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NATIONAL MACHINERY TESTING INSTITUTE

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TEST BULLETIN: OECD No. 677

Date of approval 1980-09-10

REPORT ON TEST IN ACCORDANCE WITH OECD TEST CODE FOR THE OFFICIAL TESTING OF AGRICULTURAL TRACTORS

AGRICULTURAL TRACTOR JOHN DEERE 3140

Manufactured by:

John Deere Werke Mannheim, D-6800 MANNHEIM, Germany

Test No. 5195

Test Bulletin: OECD No. 677

Agricultural Tractor John Deere 3140



This Bulletin is based on engineering tests in accordance with OECD Tractor Code.

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

Civiltryck AB, Stockholm 1980

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Tractor manufacturer's name and address:	John Deere Werke Mannheim, D-6800 Mannheim
Submitted for test by:	The manufacturer
Selected by:	The manufacturer
Place of running-in:	John Deere Werke Mannheim
Duration of running in:	50 hours

Specification of tractor

Tractor

Make	John Deere
Model	3140
Type	Wheeled Agricultural tractor, rear wheel driven, unit construction
Serial No.	320 181 L

Engine

Make	John Deere
Model	6359 DL 02
Type	4-stroke diesel engine, direct injection, water cooled
Serial No.	395 246
Cylinders No.	6
Disposition	In-line
Bore/stroke	106,5/110 mm
Capacity	5.879 dm^3
Compression ratio	16.8 : 1
Arrangement of valves	Overhead
Cylinder liners	Wet repleaceable cylinders

Fuel system

Fuel feed system	Roto diesel fuel feed pump 2FS
Make, type and model of fuel filter (s)	Roosa master fuel filter, replaceable cartridge, box type master filter
Capacity of fuel tank	130 dm^3
Make, type and model of injection pump	CAV-Roto Diesel, DPA, Distributor pump
Serial No.	R3462 F650
Manufacturer's production setting	49.4+/−1.5 mm^3 per stroke at rated engine speed.
Injection timing	15° before T.D.C.
Make, type and model of injectors	Stanadyne, 22202, 4-holes nozzles
Manufacturer's production setting	21.0 MPa

Governor

Make	CAV-Roto Diesel
Type	Mecanically acting, variable speed governor, incorporated in injection pump
Range of engine speed	800+/−50 to 2660+50/−0 rev/min
Rated engine speed	2 500 rev/min

Air cleaner

Main	Donaldson, dry paper element filter with centrifugal pre-cleaner. Situated forward of radiator under bonnet.

Exhaust silencer	Eberspächer AL 30 338, absorption type silencer, under bonnet on left hand side, vertical exhaust pipe, debouch 2 885 mm above ground

Lubrication system	
Type	Forced feed from gear type pump, strainer in sump
Type and number of filter	Full flow filter with by-pass valve, 1 replaceable filter cartridge, changing period 200 h
Oil capacity	11.5 dm^3
Changing period	100 h
Recommended oil	Engine oil according to API CC (CD for heavy operating conditions)
Cooling system	
Type	Water cooled, impeller assisted. Centrifugal pump suction type, 6 blades fan, 533 mm dia.
Coolant capacity	19 dm^3
Means of temperature control	Dual flow thermostat
Pressure details	Over pressure set at 50 kPa
Starting system	Electrical
Make	Bosch
Type	Screw push starter motor, 2.9 kW
Aids for cold starting	CAV flame glow plug in intake pipe or ether starting aid
Electrical system	
Voltage	12 V, negative earth
Generator	
Make	Bosch
Type	Alternator K1 14V – 55A
Battery	
Make	JohnDeere
Type	Varta, lead-acid (2×12 V)
Capacity (each battery)	88 Ah, 20 hours rating
Transmission	
Clutch	
	Fichtel & Sachs GN 320K
Method of operation	Dry single plate, dia. 320 mm pedal operated.
Gearbox	
Make	John Deere
Type	Speed change gear, synchronized shifted with 4 speeds; group gear with 2 forward and 1 reverse group collar shifted; creeper gear, whish may be engaged in »Slow range« and in »Reverse range«, with 4 forward and 4 reverse speeds.
No. of speeds	12 forward and 8 reverse
Rear axle and final drive	
Make	John Deere
Type	Bevel gear drive wheel and pinion
Differential lock	Bevel gear type
Method of operating lock	Hand lever and pedal, self-disengaging

Oil capacity

Gearbox and final drive housing	69 dm³
Change period	1 000 h
Recommended oil	John Deere JDM J 20 A. Viscosity min. 9.1 mm²/s at 99°C.

Group	Gear	Number of engine Revolutions for one revolution of driving wheel	Nominal Travelling speed at rated engine speed*	
			km/h	m/s
	Forward speed			
Creeper	1	1 140.47	0.68	0.19
	2	825.35	0.94	0.26
	3	574.20	1.35	0.38
	4	426.03	1.81	0.50
Slow	1	238.91	3.23	0.90
	2	172.94	4.47	1.24
	3	120.33	6.42	1.78
	4	89.23	8.66	2.41
Fast	5	69.76	11.08	3.08
	6	50.57	15.28	4.24
	7	35.11	22.11	6.14
	8	26.04	29.68	8.24
	Reverse speeds			
Creeper	1	742.60	1.04	0.29
	2	537.44	1.44	0.40
	3	373.89	2.07	0.58
	4	277.42	2.79	0.78
Direct	1	155.50	4.97	1.38
	2	112.48	6.87	1.90
	3	78.47	9.85	2.74
	4	58.13	13.29	3.69

* Calculated with a tyre rolling radius of 820 mm

Power take off

Location	At rear of tractor
Type of drive	Independent p.t.o., under load engageable and disengageable by hydraulically operated multiplate clutch; 2 shiftable speeds 540/1 000 rev/min
Dimensions	According to ISO 500
No. of splines	6 (dia. 34.9 mm)
Height above ground	743 mm, 25.4 mm to the lefthand side of tractor median plane, distance to the rear axle centre 521 mm.
540 rev/min p.t.o. speed	559 rev/min at rated engine speed; standard p.t.o. speed 540 rev/min at 2 414 rev/min engine speed Direction of rotation clockwise viewed facing driving end.
1 000 rev/min p.t.o. speed	1 038 rev/min at rated engine speed; standard p.t.o. speed 1 000 rev/min at 2 409 rev/min engine speed. Direction of rotation clockwise viewed facing driving end.

Power lift

Hydraulic system	John Deere closed center system. Oil supplied from transmission housing to ram cylinder and external tapping. One ram cylinder. Oil capacity 69 dm³, 30 dm³ available for external hydraulics for short

time. Self regulating 8-piston radial type pump, directly driven by front end of the crankshaft; gear type feed pump in transmission box, over pressure relief valve for ram set to 24 to 31 MPa overpressure.
19.0 MPa maximum oil pressure.
Draft central with lower link sensing, position control or combined draft and position control.
The tractor may be equipped with one or two dual selective control values with oil tappings.

Implement linkage — Three point linkage, category 2, telescopic draft links or quick-coupling (Walterscheid).

Implement Crossbar — Short crossbar, Category II; fitted on clevis of lower links
Length between ball joints 824 mm, thickness of bar 25 mm
Centre hole and 4 holes at eihter side with 80 mm distance each; all holes 33 mm diameter
Height above ground adjustable by power lift from 180 to 1 025 mm depending on lift rods length. Within the lifting range steplessly-hydraulically fixable by sink throttle; distance of centre hole from rear axle centre 1 088 mm and from p.t.o. shaft end 558 mm.

Drawbar — Swinging drawbar

Height above ground 480—608 mm, changed by inverting drawbar
Horizontal distance from rear axle 760—930 mm
Position relative to p.t.o. 225—395 mm
Lateral adjustment 215 mm swingable to either side. Pivot position relative to rear wheel centre 51 mm. Coupling pin diameter 33 mm.

Hitch — Height above ground 958 mm, horizontal distance from rear axle 518 mm. Position relative to p.t.o. 2 mm. Coupling pin diameter 33 mm. Maximum permissible vertical load 1 200 kg.

Steering — Danfoss. Type hydraulic steering system, oil supply from the main hydraulic system with pressure reducing valve. Hand wheel operated, acting on front wheels by double acting steering cylinder make Hengstler, bore/stroke 50/215 mm.

Brakes — Make John Deere, hydraulically operated wet disk 306 mm dia. on the final drive shafts. Independator combined pedal operated. Parking brakes mecanically acting with wedge band brake, acting on a drum with 238 mm diameter on the differential housing, operated by hand lever with ratchet.

Wheels — Two at front

Steering wheels — Diagonal 11.00—16, ply rating 8. Maximum permissable mass on each tyre 1 320 kg at 250 kPa pressure. Track widths 1 493—2 003 mm. In steps of 51 mm each changeable by extending telescopic front axle; Maximum track width 2 047 mm wheel disks reversed.

Driving wheels — Two at rear. Diagonal 18.4/15 — 38, ply rating 8. Rim size DW 15 — 38. Maximum permissable mass on each tyre 2 715 kg at 140 kPa pressure. Track width 1 600—2 000 mm. In 100 mm steps changed by offset lug type rims.

Wheelbase — 2 551 mm.

All available tyres

Front:	Rear
7.50 – 18	16.9 – 34
7.50 – 20	18.4 – 34
10.00 – 16	16.9 – 38
11.00 – 16	18.4 – 38
	15.5 – 38
	23.1 – 26

Seat

Make	Grammer DS 44 2H
Type of suspension	Adjustable spring
Type of damping	Shock absorber
Range of adjustment	
For and aft	150 mm
Up and down	60 mm

Protective frame Fritzmeier Sicherheitsramen No. 181

Lightning The lighting system is in accordance with the national Swedish regulations for road traffic (FK 20 §).

	Height above ground of centre mm	Diameter mm	Distance from outside edge of tractor to centre mm
Head lights	1 205	130	750
Side lights	1 760	70×70	60
Rear lights	1 490	150×60	215
Reflectors	1 425	140×30	215

Number of grease points (whole tractor) 11

Conditions during test

Masses	**Tractor without driver but with tanks full**	
Without ballast	Part of mass on front wheels	1 230 kg
	Part of mass on rear wheels	2 600 kg
	Total mass	3 830 kg
With ballast	Part of mass on front wheels	1 920 kg
	Part of mass on rear wheels	4 200 kg
	Total mass	6 120 kg
Ballast	Front: No. of weights 1+12	
	Total mass kg (excluding water) 90+504 kg	
	Rear: No. of weights 12	
	Total mass kg (excluding water) 660 kg	
	Water 1 036 kg	

Track setting
during tests Front: 1 595 mm
Rear: 1 600 mm

Overall dimensions

	Length m	Width m		Height m	
		Max.	Min.	With Exhaust	Without Exhaust
With ballast	4.381				
Without ballast	4.076	2.465	2.060	2.905	2.710

Minimum ground clearance 420 mm to underside of drawbar frame

Fuel and lubricants used in tests

Fuel

Diesel fuel to Swedish Standard SS 155432. Density at 15° C 0.830 g/cm^3. Viscosity at 20° C 3.2 mm^2/s. Cetane number 49.
Engine oil Shell Universal SAE 15 W/30.
Transmission oil John Deere JDM J 20 A.

Compulsory tests

1. Main power take-off performance

Date and location of tests: 1980-02-19, Ultuna, Uppsala, Sweden
Type of dynamometer: Eddy current, make Zöllner

Power	Speed rev/min		Fuel consumption				Specific energy	
kW	Engine	p.t.o.	l/h	kg/h	g/MJ	kg/kWh	MJ/l	kWh/l
Maximum power — 2 hours test								
67.5	2 500	1 038	21.9	18.15	74.6	0.269	11.13	3.09
The speed recommended by the manufacturer for drawbar work								
67.5	2 500	1 038	21.9	18.15	74.6	0.269	11.13	3.09
Part loads								
(1) 85 % of the torque obtained at maximum power								
58.7	2 556	1 061	19.9	16.55	78.4	0.282	10.59	2.94
(2) Unloaded								
0.9	2 643	1 097	8.1	6.68	–	–	–	–
(3) 50 % of the load defined in (1)								
29.9	2 602	1 080	13.8	11.43	106.3	0.383	7.81	2.17
(4) Maximum power								
67.5	2 498	1 037	21.8	18.10	74.4	0.268	11.15	3.10
(5) 25 % of the load defined in (1)								
15.0	2 621	1 088	10.7	8.84	163.3	0.588	5.08	1.41
(6) 75 % of the load defined in (1)								
44.5	2 582	1 072	16.8	13.93	87.0	0.313	9.53	2.65

Power	Speed rev/min		Fuel consumption				Specific energy	
kW	Engine	p.t.o.	l/h	kg/h	g/MJ	kg/kWh	MJ/l	kWh/l
Part loads, the governor hand lever in the position corresponding to the standard p.t.o. speed at full load (1 000 rev/min).								
(1) 85 % of the torque obtained at maximum power								
58.1	2 448	1 016	18.9	15.70	75.1	0.270	11.06	3.07
(2) Unloaded								
0.8	2 543	1 056	6.1	7.35	–	–	–	–
(3) 50 % of the load defined in (1)								
29.6	2 498	1 037	13.0	10.75	100.7	0.363	8.24	2.29

(4) Maximum power								
67.3	2 409	1 000	21.1	17.55	72.4	0.261	11.46	3.18
(5) 25 % of the load defined in (1)								
14.9	2 517	1 045	9.9	8.20	153.1	0.551	5.42	1.51
(6) 75 % of the load defined in (1)								
44.0	2 476	1 028	15.9	13.20	83.3	0.300	9.97	2.77

Standard specific fuel consumption: g/MJ (kg/kWh)
a) 78.4 (0.282)
b) 106.3 (0.383)
c) 75.1 (0.270)
d) 100.7 (0.363)

No load, maximum engine speed		2 643/min
Equivalent crankshaft torque at maximum power		258 Nm
Maximum equivalent crankshaft torque		305 Nm at 1 500 rev/min engine speed
Mean atmospheric	temperature	17.5°C
	pressure	103.2 kPa
	relative humidity	22 %
Maximum temperature	coolant	80.5°C
	engine oil	101°C
	fuel	19.5°C
	air intake	20.5°C

2. Drawbar performance

Date of tests:	1980-04-11--25
Type of track:	Drum dynamometer with concrete surface
Height of drawbar above ground:	unballasted 690 mm ballasted 700 mm
Tyre inflation pressure:	unballasted 100 kPa ballasted 140 kPa

Results see Table 1

Engine oil consumption during ten hours duration of test (ii) was 6 g/h. Test (iii) was carried out with additional ballast. Power, speed, slip and fuel consumption do not correspond to test (i) gear 2.

Table 1. Drawbar performance

Gear	Power	Draw-bar pull	Speed		Engine speed		Wheel slip	Specific fuel consumption		Specific energy		Temperatur				Atmospheric conditions		
												Coo-lant	Fuel	Engine oil	Transm. oil	Tempe-rature	Rel. hum	Pressure
	kW	kN	m/s	km/h	rev/s	rev/ min	%	g/MJ	g/kWh	MJ/1	kWh/1	°C	°C	°C	°C	°C	%	kPa
i) Maximum power (ballasted tractor)																		
1	36.5	48.0	0.76	2.74	43.0	2 580	15.0	110	395	7.57	2.10	79	17	90	26	15	30	101.2
2	51.7	48.3	1.07	3.85	42.4	2 545	14.0	99	356	8.39	2.33	79	17	88	25	17	30	101.2
3	57.7	35.6	1.62	5.83	41.7	2 500	7.2	89	322	9.27	2.57	80	20	92	29	15	30	101.2
4	58.0	25.9	2.24	8.06	41.7	2 500	5.0	89	321	9.32	2.59	80	21	93	30	15	30	101.2
5	58.9	20.3	2.90	10.44	41.7	2 500	3.7	88	316	9.46	2.63	80	20	88	30	16	30	101.2
6	55.9	13.8	4.05	14.58	41.7	2 500	2.5	92	333	8.98	2.49	81	20	94	33	16	30	101.2
ii) Five hour test at 75 % pull at maximum power																		
4	45.0	19.4	2.32	8.35	42.7	2 560	3.4	98	351	8.51	2.36	81	21	104	48	23	31	102.6
iii) Five hour test at pull corresponding to 15 % wheel slip in test i)																		
2	54.6	48.3	1.13	4.07	42.3	2 535	–	–	–	–	–	83	21	108	49	20	34	102.3
iv) Maximum power (unballasted tractor)																		
2	34.9	32.6	1.07	3.85	43.1	2 585	15.0	111	400	7.48	2.08	79	18	95	27	16	49	101.9
3	49.4	32.9	1.50	5.40	42.5	2 550	15.0	96	344	8.68	2.41	79	18	97	26	16	49	101.9
4	58.0	26.6	2.18	7.85	41.7	2 500	7.2	89	319	9.37	2.60	80	16	97	23	16	49	101.9
5	59.7	21.1	2.83	10.19	41.7	2 500	5.0	86	310	9.64	2.68	81	18	95	28	15	49	101.9
6	57.7	14.5	3.98	14.33	41.7	2 500	3.6	89	321	9.32	2.59	81	19	102	32	18	49	101.9

3. Turning space and turning circle

Details of wheel equipment: As in specification without ballast
Track of wheels: Front 1 595 mm
Rear 1 600 mm

	With brakes		Without brakes	
	Left-hand m	Right-hand m	Left-hand m	Right-hand m
Radius of turning space	4.42	4.02	4.91	4.39
Radius of turning circle	4.26	3.86	4.75	4.23

4. Location of centre of gravity

Height above ground	972 mm
Distance forward from the vertical plane containing the axis at rear wheels	828 mm
Distance from the median plane*	5 mm

* To the left hand side

5. Braking

Date of tests: 1979-09-21—10-01
Type of track: Tarmac
Type of decelerometer: Moto Meter, recording type
Mass of ballasted tractor: 6 120 kg

Cold brakes

Stopping performance

Travelling speed of the tractor 25 km/h		Unballasted tractor	Ballasted tractor
Deceleration	m/s^2	5.30	5.35
Stopping distance	m	6.64	6.15
Force pedal	N	289	376
Force on pedal to achieve a deceleration of 2.5 m/s^2	N	245	239

Parking brake

Tractor facing up 16 % slope: Force on lever 255 N
tractor does not move
Tractor facing down 16 % slope: Force on lever 255 N
tractor does not move

Hot brakes

Brake fade characteristics

Travelling speed of the tractor 25 km/h	Unballasted tractor	Ballasted tractor
Deceleration hot/cold %	93	103
Stopping dist cold/hot %	101	106
Force on pedal cold/hot %	93	104

6. Measurement of ambient noise

Date of test: 1979-09-11
Type of sound level meter: Brüel & Kjaer, type 2204
Type of track: Tarmacadam
Results of tests
Travelling speed: 23.8 km/h, gear Fast 8
Sound level: 90.5 dB(A)

7. Noise measurement at the driver's ear level

Date of tests: 1979-09-13
Type of sound level meter: Brüel & Kjaer, type 2204
Type of track: Tarmacadam

Results of tests

Gear	Travelling speed* km/h	Sound level dB(A)
Slow 4	9.3	93
Fast 5	10.5	94.5
Fast 8	30.4	94.5

* The first gear tested corresponds to the travelling speed nearest 7.5 km/h

8. Power lift and hydraulic pump performance

Date of tests: 1980-02-08 and 1980-03-25
Hydraulic fluid: Same as in the transmission
Type of linkage lock for transport: Hydraulic, opening pressure of the cylinder over pressure relief valve (manufacturer's figure) 24–31 MPa

8.1 Pump characteristics

1. Sustained pressure with pump stalled 19.1 MPa
2. Pump Delivery rate at minimum pressure and rated engine speed 0.83 l/s (50.0 l/min)
3. Pump delivery rate 0.80 l/s (48.0 l/min)
   Delivery Pressure 16.7 MPa
   Power 13.3 kW

8.2 Lifting forces

At the hitch points

Lifting heights in relation to a horizontal line through the lower links pivoting points in mm

−308	−300	−200	−100	−35	0	100	200	244	300	400	450
Maximum mechanical advantage											Lifting force kN[1]
–	–	–	–	29.1*	29.8	32.4	33.3	–	34.1	35.4	36.8
Minimum mechanical advantage											Lifting force kN[1]
25.7*	25.7*	29.3	29.9	–	30.8	31.0	31.8	33.3	–	–	–

[1] Values calculated for the pressure at maximum hydraulic power (16.7 MPa) from measurements made at maximum pressure 19.1 MPa.
* Maximum force exerted throughout whole range indicated.
Force at which front of tractor is calculated to lift with maximum allowable front ballast is in exess of measured values.

At the standard frame – Maximum mechanical advantage

Lifting heights in relation to a horizontal line through the lower links pivoting points in mm

−272	−250	−200	−100	0	100	200	250	At the frame
−297	−264	−213	−104	0	94	184	230	At the hitch points
Lifting force in kN[1]								
30.8	30.8	30.8	30.4	29.1	28.2	27.3*	27.3*	

[1] Values calculated for the pressure at maximum hydraulic power (16.7 MPa) from measurements made at maximum pressure 19.1 MPa.
* Maximum force exerted throughout whole range indicated.
Force at which front of tractor is calculated to lift with maximum allowable front ballast in exess of measured values.

At the standard frame – Minimum mechanical advantage

Lifting heights in relation to a horizontal line through the lower links pivoting points in mm

−38	0	100	200	300	400	500	590	At the frame
−36	0	87	171	252	328	403	463	At the hitch points
Lifting force in kN[1]								
25.8	26.4	27.0	26.8	25.6	24.7	23.9	23.5*	

[1] Values calculated for the pressure at maximum hydraulic power (16.7 MPa) from measurements made at maximum pressure 19.1 MPa.
* Maximum force exerted throughout whole range indicated.
Force at which front of tractor is calculated to lift with maximum allowable front ballast is in exess of measured values.

CORRECTION DURING TESTS — The rockshaft control system has been readjusted.

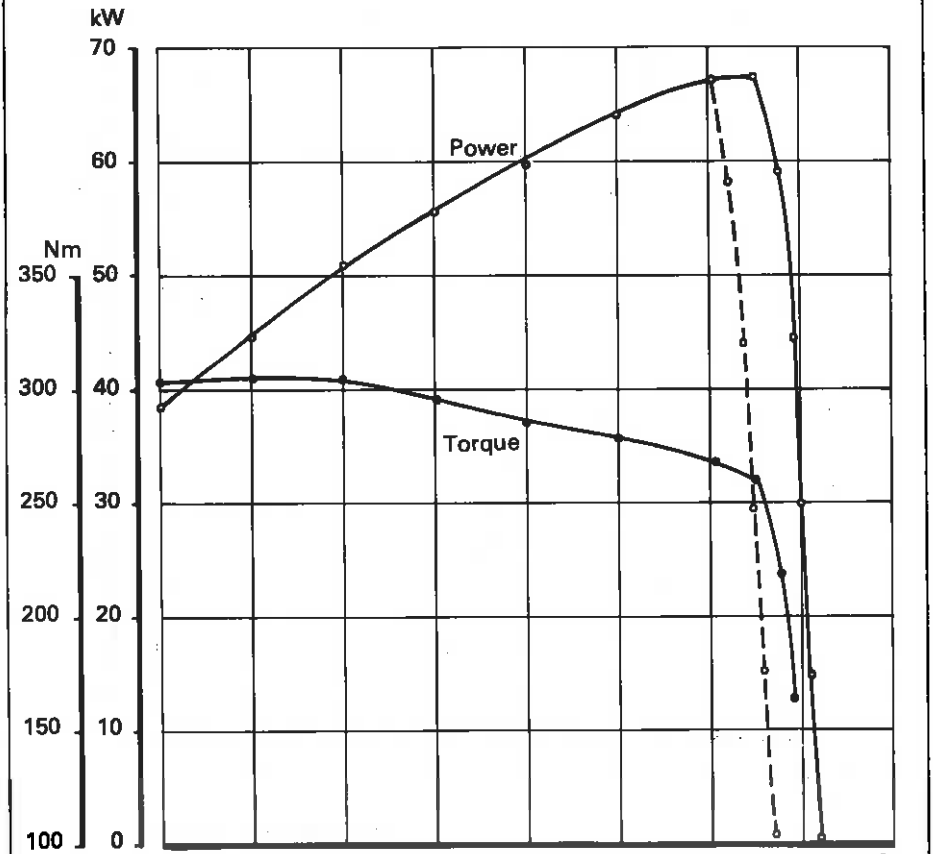
REMARKS — None

Table 2. Linkage geometry when connected to the standard frame

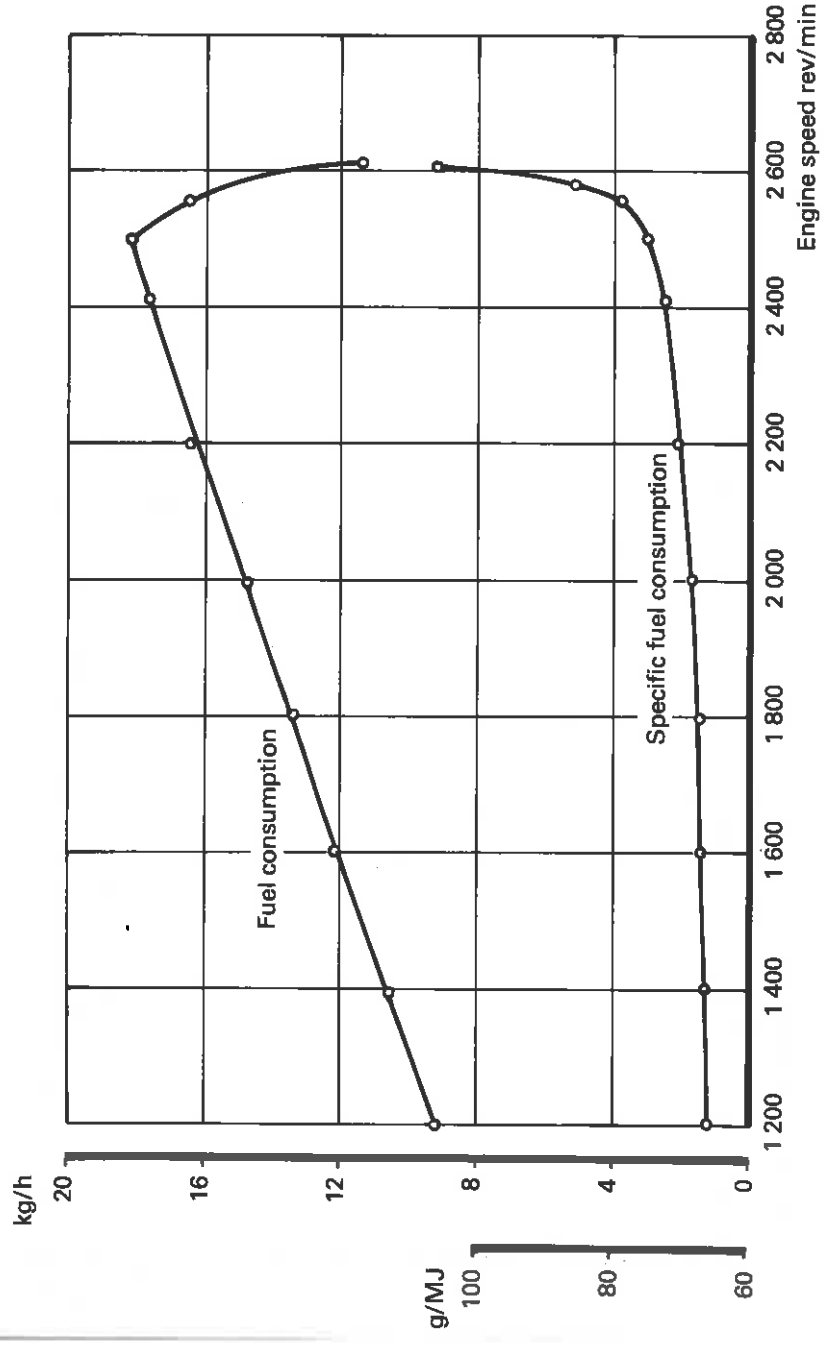
	Maximum mechanical advantage	Minimum mechanical advantage
Projected length in side view:		
Lower links	973+/− 3 mm	973+/− 3 mm
Lift arms	280 mm	280 mm
Lift rods	907 mm	761 mm
Top link	698 mm	705 mm
Distance of lift rod connection point from pivot point of lower link	624 mm	624 mm
The following dimensions are given relative to the rear wheel centre line, situated 820 mm above the ground level.		
Lower link pivot point	115 mm behind, 251 mm below	115 mm behind, 251 mm below
Top link pivot point	371 mm behind, 193 mm above	371 mm behind, 143 mm above
Lift arm pivot point	−7 mm forward, 336 mm above	−7 mm forward, 336 mm above
Maximum and minimum height of lower link hitch points	−21 mm above, 548 mm below	212 mm above, 287 mm below
Height of lower link hitch points when locked in transport position	799 mm	1 032 mm

Ultuna, Uppsala 1980-12-09
NATIONAL MACHINERY TESTING INSTITUTE

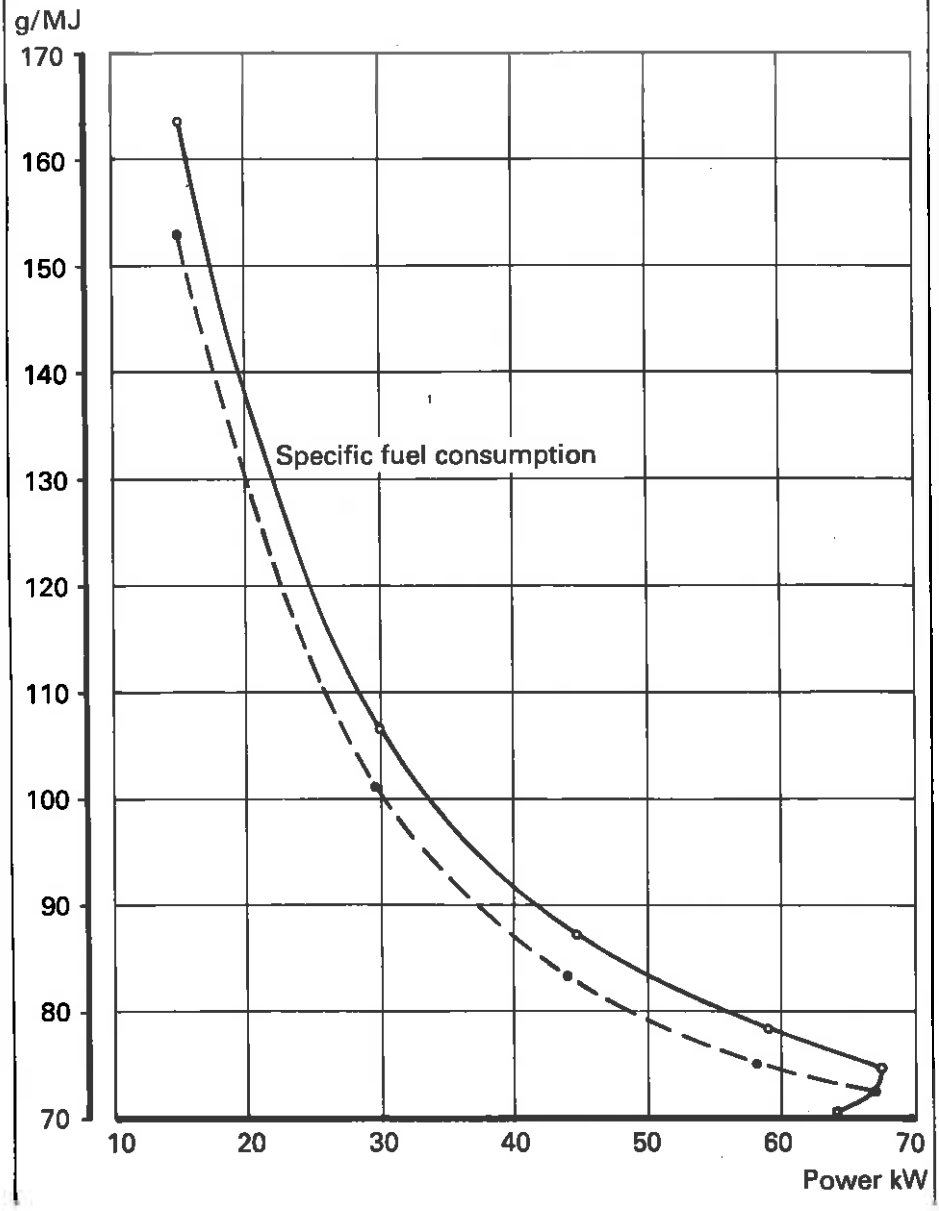
National Machinery Testing Institute	**Power take-off test John Deere 3140**	Figure 1



National Machinery Testing Institute	**Power take-off test John Deere 3140**	Figure 2



National Machinery Testing Institute	**Power take-off test John Deere 3140**	Figure 3



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