AFRC Institute of ENGINEERING RESEARCH

OECD Approval No. 1218 Restricted
Approval date: 8th September 1989

Test in accordance with the OECD restricted standard code for the official testing of agricultural tractors

Case International 1896 4 Wheel-Drive Tractor



Manufacturered by	J.I. Case Europe Ltd., Wheatley Hall Road, Doncaster, South Yorkshire DN2 4PG.
Test No.	R89/70858/OECD
Report No.	738
Date	April 1989

THE BRITISH SOCIETY FOR RESEARCH IN AGRICULTURAL ENGINEERING

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- Tractor manufacturer's name and address:	J.I. Case Europe Limited, Wheatley Hall Road, Doncaster, South Yorkshire DN2 4PG.
- Location of tractor assembly:	J.I. Case Europe Limited, Wheatley Hall Road, Doncaster, South Yorkshire DN2 4PG.
- Submitted for test by:	The manufacturer
Selected for test by:	The manufacturer with the agreement of the testing station
- Place of running in:	J.I. Case Europe, Doncaster
- Duration of running in:	97 hours
- Location of test:	AFRC Institute of Engineering Research

I. SPECIFICATION OF TRACTOR

TRACTOR

- Make:	Case International
- Model:	1896
- Type:	Four wheel drive unit construction
- Serial No:	X178955122X
- 1st Serial No:	X178955122X

ENGINE

- Make:	Consolidated Diesel Corporation - Case Diesel
- Model:	CT590
- Type:	4-stroke, turbocharged, direct injection, diesel
- Serial No:	210 35 34 1

Cylinders

- Number/disposition:	6, vertical, in-line
- Bore/stroke:	102.0 mm/120.0 mm
- Capacity:	5883 cm^3
- Compression ratio:	17.5:1
- Arrangement of valves:	Overhead
- Cylinder liners:	Cast in block

Supercharging

- Make:	Holset
- Model:	H1C
- Type:	8243 AF E18 DA11
- Pressure:	56 kPa to 81 kPa

Fuel System

- Fuel feed system:	AC-Delco, model cam driven diaphragm pump with hand primer
- Make, type and model of fuel filter(s):	Case J903410 and J903640. Primary and secondary dual element replacement filters with water trap as primary
- Capacity of fuel tank:	246 l
- Make, type and model of injection pump:	Robert Bosch, VE distributor (VE-R159-12)
- Serial No:	NR0460426055
- Manufacturer's production setting of injection pump:	
. Flow rate:	18.25 kg/h to 21.2 kg/h at 2100 rev/min engine speed full load using 0.833 specific gravity fuel at 40°C inlet temperature
. Timing:	T.D.C.
- Make, type and model of injectors:	Robert Bosch, 17 mm
- Injection pressure:	24.5 + 0.8 MPa

Governor

- Make:	Robert Bosch
- Model:	1896
- Type:	Mechanical, integral with pump
- Governed range of engine speed:	700 to 2310 rev/min
- Rated engine speed:	2100 rev/min

Air cleaner

- Pre-cleaner	
. Make:	Donaldson
. Model:	EEH00-1703
. Type:	Ejector
. Location of air intake:	Under bonnet, above radiator
- Main cleaner:	
. Make:	Donaldson XLP
. Model:	ST8090024
. Type:	Dual, dry paper element
- Maintenance indicator:	Warning light on instrument panel

Lubrication system	
- Type of feed pump:	Full pressure positive displacement
- Type of filter(s):	Full flow replaceable cartridge and metal strainer in sump
- Number:	1
Cooling system	
- Type of coolant:	Water and antifreeze to 1:1 solution
- Type of pump	Centrifugal belt driven
- Specification of fan:	Puller type
- Number of fan blades:	6
- Fan diameter:	550 mm
- Coolant capacity:	20.8 l
- Type of temperature control:	Thermostat
- Superpressure system:	103 kPa
Starting system	
- Make:	Nippondenso
- Model:	F II
- Type:	Electrical, positive engagement, solenoid operated
- Starter motor power rating:	4.0 kW
- Cold starting aid:	Ether spray in intake manifold
- Safety device:	Gearbox in neutral or park positions
Electrical system	
- Voltage:	12
- Generator:	
. Make:	Delco Remy
. Model:	15 SI
. Type:	Belt driven alternator
. Power:	105 AMP at 6000 rev/min
- Batteries:	2, Case IH, low maintenance
. Rating:	650 AMP cold crank, reserve 170 min at 25 AMPS
Exhaust system	
- Make:	Nelson
- Model:	20654A
- Type:	Horizontal, side entry
- Location:	Vertical pipe at front right-hand corner of cab with muffler under hood

TRANSMISSION TO WHEELS

Clutch	Transmission only
- Make:	Case IH
- Model:	1896
- Type:	Oil cooled, multiplate
- Number of plates:	4
- Diameter of plates:	212 mm
- Method of operation:	Hydraulic via foot pedal
Gear box	
- Make:	Case IH
- Model:	1896
- Type:	Partial Power Shift + mechanical
- Arrangement:	4 mechanical ranges with 3 power-shift clutchless forward gears in each and a clutchless reverse on ranges 1 to 3
- Number of gears:	12 forward, 3 reverse
- Available options:	None
Rear axle and final drives	
- Make:	Case IH
- Model:	1896
- Type:	Crown wheel and pinion, with differential and reduction on final drives
- Differential lock:	
. Type:	Hydraulic
. Method of engagement:	Electrically operated by switch on control panel
. Method of disengagement:	Control switch or when either brake pedal is applied
Front axle and final drives	
- Make:	ZF
- Model:	APL 365
- Type:	Crown wheel and pinion differential with planetary reduction on final drives
- Differential lock:	
. Type:	Limited slip
. Method of engagement:	Automatic
. Method of disengagement:	Automatic
. Driven from:	Main transmission countershaft

Total ratios and travelling speeds

Gear No.	Group No.	Number of engine revolutions for one revolution of the driving wheels	Nomimal travelling speed at rated engine speed*: 2100 rev/min km/h
Forward			
1	1	207.059	3.14
2		155.294	4.18
3		124.235	5.23
Reverse		124.235	5.23
1	2	121.524	5.34
2		91.143	7.12
3		72.914	8.90
Reverse		72.914	8.90
1	3	81.016	8.02
2		60.762	10.68
3		48.610	13.35
Revese		48.610	13.35
1	4	39.810	16.31
2		29.857	21.74
3		23.886	27.18

(*)Calculated with a tyre dynamic radius index of 820 mm (ISO 4251/1-1984).

Number of revolutions of front wheels for one revolution of rear wheels: 1.308:1

POWER TAKE-OFF

Main power take-off

- Type: Independent
- Method of engagement: Hydraulically operated multiplate wet clutch via hand lever
- Number of shafts: 1
- Method of changing power take-off speeds: Removing shaft with reversible ends, 6 or 21 spline

Clutch

- Make: Case IH
- Model: 1896
- Type: I.P.T.O.
- Number of plates: 6

Power take-off proportional to engine speed

540 rev/min

- Location:	At rear of tractor
- Diameter of power take-off shaft:	34.9 mm
- Number of splines:	6, in conformity with ISO 500/1979
- Height above ground:	708 mm
- Distance from the median plane of the tractor:	0 mm
- Distance behind rear-wheel axis:	536 mm
- PTO speed at rated engine speed:	534 rev/min
- Engine speed at standard power take-off speed:	2125 rev/min
- Ratio of rotation speeds:	3.936:1
- Power restriction and maximum: torque:	63.4 kW
- Direction of rotation (viewed from behind tractor):	Clockwise

1000 rev/min

- Location:	At rear of tractor
- Diameter of power take-off shaft:	34.9 mm
- Number of splines:	21, in conformity with ISO 500/1979
- Height above ground:	708 mm
- Distance from the median plane of the tractor:	0 mm
- Distance behind rear-wheel axis:	563 mm
- PTO speed at rated engine speed:	997 rev/min
- Engine speed at standard power take-off speed:	2105 rev/min
- Ratio of rotation speeds:	2.105:1
- Direction of rotation (viewed from behind tractor):	Clockwise

POWER LIFT

- Make:	Case International
- Model:	1896
- Type:	Hydraulic
- Type and number of cylinders:	One internal single acting
- Type of linkage lock for transport:	Hydraulic
- Relief valve pressure setting (tolerance):	15.17 - 15.86 MPa
- Opening pressure of cylinder safety valve:	21.62 MPa
- Lift pump type:	Axial piston, pressure and flow rate compensated
- Transmission between pump and engine:	Gear driven from transmission
- Type and number of filters:	Common with gearbox
- Site of oil reservoir:	Common with gearbox

Three-point linkage

- Category:	2 in conformity with ISO/730/1 -1977, 730/2-1979 and 730/3-1982
- Category adaptor:	To Category 1 above by fitting reducer bushes provided with machine

LIFT TEST

Linkage geometry

Figure 2.1

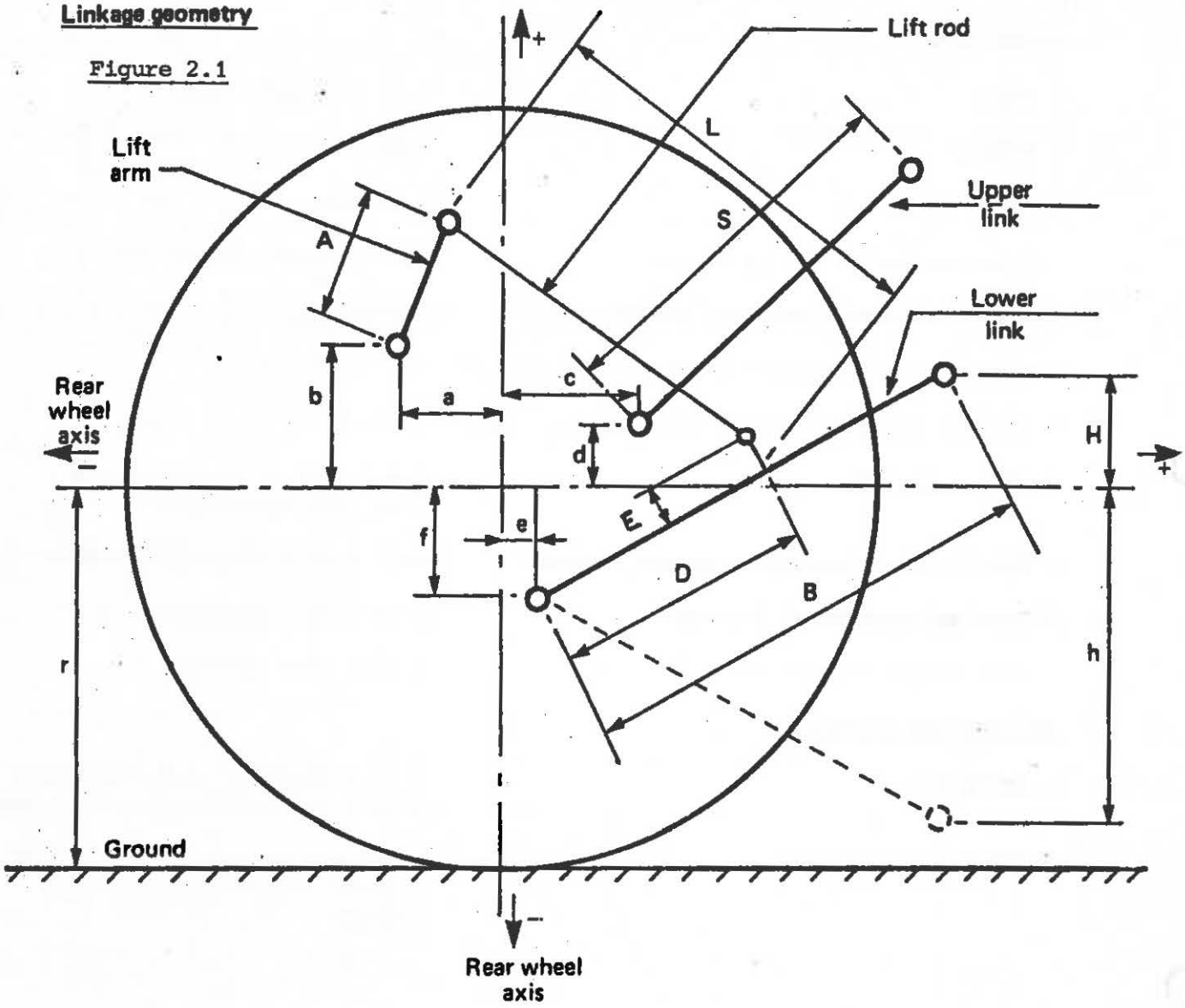
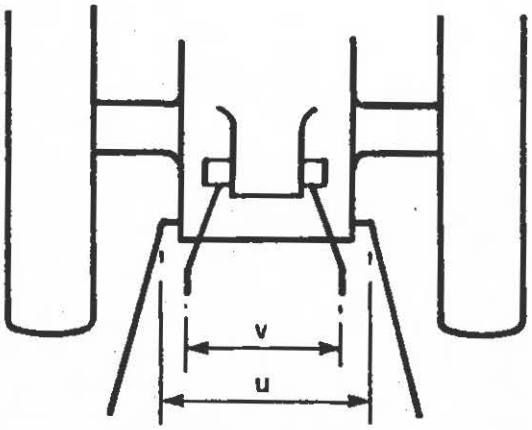


Figure 2.2



		Dimension or range mm	Settings used in test mm
Length of lift arms:	(A)	305	305
Length of lower links:	(B)	765	765
Distance of lift arm pivot : horizontally	(a)	165	165
point from rear-wheel axis : vertically:	(b)	333	333
Horizontal distance between the two lower link points:	(u)	486	486
Horizontal distance between the two lift arm end points:	(v)	624	624
Length of upper link:	(S)	from 550 to 670	581
Distance of upper link pivot point from rear : horizontally	(c)	514	514
wheel axis : vertically	(d)	80 and 156	80
Distance of lower link pivot point from rear : horizontally	(e)	319	319
wheel axis : vertically	(f)	315	315
Distance of lower link points to lift rod pivot : horizontally	(D)	434	434
points on lower links : vertically	(E)	0	0
Length of lift rods:	(L)	from 830 to 900	875
Height of lower hitch points relative to the rear wheel axis:			
- in low position:	(h)	max 675	620
- in high position:	(H)	max 80	5
Height above ground of lower hitch points when locked in transport position (*)		Any height within lift range	

Table 2.1 Dimensions of linkage geometry
(when connected to the standard frame)

(*) Assuming r = 820 mm, tyre dynamic radius index (ISO 4251/1-1984)

SWINGING DRAWBAR

- Type:	Straight bar with hitch pin hole
- Height above ground	
. Maximum:	400 mm
. Minimum	393 mm
- Type of adjustment:	None
- Distance of hitch point from rear-wheel axis, horizontally:	894 mm and 970 mm
- Distance of hitch point from power take-off shaft end:	
. Vertically:	300 mm and 307 mm
. Horizontally: 540 shaft	356 mm and 432 mm
1000 shaft	330 mm and 406 mm
- Lateral adjustment (centre of clevis):	
. Right-hand:	149 and 156 mm
. Left-hand:	149 and 156 mm
- Distance of pivot point from rear axles, horizontally:	379 and 455 mm
-Diameter drawbar pin hole:	32 mm
Maximum vertical permissible load:	8.6 kN

STEERING

- Make:	Case IH
- Model:	1896
- Type:	Hydrostatic
- Method of operation:	Orbitrol unit supplied from main hydraulic system operating steering ram
. Pump(s):	Open centre gear pump
. Ram(s):	Double acting balanced cylinder
- Working pressure:	14.5 MPa

BRAKES

Service brake

- Make: Case IH
- Model: 1896
- Type: Oil immersed multi disc
- Method of operation: Hydraulically actuated from main hydraulic system through two pedals independently or combined
- No. of plates: 3 per side
- Trailer braking take-off: None

Parking brake

- Type: Park-lock position on range select lever
- Method of operation: Hand lever mechanically operated band brake on main transmission

WHEELS

- Number:
  - Front: Driving and steering
  - Rear: Driving
- Wheelbase: 2760 mm
- Track width adjustment

	Minimum mm	Maximum mm	Adjustment method
Front	1524	2261	Reversing offset lug centres and rims
Rear	1574	2100	Sliding hub

PROTECTIVE STRUCTURE

- Make:	Case IH
- Model:	1896
- Type:	Safety Cab
- Manufacturer's name and address:	J.I. Case Europa Limited Wheatley Hall Road, Doncaster
- Protective device:	
. Cab:	4-post ROPS
. Tiltable/Not tiltable:	Non-folding cab
- OECD approval number:	None
S.A.E. Number:	SAE S383 J1194 ASAE S310.3 J167

DRIVER'S SEAT

- Make:	Sears
- Model:	1896, Case Part No. A176375
- Type:	Suspension seat
- Type of suspension:	Air over oil
- Type of damping:	Hydraulic
- Range of adjustment:	
. Longitudinal:	152 mm
. Vertical:	76.2-101.6 mm

LIGHTING

	Height above ground of centre mm	Size mm	Distance from outside edge of lights to median plane of tractor mm
Headlights	1630	150 x 90	275
Sidelights	Not fitted	-	-
Rearlights	1875		705
Reflectors	1875		705

II. TEST CONDITIONS

Overall dimensions

Length, mm	Width		Height at top of	
	minimum mm	maximum mm	protective structure mm	exhaust silencer mm
4572	2567	2567	2997	2972

Ground clearance (unballasted tractor) 335 mm

- Clearance-limiting part: Bolt heads on underside of drawbar frame

Tractor mass

	Without driver kg	With driver kg
Front	2023	2031
Rear	3921	3988
Total	5944	6019

Tyres and track width specification

	Front	Rear
Tyres:		
. dimensions	14.9-28	18.4-38
. ply rating	6	*141A8
. type	radial	radial
. maximum load (tyre manufacturer's)	1615 kg	2722 kg
. maximum load (tractor manufacturer's)	1615 kg	2722 kg
. inflation pressure (tyre manufacturer's)	138 kPa	138 kPa
. dynamic radius index	640 mm	820 mm
Chosen track width	1829 mm	1900 mm

*Old 6 or 8 ply equivalent

Oils and lubrication

Capacity and change interval

	Capacity l	Oil change h	Filter change h
Engine	16.4	250	250
Gearbox	94.6	1000	1000
Front axle	8.5	1000	none
Rear axle	Common with transmission		
Final drive (front)	1.4 each	1000	none
Final drive (rear)	Common with transmission		
Hydraulic system	Common with transmission		
Steering	Common with transmission		
Brakes	Common with transmission		

- Specification (SAE, API, Mil.L, ISO)

	Recommended	Used during test
Engine oil . Type: . Viscosity: . Classification:	 SAE 15 W/40 71 cSt at 50°C MIL-L-2104C	 As recommended " "
Transmission oils . Type: . Viscosity: . Classification:	 International Hy-Tran 27.2 cSt at 50°C Not applicable	 " " "
Hydraulic fluid . Type: . Viscosity: . Classification:	 International Hy-Tran 27.2 cSt at 50°C Not applicable	 " " "
Steering oil . Type: . Viscosity: . Classification:	 International Hy-Tran 27.2 cSt at 50°C Not applicable	 " " "
Front differential and first drives . Type: . Viscosity: . Classification:	 SAE 90 EP 115 cSt at 50°C MIL-L-2105B	 " " "

- Grease:

  . Number of lubrication points: 36

Fuel

- Type: Gas oil
  Standard: In conformity with CEC Ref-05-A-80 Gas oil

- Density at 15°C: 0.8380 g/cm^3

III. **TEST RESULTS**

COMPULSORY TESTS RESULTS

1. **MAIN POWER TAKE-OFF**

- Date and location of tests: AFRC Engineering,

- Type of dynamometer: Water brake, Heenan & Froude

Power	Speed		Fuel consumption			Specific energy
	Engine	P.T.O.	Hourly		Specific	
kW	rev/min		kg/h	l/h	g/kWh	kWh/l
1.1 MAXIMUM POWER - TWO HOUR TEST						
77.8	1879	892	18.06	21.55	0.232	3.61
1.2 POWER AT RATED ENGINE SPEED						
75.8	2105	1000	18.25	21.78	0.241	3.48
1.3 STANDARD POWER TAKE-OFF SPEED (1000 rev/min)						
75.8	2105	1000	18.25	21.78	0.241	3.48
1.4 PART LOADS 1.4.1 the torque corresponding to maximum power at rated engine speed						
75.8	2105	1000	18.25	21.78	0.241	3.48
1.4.2 85% of the torque defined in 1.4.1						
65.7	2145	1019	16.45	19.63	0.250	3.35
1.4.3 75% of the torque defined in 1.4.2						
49.9	2165	1029	13.85	16.53	0.278	3.02
1.4.4 50% of the torque defined in 1.4.2						
33.7	2194	1042	11.24	13.41	0.333	2.51
1.4.5 25% of the torque defined in 1.4.2						
16.8	2227	1058	8.53	10.18	0.508	1.65
1.4.6 Unloaded						
0	2252	1070	6.15	7.34	-	-

Power	Speed		Fuel consumption			Specific energy
	Engine	P.T.O.	Hourly		Specific	
kW	rev/min		kg/h	l/h	g/kWh	kWh/l
1.5 PART LOADS AT STANDARD POWER TAKE-OFF SPEED (1000 rev/min)						
1.5.1 the torque corresponding to maximum power						
75.8	2105	1000	18.25	21.78	0.241	3.48
1.5.2 85% of the torque obtained in 1.5.1						
65.7	2145	1019	16.45	19.63	0.250	3.35
1.5.3 75% of the torque obtained in 1.5.2						
49.9	2165	1029	13.85	16.53	0.278	3.02
1.5.4 50% of the torque obtained in 1.5.2						
33.7	2194	1042	11.24	13.41	0.333	2.51
1.5.5 25% of the torque obtained in 1.5.3						
16.8	2227	1058	8.53	10.18	0.508	1.65
1.5.6 unloaded						
0	2252	1070	6.15	7.34	-	-

Standard specific fuel consumption, kg/kWh

a) 0.250 c) 0.250
b) 0.333 d) 0.333

- No load, maximum engine speed: 2252 rev/min
- Torque (equivalent crankshaft) at maximum power: 395.6 Nm
- Maximum torque (equivalent crankshaft): 493.0 Nm
  (engine speed 1202 rev/min)
- Mean atmospheric conditions:
  - . Temperature: 27°C
  - . Pressure: 103 kPa
  - . Relative humidity: 17%
- Maximum temperatures:
  - . Coolant: 91°C
  - . Engine oil: 101°C
  - . Fuel: 42°C
  - . Engine air intake: 32°C

2. HYDRAULIC POWER AND LIFTING FORCE

- Date of tests: 23rd March and 6th April 1989

2.1 HYDRAULIC POWER TEST

- Sustained pressure with relief valve open: 15.7 MPa
- Pump delivery rate at minimum pressure: 89.5 l/min

	Flow rate l/min	Pressure MPa	Power kW
Flow rate corresponding to a hydraulic pressure equivalent to 90% of the actual relieve valve pressure setting and corresponding hydraulic power	58.0	14.1	13.7
Flow rate and hydraulic pressure corresponding to maximum hydraulic power	87.0	12.2	17.7

- Tapping point used for test: Auxilliary spool valve connector
- Temperature of hydraulic fluid if different from 65 ±5°C: NA
- Opening pressure of the unloading valve: NA
- Closing pressure of the unloading valve: NA

2.2 POWER LIFT TEST

	at the hitch point	on the frame
Height of lower hitch points above ground in down position	200 mm	200 mm
Vertical movement	625 mm	814 mm
Maximum corrected force exerted through full range	29.6 kN	25.4 kN
Corresponding pressure of hydraulic fluid	12.2 MPa	12.2 MPa
Moment about rear-wheel axis	32.1 kNm	43.0 kNM
Maximum tilt angle of mast from vertical	NA	13 degrees

- Linkage settings for test - see Table 2.1 and Figures 2.1 and 2.2

Lifting heights relative to the horizontal plane including the lower link pivot points											
mm	-354	-305	-200	-100	0	+50	+100	+200	+250	+320	+460
Lifting forces (the values measured are corrected to correspond to a hydraulic pressure equivalent to 90% of the actual relief valve pressure setting or to maximum power delivered by the hydraulic system, whichever is lower)											
at the hitch points kN	-	29.6	31.1	32.8	34.1	35.0	36.0	38.1	39.4	41.5	-
Corresponding pressure: 12.2 MPa											
at the frame kN	26.7	27.0	27.0	27.0	27.0	27.0	26.9	26.8	26.4	26.0	25.4
Corresponding pressure: 12.2 MPa											

3. DRAWBAR POWER AND FUEL CONSUMPTION (UNBALLASTED TRACTOR)

Date of tests: 7th February 1989
Type of track: Concrete

Height of drawbar above ground	Tyre inflation pressure	
	Front	Rear
370 mm	97 kPa	110 kPa

Gear and Range	Power	Drawbar pull	Speed	Engine speed	Slip of wheels or tracks	Specific fuel consumption	Specific energy	Temperature			Atmospheric conditions		
								Fuel	Coolant	Engine Oil	Temperature	Relative humidity	Pressure
	kW	kN	km/h	rev/min	%	g/kWh	kWh/l	°C	°C	°C	°C	%	kPa
3.1	MAXIMUM POWER IN TESTED GEARS												
*1.1	*44.2	55.5	2.87	2169	15.0	0.366	2.29	35	83	94	10	56	1024
*1.2	*58.4	55.5	3.79	2101	15.0	0.326	2.57	37	84	95	10	53	1024
1.3	63.7	50.9	4.51	1904	6.8	0.293	2.86	37	83	93	10	58	1024
2.1	63.6	50.2	4.56	1884	6.6	0.294	2.85	35	84	92	10	57	1024
2.2	63.7	36.5	6.29	1884	3.5	0.291	2.88	36	83	92	10	57	1024
2.3	64.6	29.4	7.91	1879	2.8	0.286	2.93	37	84	92	11	53	1024
3.1	65.1	33.0	7.09	1878	3.1	0.283	2.96	39	84	94	11	51	1024
3.2	63.2	23.9	9.53	1876	2.3	0.293	2.86	38	84	92	12	46	1023
3.3	61.7	18.5	12.01	1883	1.8	0.299	2.80	38	84	93	12	47	1023
3.2	FUEL CONSUMPTION												
3.2.1	in selected gear, at maximum power at rated speed												
3.1	58.1	26.2	7.99	2100	2.5	0.325	2.58	38	84	95	12	49	1023
3.2.1.1	75% of pull at maximum power at rated speed												
3.1	43.2	18.7	8.31	2173	1.9	0.353	2.37	39	85	96	12	47	1023
3.2.1.2	50% of pull at maximum power at rated speed												
3.1	30.6	13.1	8.42	2190	1.5	0.426	1.97	38	84	95	12	47	1023
3.2.1.3	next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.1.1.												
2.3	43.2	18.7	8.33	1956	1.9	0.332	2.53	37	82	86	11	47	1023
3.2.1.4	next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.1.2.												
2.3	30.5	13.1	8.42	1966	1.5	0.389	2.15	39	82	81	12	47	1023
3.2.2	in selected gear nearest to 7.5 km/h, at maximum power at rated speed												
2.2	60.4	30.8	7.06	2099	2.9	0.312	2.69	36	84	92	10	55	1024
3.2.2.1	75% of pull at maximum power at rated speed												
2.2	47.1	23.1	7.34	2168	2.2	0.346	2.42	37	84	93	11	56	1024
3.2.2.2	50% of pull at maximum power at rated speed												
2.2	31.9	15.4	7.46	2189	1.6	0.412	2.03	36	84	94	11	53	1024
3.2.2.3	next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.2.1.												
3.1	47.2	23.1	7.34	1922	2.2	0.313	2.68	36	84	92	10	55	1024
3.2.2.4	next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.1.2												
3.1	31.9	15.4	7.46	1938	1.6	0.364	2.30	36	84	94	11	53	1024

*Drawbar power limited by wheelslip at 15%

REPAIRS AND ADJUSTMENTS None

REMARKS None

Test carried out by: F. Thistlethwaite

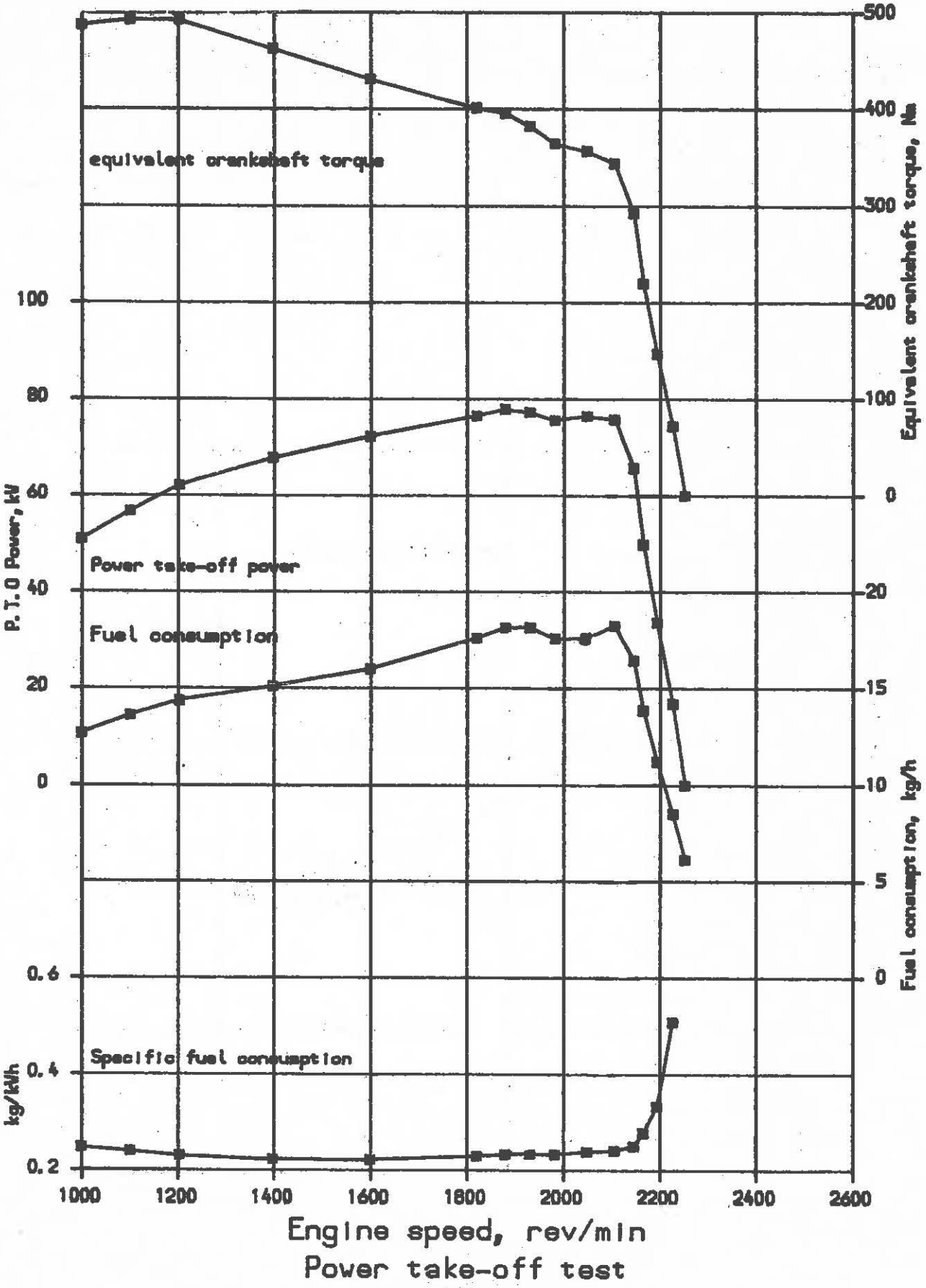
Officer in charge: P.C. Seward

Signed: Head of Testing Group

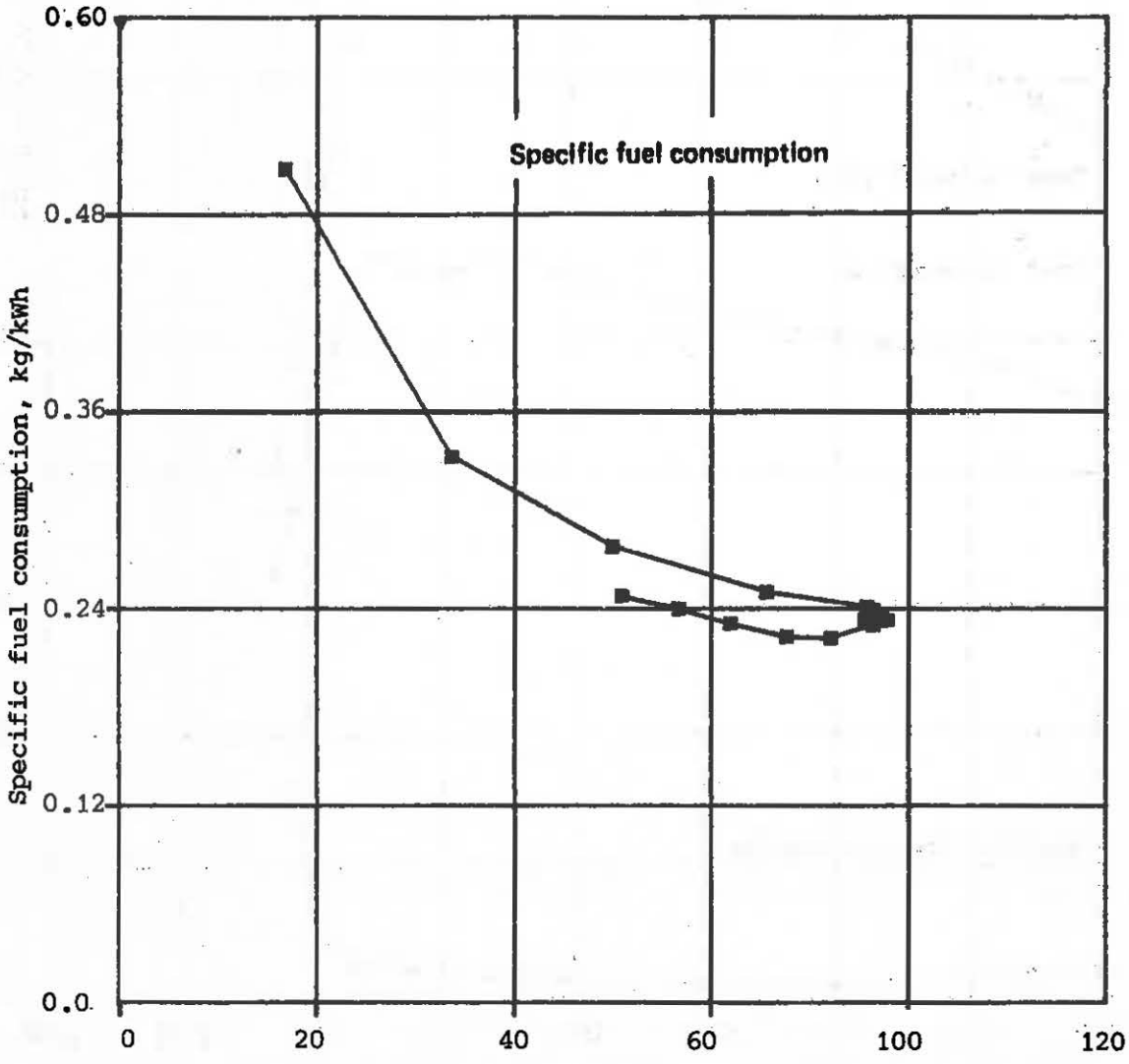
for the Director

Date: 24.7.89

Annex: Main Power Take-off Curves



Power take-off test



Power take-off test