE protective frame ROLL GARD

Results of tests

Gear	Drawbar pull at which the tractor develops the maximum sound level daN	Travelling speed nominal km/h	Travelling speed effective km/h	Sound level dB(A)
1 I	1641	2,36	2,07	92,0
2 I	1607	3,37	2,99	92,0
3 I	1658	5,00	4,32	93,0
4 I +)	1538	6,99	6,07	94,0
4 I +)	light load	6,99	7,52	92,0
1 II	1153	9,25	8,40	94,0
2 II	792	13,22	12,52	94,5
4 II	light load	27,41	28,94	92,5

+) The 4 I gear corresponds to the nominal speed nearest to 7,5 km/h

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