AFRC Institute of ENGINEERING RESEARCH

OECD Approval No. 1256 Restricted

Approval Date : 8th February 1990

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

Massey-Ferguson 390T Four-Wheel Drive Tractor with 12-speed Transmission

Manufacturered by	Massey-Ferguson Manufacturing Limited Banner Lane Coventry Warwickshire CV4 9GF
Test No.	R89/70935/OECD
Report No.	739
Date	November 1989

THE BRITISH SOCIETY FOR RESEARCH IN AGRICULTURAL ENGINEERING

AFRC Institute of Engineering Research
Wrest Park Silsoe Bedford MK45 4HS

TABLE OF CONTENTS

- Tractor manufacturer's name and address:	Massey-Ferguson Manufacturing Ltd., Banner Lane, Coventry, Warwicks. CV4 9GF
- Location of tractor assembly:	Coventry
- Submitted for test by:	The manufacturer
- Selected for test by:	The manufacturer with the agreement of the testing station
- Place of running in:	Coventry
- Duration of running in:	60 hours
- Location of test:	AFRC Engineering, Silsoe

I. **SPECIFICATION OF TRACTOR**

TRACTOR

- Make:	Massey-Ferguson
- Model:	M-F 390T with 12-speed synchromesh transmission
- Type:	Four-wheel drive, unit construction
- Serial No:	5724 P 23121
- 1st Serial No:	5724 P 12012

ENGINE

- Make:	Perkins
- Model:	AT4.236
- Type:	4-stroke, direct injection turbo-charged diesel
- Serial No:	U330575T

Cylinders

- Number/disposition:	4, vertical, in-line
- Bore/stroke:	98.5 mm/127.0 mm
- Capacity:	3870 cm^3
- Compression ratio:	15.5:1
- Arrangement of valves:	Overhead
- Cylinder liners:	Dry

Supercharging

- Make:	Garrett Air Research
- Model:	T3
- Type:	Exhaust driven with Wastegate
- Pressure:	0.82 bar

Fuel system	
- Fuel feed system:	AC Delco mechanical feed pump
- Make, type and model of fuel filter:	C.A.V. paper element filter with transparent sediment bowl
- Capacity of fuel tank:	108 l
- Make, type and model of injection pump:	C.A.V. Distributor, DPA 3348F230
- Serial Number:	01078 DGG
- Manufacturer's production setting of injection pump:	
. Flow rate:	18.4-20.5 l/h at 2200 rev/min engine speed at full load on 50°C pump inlet temperature
. Timing:	Delivery starts 16° before T.D.C., static
- Make, type and model of injectors:	C.A.V. 4-HOLE, LRB6701407
- Injection pressure:	23.2 MPa
Governor	
- Make:	C.A.V.
- Model:	Not applicable
- Type:	Mechanical incorporated in injection pump
- Governed range of engine speed:	750 to 2310 rev/min
- Rated engine speed:	2200 rev/min
Air cleaner	
- Pre-cleaner:	
. Make:	Nelson Burgess
. Type:	Centrifugal
. Model:	Visibowl
. Location of air intake:	Above centre of bonnet
- Main cleaner:	
. Make:	Donaldson
. Type:	2 stage, dry paper element
. Model:	ELD08
. Location of air intake:	From pre-cleaner
- Maintenance indicator:	Warning light on instrument panel

Lubrication system	
- Type of feed pump:	Forced feed from gear pump
- Type of filter:	Full flow replacement element
- Number:	1
Cooling system	
- Type of coolant:	Water or water and antifreeze solution
- Type of pump:	Centrifugal
- Specification of fan:	Belt driven puller
- Number of fan blades:	6
- Fan diameter:	457 mm
- Coolant capacity:	15.5 l
- Type of temperature control:	Thermostat
- Superpressure system:	75 kPa
Starting system	
- Make:	Lucas
- Model:	M127
- Type:	Electrical, pre-engaged, solenoid operated
- Starter motor power rating:	12V, 2.8 kW
- Cold starting aid:	Lucas, C.A.V. Thermostart
- Safety device:	Operable only when high/low range and pto selectors are in neutral position
Electrical system	
- Voltage:	12
- Generator:	Alternator
. Make:	Valeo
. Model:	2541163
. Type:	Belt driven
. Power:	0.54 kW
- Batteries:	2 M-F Powerpart, lead acid maintenance free
. Rating:	420 CCA rating each or equivalent 75 Ah at 20-hour rating
Exhaust system	
- Make:	Nelson Burgess
- Model:	17AE08
- Type:	Spark arrester silencer
- Location:	Under engine cover with vertical stack pipe
- Height of outlet above ground:	2530 mm

TRANSMISSION TO WHEELS

Clutch

- Make:	Laycock
- Model:	None
- Type:	Dry for transmission only
- Number of plates:	1
- Diameter of plates:	330 mm
- Method of operation:	Mechanically by pedal

Gear box

- Make:	M-F
- Model:	None
- Type:	Mechanical manual operation, 3 forward synchromesh combinations and 1 reverse with manually operated high/low reduction epicyclic unit and high/low shift range with synchromesh
- Number of gears:	12 forward, 4 reverse
- Available options:	Numerous specified by order

Rear axle and final drives

- Make:	Own make
- Model:	None
- Type:	Crown wheel and pinion with outboard epicyclic reduction gear final drives
- Differential lock:	
. Type:	Mechanical dog clutch on differential gears
. Method of engagement:	Pedal operated
. Method of disengagement:	Pedal operated

Front axle and final drives

- Make:	M-F
- Model:	None
- Type:	Crown wheel and pinion with differential and outboard epicyclic reduction gear final drives
- Differential lock:	
. Type:	Mechanical dog clutch on differential gears
. Method of engagement:	Hydraulically actuated in unison with rear differential in response to electrical signal from diff-lock pedal
. Method of disengagement:	Reverse of above

Total ratios and travelling speeds

Gear	Group No.	Number of engine revolutions for one revolution of the driving wheels	Nominal travelling speed at rated engine speed:* 2200 rev/min km/h
Forward			
1	Ll	294.83	1.96
1	Lh	232.81	2.48
2	Ll	196.56	2.93
2	Lh	155.21	3.71
3	Ll	107.21	5.38
3	Lh	84.66	6.81
1	Hl	72.07	8.00
1	Hh	56.91	10.13
2	Hl	48.05	12.00
2	Hh	37.94	15.19
3	Hl	26.21	21.99
3	Hh	20.69	27.85
Reverse			
R	Ll	196.56	2.93
R	Lh	155.21	3.71
R	Hl	48.05	12.00
R	Hh	37.94	15.19

l = Low reduction h = High reduction
L = Low range H = High range

(*) Calculated with a tyre dynamic radius index of 695 mm (ISO 4251/1-1984)

Number of revolutions of front wheels for one revolution of rear wheels: 1.374:1.

POWER TAKE-OFF

Main power take-off

- Type: Independent
- Method of engagement: By hand lever mechanically engaging multi-plate clutch
- Number of shafts: 1
- Method of changing power take-off speeds: Manually by exchanging shafts

Clutch

- Make: Own make
- Model: None
- Type: Hydraulically actuated wet multiplate
- Number of plates: 7
- Diameter of plates: 136 mm

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 to ISO 500
- Height above ground:	563 mm
- Distance from the median plane of the tractor:	Central
- Distance behind rear-wheel axis:	298 mm
- PTO speed at rated engine speed:	627 rev/min
- Engine speed at standard power take-off speed:	1893 rev/min
- Ratio of rotation speeds:	3.5064:1
- Power restriction and maximum torque:	None
- Direction of rotation (viewed from behind tractor):	Clockwise

1000 rev/min (not fitted for test)

- Location:	At rear of tractor
- Diameter of power take-off shaft:	34.9
- Number of splines:	21, to ISO 500
- Height above ground:	563 mm
- Distance from the median plane of the tractor:	Central
- Distance behind rear-wheel axis:	298 m
- PTO speed at rated engine speed:	1158 rev/min
- Engine speed at standard power take-off speed:	1900
- Ratio of rotation speeds:	1.900:1
- Direction of rotation (viewed from behind tractor):	Clockwise

POWER LIFT

- Make:	Massey-Ferguson
- Model:	None
- Type:	Hydraulic, with inlet suction control
- Type and number of cylinders:	1, single acting, internal
- Type of linkage lock for transport:	Hydraulic
- Relief valve pressure setting:	20.5-24.0 MPa
- Opening pressure of cylinder safety valve:	None fitted
- Lift pump type:	4 cylinder, piston
- Transmission between pump and engine:	Driven from PTO shaft independent of main clutch
- Type and number of filters:	Full flow with metal mesh strainer, 1
- Site of oil reservoir:	Transmission housing
- Type, number and location of tapping points:	One on centre housing, top cover, a valve allows flow to spool valves and quick release couplings
- Maximum volume of oil available to external cylinders:	18.0 l

AUXILIARY HYDRAULIC SYSTEM

- Make:	Bosch
- Model:	None
- Type:	Gear
- Relief valve pressure setting:	17.0-20.6 MPa
- Lift pump type:	Gear
- Transmission between pump and engine:	Engine mounted in tandem with Parker Hannifin steering pump
- Type and number of filters:	Metal mesh strainer and Parker Hannifin replaceable canister in shared circuit with steering system
- Site of oil reservoir:	Main transmission housing
- Type and number of tapping points:	2 quick release couplings with own spool valves and separate returns to ISO. A valve allows combination with main system up to auxiliary relief valve pressure
- Maximum volume of oil available to external cylinders:	18.0 l

<u>Three-point linkage</u>

- Category:	2 to ISO standard 730/1-1977
- Category adaptor:	None
- Controls:	Draught or position control, top link sensing

LIFT TEST

Linkage geometry

Figure 2.1

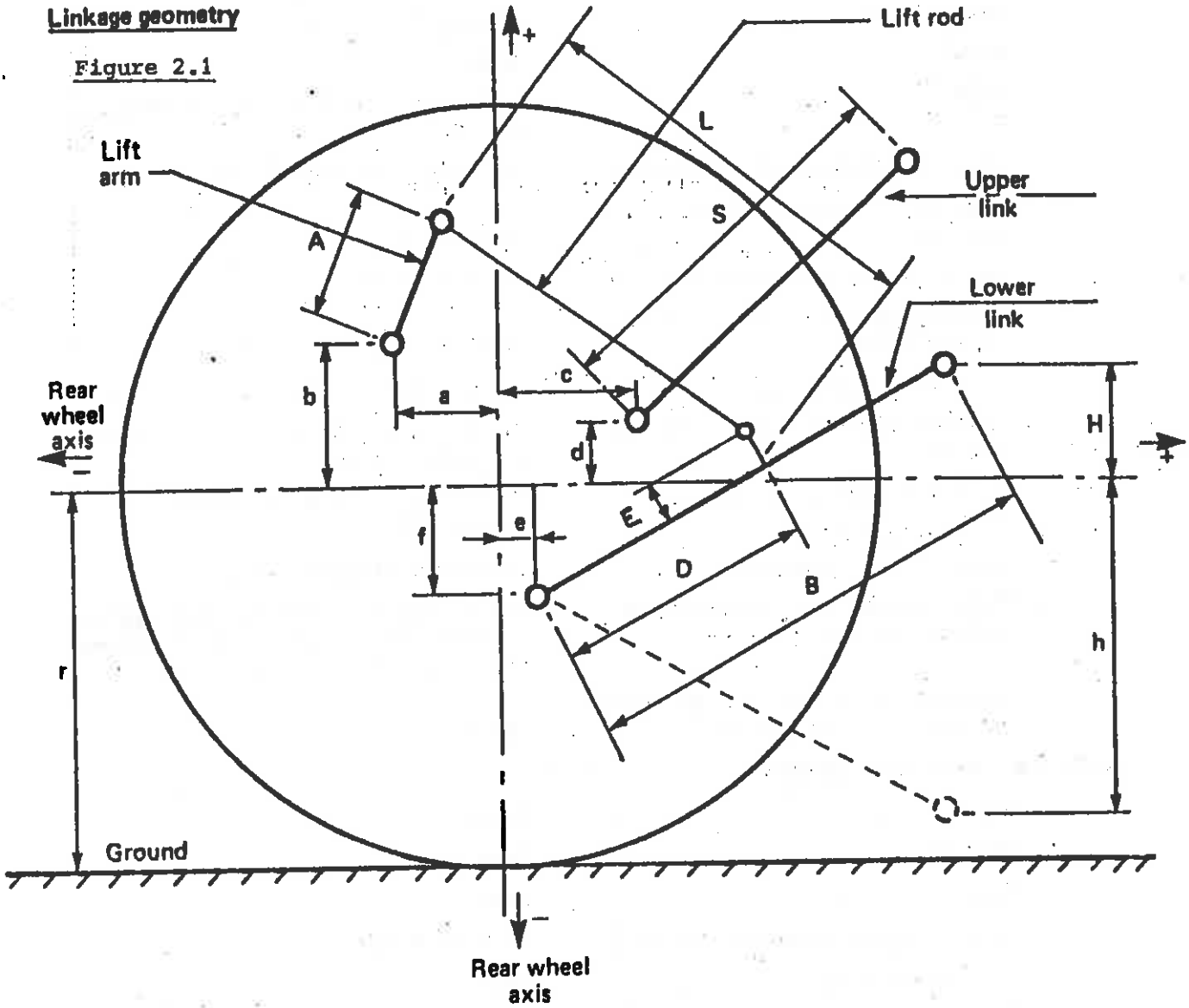


Figure 2.2

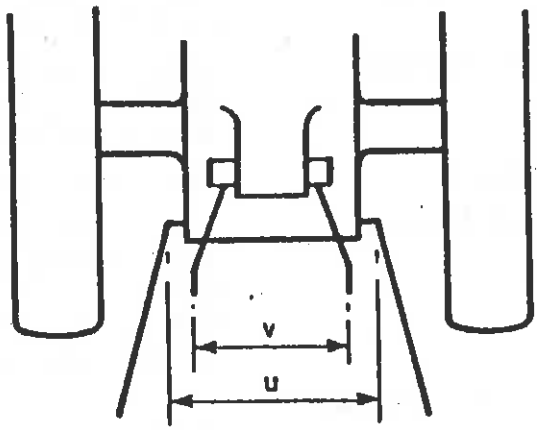


Table 2.1

Dimensions of linkage when attached to the standard frame (ISO 730/3-1982 CAT 2)

			Dimensions or range	Setting used in test
Length of lift arms:		(A)	267 mm	267 mm
Length of lower links:		(B)	965 mm	965 mm
Distance of lift arm pivot point from rear wheel centre line:	horizontally:	(a)	196 mm	196 mm
	vertically:	(b)	233 mm	233 mm
Horizontal distance between the two lower link points:		(u)	492 mm	492 mm
Horizontal distance between the two lift arm end points:		(v)	534 mm	534 mm
Length of upper link:		(S)	681 to 831 mm	753 mm
Distance of upper link pivot point from rear wheel centre line	horizontally:	(c)	186,200,216 mm	186 mm
	vertical:	(d)	205,171,132 mm	205 mm
Distance of lower link pivot point from rear wheel centre	horizontally:	(e)	32 mm forward	32 mm
	vertically:	(f)	212 mm	212 mm
Distance of lower link points to lift rod pivot points on lower link centre line:	horizontal:	(D)	504 mm	504 mm
	vertically:	(E)	+21 or -21 mm	+21 mm
Length of lift rods:		(L)	617 to 682 mm	666 mm
Height of lower hitch points relative to the rear wheel centre line, situated 695 mm above the ground level:				
- in low position:		(h)	546 to 282 mm	495 mm
- in high position:		(H)	112 to 302 mm	138 mm
Height of lower hitch points when locked in transport position:			Any height within lift range	

*Assuming r = tyre dynamic radius index of 695 mm to ISO 4251/1-1984

SWINGING DRAWBAR

- Type:		Clevis
- Height above ground,	maximum:	488 mm
	minimum:	338 mm
- Type of adjustment:		Inverting drawbar and clevis
- Distance of hitch point from rear-wheel axis, horizontally:		652 mm and 702 mm
- Distance of hitch point from power take-off shaft ends:		
. Vertically:		75 mm and 225 mm
. Horizontally:		356 mm and 406 mm
- Lateral adjustment centre of clevis:		
. Right-hand:		250 mm drawbar in 276 mm out
. Left-hand:		250 mm drawbar in 276 mm out
- Distance of pivot point from rear axles horizontally:		132 mm forward
- Width of clevis:		65 mm
- Diameter of drawbar pin hole:		25 mm
- Maximum vertical permissible load:		7.6 kN

TRAILER HITCH

- Type:	None
- Hole diameter:	N/A
- Height above ground:	N/A
- Distance of hitch points from rear wheel axis, horizontally:	N/A
- Distance of hitch point from power take-off shaft end:	
. Vertically:	N/A
. Horizontally:	N/A
- Maximum vertical permissible load:	N/A

LINKAGE DRAWBAR

- Type:	None
- Height above ground:	
. Minimum:	N/A
. Maximum:	N/A
- Horizontal distance to power take-off shaft end:	N/A
- Number of holes:	N/A
- Distance between holes:	N/A
- Hole diameter:	N/A
- Thickness and width of drawbar:	N/A

FRONT TOWING HITCH

- Type:	Clevis in front weight frame
- Vertical height to centre of clevis:	732 mm
- Width of clevis:	63 mm
- Diameter of pin hole:	33 mm

STEERING

- Make:	Own make
- Model:	None
- Type:	Hydrostatic
- Method of operation:	
. Pump:	Bosch gear type mounted on engine in tandem with auxiliary hydraulic system pump
. Motor:	Danfoss OSPC-ON
. Ram:	1 double acting integral with track rod
. Filter:	1 replaceable canister in shared circuit with auxiliary hydraulics
- Working pressure:	17.0 MPa

BRAKES

Service brake

. Make:	Girling
. Model:	None
. Type:	Oil immersed multi-plate discs, 4 per side
- Method of operation:	Independent or combined pedal, hydraulic actuation
- Trailer braking take-off:	None fitted

Parking brake

- Type:	Mechanical via cable
- Method of operation:	Hand lever with ratchet

WHEELS

- Number:	4
. Front:	2 steering and driving
. Rear:	2 driving
- Wheelbase:	2350

- Track width adjustment:

	Minimum, mm	Maximum, mm	Adjustment method
Front	1490	1944	By reversing wheels and offset lug rims
Rear	1500	2225	Power assisted variable track

PROTECTIVE STRUCTURE

- Make: Massey-Ferguson
- Model: 300H
- Type: ROPS
- Manufacturer's name and address: Massey-Ferguson Ltd., Banner Lane, Coventry
- Protective device:
  - . Rollguard: Two post folding ROPS
  - . Tiltable/Not tiltable: Tiltable
- OECD approval number: CSS 052/20

DRIVER'S SEAT

- Make/Model/Type: Grammer DS44/1H
- Type of suspension: Spring
- Type of damping: Hydraulic
- Range of adjustment:
  - . Longitudinal: 150 mm
  - . Vertical: 60 mm

LIGHTING

- Unrestricted beam angle of head light in plan view: 110°

	Height above ground of centre, mm	Size mm	Distance from outside edge of tractor to centre, at 1500 mm track width, mm
Headlights	1220	90 x 150	827
Sidelights	None	-	-
Rear lights	1530	47 x 112	403
Reflectors	650	80 dia	522

II. TEST CONDITIONS

Overall dimensions

Length	Width		Height at top of	
	minimum	maximum	protective structure	steering wheel
mm	mm	mm	mm	mm
3.88	1.94	2.66	2.47	1.74

Ground clearance (unballasted tractor) 270 mm

- Clearance-limiting part: Drawbar clevis in lowest position

Tractor mass (with roll bar)

	Unballasted		Ballasted	
	Without driver kg	With driver kg	Without driver kg	With driver kg
Front	1384	1402	N/A	N/A
Rear	1956	2013	N/A	N/A
Total	3340	3415	N/A	N/A

Ballast

	Number of weights	Mass (total) kg	Water kg
Front	N/A	N/A	N/A
Rear	N/A	N/A	N/A
Additional front frame and weights	N/A	N/A	N/A

Dimensions of tracks

Tyres and track width specification

	Front	Rear
Tyres:		
. dimensions	11.2-24	16.9-30
. ply rating	8	6
. type	Cross ply	Cross ply
. maximum load (tyre manufacturer's), kg	1225	1900
. maximum load (tractor manufacturer's), kg	1225	1900
. inflation pressure (tyre manufacturer's)	240 kPa	124 kPa
. dynamic radius index	515 mm	695 mm
. Chosen track width	1490	1500

Oils and lubrication

Capacity and change interval

	Capacity	Oil change	Filter change
	l	h	h
Engine	7.7	250	250
Front axle	5.8	1000	N/A
Final drive (front)	2.8	1000	N/A
Gearbox	49.8	1000	250
Rear axle Final drives (rear) Hydraulic system Steering	Integral with gearbox		
Brakes	N/A	Top-up	N/A

Fuels and lubricants used in tests

Fuel

Type:	Diesel oil with Cetane index of 54.5 and kinematic viscosity of 2.9 cSt at 40°C within the specification limits of Class A2 British Standard 2869/1983
Specific gravity:	0.8380 at 15°C

Oils	Recommended	Used during test
Engine oil:		
Type:	SAE 15W/30	As recommended
Viscosity:	54 cSt at 50°C	
Classification	MIL-L-2104-C	
Transmission oils		
Type:	SAE 15W/30	As recommended
Viscosity:	54cSt at 50°C	
Classification:	MIL-L-2104-C	
Rear final drives:		
Type:	SAE 15W/30	As recommended
Viscosity:	54cSt at 50°C	
Classification:	MIL-L-2104-C	
Front differential and final drives:		
Type:	SAE 15w/30	As recommended
Viscosity:	54 cSt at 50°C	
Classification:	MIL-L-2104-C	
Hydraulic brakes:		
Type:	Mineral	As recommended
Viscosity:	7.2 cSt at 50°C	
Classification:	M-F CMS 1151A	
Hydraulic fluid:		
Type:	SAE 15W/30	As recommended
Viscosity:	54 cSt at 50°C	
Classification:	MIL-L-2104-C	
Steering oil:		
Type:	SAE 15W/30	As recommended
Viscosity:	54 cSt at 50°C	
Classification:	MIL-L-2104-C	
Recommended grease:	Consistency 2 lithium	As recommended
Number of lubrication points:	13	

III. TEST RESULTS

COMPULSORY TEST RESULTS

1. MAIN POWER TAKE-OFF

- Date and location of tests: 15th September 1989
  AFRC Engineering, Wrest Park,
  Silsoe, Bedford

- 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						
59.8	2197	627	15.58	18.59	261	3.21
1.2 POWER AT RATED ENGINE SPEED						
59.8	2197	627	15.58	18.59	261	3.21
1.3 STANDARD POWER TAKE-OFF SPEED (540 ± 10 rev/min)						
56.0	1892	539	13.68	16.32	244	3.43
1.4 PART LOADS 1.4.1 the torque corresponding to maximum power at rated engine speed						
59.8	2197	627	15.58	18.59	261	3.21
1.4.2 85% of the torque defined in 1.4.1						
51.2	2214	631	13.70	16.40	268	3.13
1.4.3 75% of the torque defined in 1.4.2						
38.6	2226	637	11.40	13.60	295	2.84
1.4.4 50% of the torque defined in 1.4.2						
25.9	2235	635	9.11	10.87	352	2.38
1.4.5 25% of the torque defined in 1.4.2						
13.0	2235	637	6.94	8.28	534	1.57
1.4.6 Unloaded						
0	2279	650	4.94	5.90	-	-

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 (± 10 rev/min)					
1.5.1	the torque corresponding to maximum power					
56.0	1892	539	13.68	16.32	244	3.43
1.5.2	85% of the torque obtained in 1.5.1					
47.9	1907	544	11.90	14.20	248	3.38
1.5.3	75% of the torque obtained in 1.5.2					
36.6	1929	550	9.73	11.61	266	3.15
1.5.4	50% of the torque obtained in 1.5.2					
24.4	1945	555	7.63	9.10	312	2.69
1.5.5	25% of the torque obtained in 1.5.2					
12.4	1959	559	5.57	6.65	448	1.87
1.5.6	unloaded					
0	1999	570	3.65	4.36	-	-

- No load, maximum engine speed: 2279 rev/min
- Torque (equivalent crankshaft) at maximum power: 259.7 Nm
- Maximum torque (equivalent crankshaft): 315.9 Nm
  (engine speed 1303 rev/min)
- Mean atmospheric conditions:
  - . Temperature: 25° C
  - . Pressure: 1006 m bar
  - . Relative humidity: 50%
- Maximum temperatures:
  - . Coolant: 85° C
  - . Engine oil: 108° C
  - . Fuel: 55° C
  - . Engine air intake: 32° C

2. HYDRAULIC POWER AND LIFTING FORCE

- Date of tests: 28th October 1989

2.1 HYDRAULIC POWER TEST

- Sustained pressure with relief valve open: 20.0 MPa

- Pump delivery rate at minimum pressure: 31.4 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	26.9	20.7	9.3
Flow rate and hydraulic pressure corresponding to maximum hydraulic power	28.7	20.0	9.6

- Tapping point used for test: Auxilliary service connection

- Temperature of hydraulic fluid if different from 65 ± 5°C NA °C

- Opening pressure of the unloading valve NA MPa

- Closing pressure of the unloading valve NA MPa

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	633 mm	744 mm
Maximum corrected force exerted through full range	19.7 kN	18.6 kN
Corresponding pressure of hydraulic fluid	20.0 MPa	20.0 MPa
Moment about rear-wheel axis	18.4 kNm	28.5 kNm
Maximum tilt angle of mast from vertical	NA	10 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	-319	-283	-200	-100	0	+80	+160	+240	+300	+350	+425
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	-	19.7	20.9	22.5	24.0	24.5	24.9	25.4	25.6	25.9	-
Corresponding pressure: 20.0 MPa											
at the frame Kn	18.7	19.2	19.8	20.3	20.5	20.4	20.1	19.7	19.4	19.1	18.6
Corresponding pressure: 20.0 MPa											

3. DRAWBAR POWER AND FUEL CONSUMPTION (UNBALLASTED TRACTOR)

Date of tests: 22nd September 1989
Type of track: Concrete

Height of drawbar above ground	Tyre inflation pressure	
	Front	Rear
315mm	83 kPa	83 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	%	Bar
3.1 MAXIMUM POWER IN TESTED GEARS													
2Lh	27.0	30.5	3.18	2238	15.0	430	1.95	45	81	99	18	35	1009
3L1	39.1	30.5	4.61	2234	15.0	369	2.27	46	81	99	18	35	1009
3Lh	45.0	27.4	5.91	2202	12.5	353	2.38	47	82	100	18	36	1009
1H1	47.1	23.9	7.10	2192	9.8	337	2.48	46	82	101	17	59	1009
1Hh	47.8	18.4	9.35	2199	6.5	333	2.52	46	82	101	17	57	1009
2H1	48.6	15.5	11.29	2202	5.1	327	2.56	47	82	102	17	59	1009
2Hh	47.2	11.7	14.52	2200	3.5	335	2.50	45	82	97	17	38	1009
3.2 FUEL CONSUMPTION 3.2.1 in selected gear, at maximum power													
2H1	48.6	15.5	11.29	2202	5.1	327	2.56	47	87	102	17	59	1009
3.2.1.1 75% of pull at maximum power at rated speed													
2H1	37.0	11.4	11.64	2225	3.4	353	2.38	47	81	103	17	59	1009
3.2.1.2 50% of pull at maximum power at rated speed													
2H1	25.4	7.7	11.83	2227	2.1	413	2.03	45	80	99	18	53	1009
3.2.1.3 next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.1.1.													
2Hh	37.1	11.5	11.62	1758	3.4	303	2.76	47	81	99	17	39	1009
3.2.1.4 next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.1.2.													
2Hh	25.3	7.7	11.81	1762	2.1	340	2.46	46	80	98	17	40	1009
3.2.2 in selected gear nearest to 7.5 km/h													
1H1	47.1	23.9	7.10	2192	9.8	337	2.48	46	82	101	17	59	1009
3.2.2.1 75% of pull at maximum power at rated speed													
1H1	37.3	17.9	7.51	2232	6.4	359	2.34	49	82	102	18	35	1009
3.2.2.2 50% of pull at maximum power at rated speed													
1Hh	25.3	11.7	7.77	2243	3.5	415	2.02	46	80	101	18	35	1009
3.2.2.3 next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.2.1.													
1Hh	37.4	17.9	7.54	1764	6.4	305	2.75	45	81	94	17	39	1009
3.2.2.4 next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.2.2													
1Hh	25.2	11.6	7.80	1775	3.5	340	2.47	44	80	95	17	40	1009

4. OPTIONAL DRAWBAR POWER (UNBALLASTED TRACTOR, 2 wheel drive only)

Date of tests: 26th September 1989
Type of track: Concrete

Height of drawbar above ground	Tyre inflation pressure	
	Front	Rear
415mm	83 kPa	83 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	%	Bar
3.1 MAXIMUM POWER IN TESTED GEARS													
3Lh	35.6	22.4	5.73	2226	15.0	376	2.23	42	81	98	16	59	1021
1Hl	42.0	22.4	6.74	2226	15.0	350	2.39	42	81	99	16	61	1021
1Hh	46.9	19.3	8.74	2202	11.4	341	2.46	45	82	101	16	61	1021
2Hl	48.0	16.2	10.66	2203	8.5	332	2.52	45	81	102	16	61	1021
2Hh	47.2	12.2	13.91	2204	5.9	341	2.46	46	82	101	17	53	1020
3.2 FUEL CONSUMPTION 3.2.1 in selected gear, at maximum power													
2Hl	48.0	16.2	10.66	2203	8.5	332	2.52	45	81	102	16	61	1021
3.2.1.1 75% of pull at maximum power at rated speed													
2Hl	37.6	12.2	11.08	2217	5.9	361	2.32	40	80	87	18	48	1020
3.2.1.2 50% of pull at maximum power at rated speed													
2Hl	25.7	8.1	11.40	2227	4.0	425	1.97	43	81	92	18	52.5	1020
3.2.1.3 next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.1.1.													
2Hh	37.1	12.0	11.10	1751	5.9	309	2.71	45	81	97	17	52	1020
3.2.1.4 next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.1.2.													
2Hh	25.5	8.0	11.40	1756	4.0	343	2.44	43	80	95	17	57	1020

5. MEASUREMENT OF EXTERNAL NOISE LEVEL

- Date of tests:	2nd October 1989
- Type of sound level meter:	Bruel and Kjaer 2297
- Type of track:	Concrete
- Gear:	3
- Group:	Hh
- Travelling speed before acceleration:	21.2 km/h
- Sound level:	87 dBA

6. REPAIRS — None

7. REMARKS — None

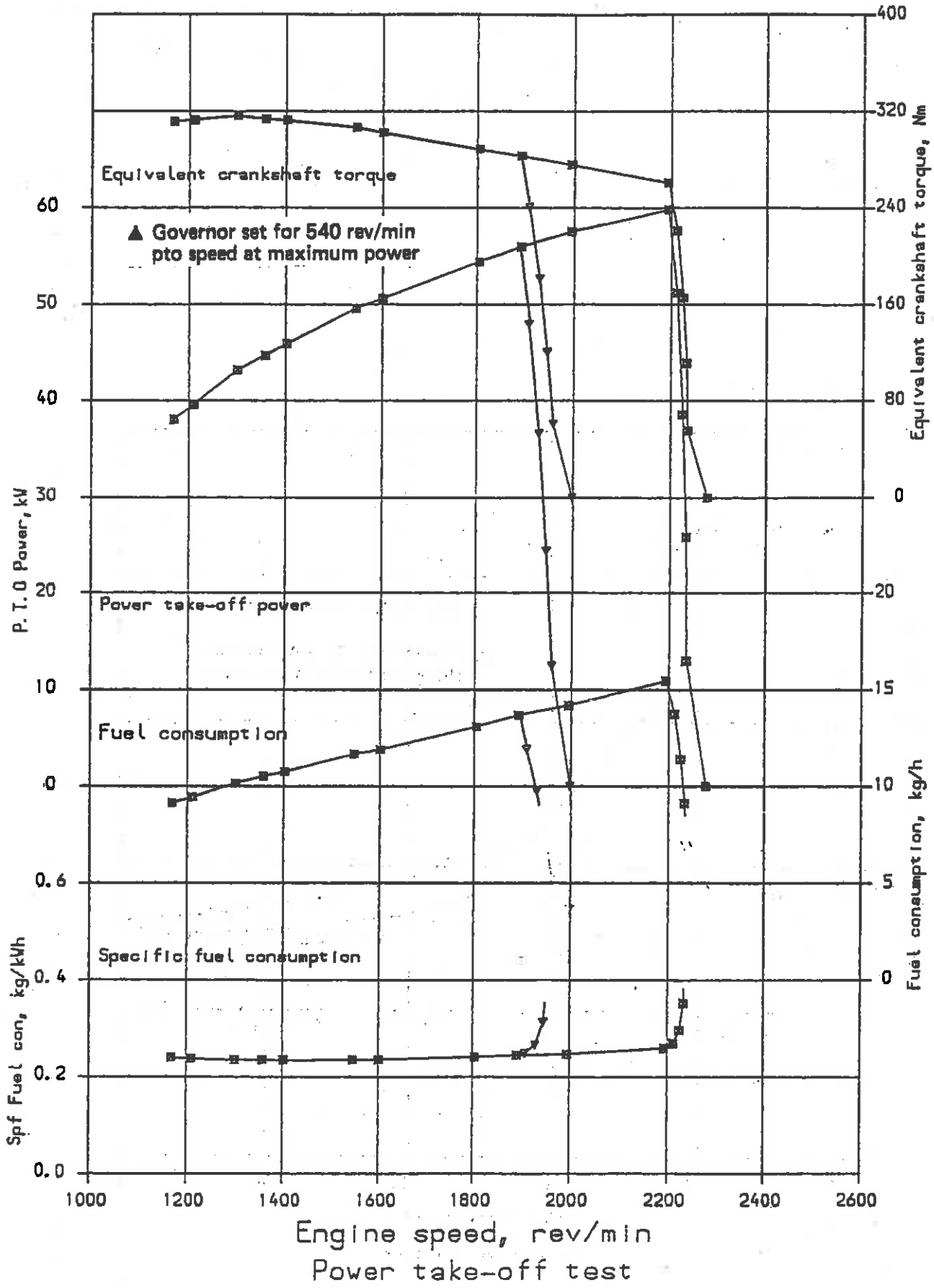
Test carried out by: P.C. Seward, E. Nigro

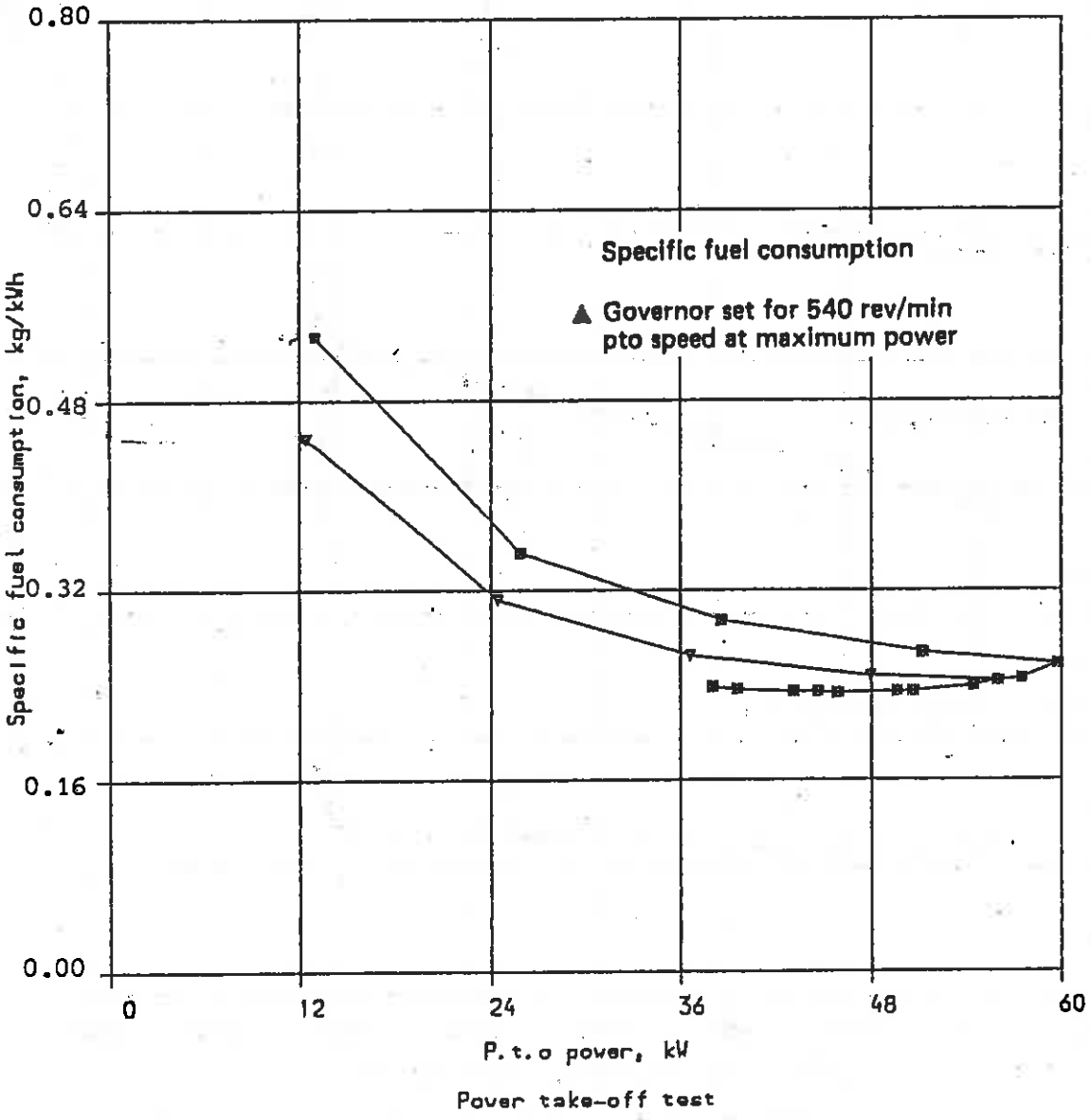
Officer in charge: P.C. Seward

Signed: RRBales — Head of Testing Group

for the Director

Date: 8/2/90 — 5th February 1990


Equivalent crankshaft torque
▲ Governor set for 540 rev/min
pto speed at maximum power
Power take-off power
Fuel consumption
Specific fuel consumption
P.T.O Power, kW
Spf Fuel con, kg/kWh
Equivalent crankshaft torque, Nm
Fuel consumption, kg/h
60
50
40
30
20
10
0
0.6
0.4
0.2
0.0
400
320
240
160
80
0
20
15
10
5
0
1000
1200
1400
1600
1800
2000
2200
2400
2600
Engine speed, rev/min
Power take-off test



Power take-off test