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OECD Approval No: 1732 Restricted Code
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Report on test in accordance with the OECD STANDARD CODE II (RESTRICTED CODE) for the Official Testing of Agricultural and Forestry Tractors

Massey Ferguson 4220 Four-Wheel Drive Tractor with Emissions Compliant Engine (30 Km/h)



Manufactured by:
AGCO Limited
P O Box 62
Banner Lane
Coventry
West Midlands CV4 9GF
England

Submitted for test by: The manufacturer

Report No: 791

Date: October 1997

OECD/7339/0196

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Tractor manufacturer's name and address:	AGCO Limited, P O Box 62 Banner Lane, Coventry, West Midlands, CV4 9GF
Location of tractor assembly:	Coventry, England
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:	70 hours
Location of test:	Silsoe Research Institute Wrest Park, Silsoe, England

I. SPECIFICATION OF TRACTOR

TRACTOR

Make:	Massey Ferguson
Model:	MF 4220 with emissions compliant engine (30 Km/h),
Type:	Four wheel drive, unit construction
Serial No:	CABB13BFXAE19999
1st Serial No:	CABB13BFXAF45180
Tractor type code:	CABB13BFXA

ENGINE

Make:	Perkins
Model:	T903.27
Type:	4 stroke, direct injection, naturally aspirated diesel
Serial No:	33060PLO2 CRU313839C (prototype only)
Type number:	1942/2250
Ist serial No:	CP31293U******C (production number)

Cylinders

Number/disposition:	3 vertical In-line
Bore/stroke:	95 mm/127 mm
Capacity:	2700 cm^3
Compression ratio:	17.5:1
Arrangement of valves:	Overhead
Cylinder liners:	Dry

Supercharging

Make:	Schwitzer
Model:	U2674 A 175

Fuel system

Fuel feed system:	Superpar Mechanical Diaphram
Make, type and model of fuel filter:	1 off, Paper element filters with transparent sediment bowl (one off as standard build)
Capacity of fuel tank:	84 litres
Make, type and model of injection pump:	CAV, rotary, type 1236
Serial No:	92782BPG
Manufacturer's production setting of injection pump:	13.04 - 13.85 l/hr
Flow rate:	66.4 +/- 3% mm^3/stroke at 2250 rev/min engine speed at full load on 45°C pump inlet temperature
Timing:	TDC at 2250 rev/min dynamic timing
Make, type and model of injectors:	Lucas CAV, code KS

	Complete injector	Nozzle
CAV number:-	L20B01401A	L068PBA
Perkins number:-	2645A055	2645A637

Injection pressure:	300 bar

Governor

Make:	LUCAS
Model:	Not applicable
Type:	Mechanical, all speed, incorporated in injection pump
Governed range of engine speed:	750 to 2420 rev/min
Rated engine speed:	2250 rev/min

Air cleaner

Make:	Mann and Hummel
Type:	3 stage, 2 stages are paper elements
Model:	44, 311, 92, 931
Location of air intake:	Behind radiator grill, in front of radiator
Maintenance indicator:	Warning light on instrument panel

Lubrication system

Type of feed pump:	Forced feed from eccentric rotor pump
Type of filter:	Full flow, replaceable canister
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:	4
Fan diameter:	406 mm
Coolant capacity:	12.5 litres
Type of temperature control:	Thermostat
System pressure:	75 kPa

Starting system

Make:	Magneti Marelli
Model:	M127
Type:	Electrical, pre-engaged, solenoid operated
Starter motor power rating:	2.8 kW
Cold starting aid:	CAV, SINTEROM or ISKRA induction heater
Safety device:	Starting operable only when shuttle and PTO levers are in neutral

Electrical system

Voltage:	12
Generator:	Alternator
Make:	Magneti Marrelli
Model:	A 127-70
Type:	Belt driven
Power:	0.84 kW
Batteries:	1 M-F Power Part, type 665 lead acid, maintenance free
Rating:	IEC 545 amp. Equivalent to 120 AH at 20 hour rating

Exhaust system

Make:	Tecnov
Model:	AGCO type 10
Type:	Horizontal silencer
Location:	Under bonnet, right hand side
Height of outlet above ground:	2515 mm

TRANSMISSION TO WHEELS

Clutch

Make:	LUK
Model:	None
Type:	Dry for transmission only
Number of plates:	1
Diameter of plates:	305 mm
Method of operation:	Mechanical by pedal

Gear box

Make:	Massey Ferguson
Model:	None
Type:	Mechanical manual synchromesh operation, 4 speeds and 2 ranges, selected with single side mounted lever. Console mounted hand lever selects forward and reverse for each combination.
Number of gears:	8 forward 8 reverse
Available options:	12x4, 12x4 with creep

Rear axle final drives

Make:	Own make
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 operated in response to right hand side console mounted electrical switch
Method of disengagement:	Reverse of above switch

Front axle and final drives

Make:	Dana Spicer Europe
Model:	AG 66 Narrow
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 rear differential lock switch on side console
Method of disengagement:	Reverse of above switch

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:* 2250 rev/min km/h
Forward			
1	L	232.802	2.532
2	L	155.201	3.798
3	L	107.035	5.508
4	L	75.381	7.821
1	H	56.907	10.359
2	H	37.938	15.539
3	H	26.164	22.532
4	H	18.427	31.992
Reverse			
1	L	227.126	2.596
2	L	151.417	3.893
3	L	104.425	5.645
4	L	73.543	8.016
1	H	55.520	10.618
2	H	37.013	15.928
3	H	25.526	23.095
4	H	17.977	32.793

Range selection, (main gear lever): L = low H =High

(*) Calculated with a tyre dynamic radius index of 695 mm (ISO 4251/1-1992)

Number of revolutions of front wheels for one revolution of rear wheels: 1.3833

POWER TAKE-OFF

Main power take-off

Type:	Independent
Method of engagement:	By hand lever hydraulically engaging wet multi-plate clutch
Number of shafts:	1 (interchangeable for 6 or 21 splines to ISO 500/1991)
Method of changing power take-off speeds:	None

Clutch

Make:	Own make
Model:	None
Type:	Hydraulically actuated wet multiplate
Number of plates:	5
Diameter of plates:	128 mm

Power take-off proportional to engine speed

540 rev/min

Location:	Rear of tractor
Diameter of power take-off shaft:	34.9 mm
Number of splines:	6 to ISO 500/1991
Height above ground:	556 mm
Distance from the median plane of the tractor:	Central
Distance behind rear wheel axis:	333 mm
Pto speed at rated engine speed:	679 rev/min
Engine speed at standard power take-off speed:	1789 rev/min
Ratio of rotation speeds:	3.3125:1
Power restriction and maximum torque:	None
Direction of rotation (viewed from behind tractor):	Clockwise

POWER LIFT (as fitted to the test tractor)

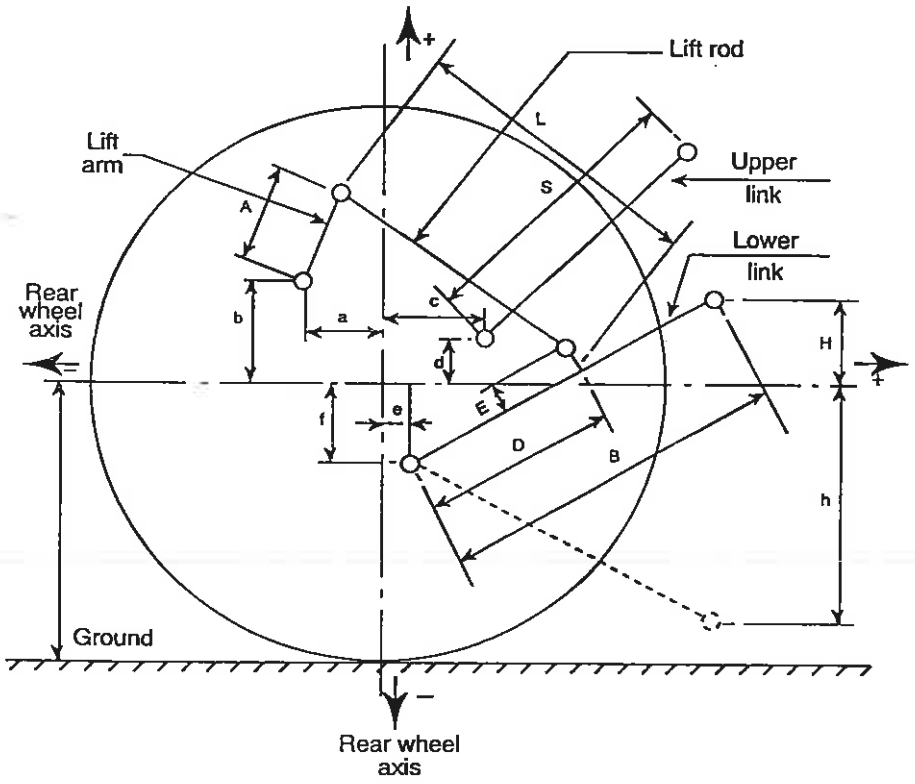
Make:	Massey Ferguson
Model:	None
Type:	Hydraulic, with inlet suction control closed system
Type and number of cylinders:	1 single acting, internal
Type of linkage lock for transport:	Hydraulic
Relief valve pressure setting:	21.4 - 24.0 MPa
Opening pressure of cylinder safety valve:	26.2 - 27.6 MPa
Lift 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:	Optional tapping port (not fitted to test tractor), a valve allows flow to spool valve and quick release couplings
Maximum volume of oil available to external cylinders:	20.0 litres

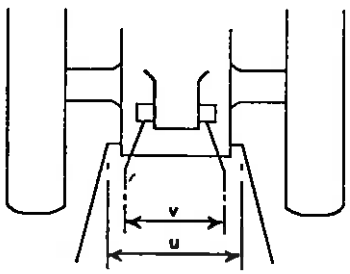
AUXILIARY HYDRAULIC SYSTEM

Make:	Sundstrand
Model:	SP250
Type:	Gear
Relief valve pressure setting:	20.0 - 22.0 MPa
Transmission between pump and engine:	Driven by chain from PTO shaft which is independent of the main clutch
Type and number of filters:	One off metal mesh full flow strainer; and one off by-pass centrifugal filter
Site of oil reservoir:	Main transmission housing
Type and number of tapping points:	2 spool valves, each with quick release coupling and separate return, to ISO 5675. Note 2 further spool valves may be fitted if required. A valve allows combination with main system up to the auxiliary relief valve pressure
Maximum volume of oil available to external cylinders:	20.0 litres

THREE-POINT LINKAGE

Category:	2 to ISO standard 730-1:1994
Category adaptor:	1 to ISO standard 730-1:1994 interchangeable balls in lower links and interchangeable socket in top link
Controls:	Draught or position control with top link sensing





LIFT TEST
Linkage geometry

Fig 2.1

Table 2.1
Dimensions of linkage when attached to the standard frame (ISO 730-1-1994 CAT 2)

			Dimensions or range	Setting used in	
				Main Test	Test 2
Length of lift arms:		(A)	310 mm	310 mm	310 mm
Length of lower links:		(B)	1000 mm	1000 mm	1000 mm
Distance of lift arm pivot point from rear wheel centre line:	horizontally: vertically:	(a) (b)	196 mm 233 mm	196 mm 233 mm	196 mm 233 mm
Horizontal distance between the two lower link points:		(u)	492 mm	492 mm	492 mm
Horizontal distance between the two lift arm end points:		(v)	584 mm	584 mm	584 mm
Length of upper link:		(S)	666 - 906 mm	815 mm	815 mm
Distance of upper link pivot point from rear wheel centre line:	horizontally: vertically:	(c) (d)	186, 200, 216 mm 205, 171, 132 mm	186 mm 205 mm	186 mm 205 mm
Distance of lower link pivot point from rear wheel centre line:	horizontally: vertically:	(e) (f)	32 mm forward 212 mm	32 mm 212 mm	32 mm 212 mm
Distance of lower link points to lift rod pivot points on lower link centre line:	horizontally: vertically:	(D) (E)	540 mm -9 mm (below C/l)	540 mm -9 mm	540 mm -9 mm
Length of lift rods:		(L)	595 - 725 mm	665 mm	606 mm
Height of lower hitch points (*) relative to the rear wheel centre line, situated 695 mm above the ground level:					
- in low position - in high position		(h) (H)	342 - 642 mm 150 - 332 mm	497 mm 210 mm	342 mm 295 mm
Height of lower hitch points when locked in transport position (*)			Any height within lift range (hydraulic transport lock)		

* Assuming r = tyre dynamic radius index of 695 mm ISO 4251/1-1992

SWINGING DRAWBAR

Type:	Clevis
Height above ground: maximum	472 mm
minimum:	270 mm
Type of adjustment:	Inverting drawbar and clevis
Distance of hitch point from rear-wheel axis, horizontally:	583 mm, 683 mm, 733 mm
Distance of hitch point from power take-off shaft ends:	
Vertically:	84 mm, 187 mm, 183 mm, 286 mm
Horizontally:	250 mm, 350 mm, 400 mm
Lateral adjustment (centre of clevis):	
Right-hand:	175 mm drawbar in, 200 mm, 220 mm, drawbar out
Left-hand:	175 mm drawbar in, 200 mm, 220 mm, drawbar out
Distance of pivot point from rear axles horizontally:	30 mm forward
Width of clevis:	70 mm
Diameter of drawbar pin hole:	33 mm
Maximum vertical permissible load:	11.6 kN

TRAILER HITCH

Type:	None fitted

LINKAGE DRAWBAR

Type:	None fitted

FRONT TOWING HITCH

Type:	Clevis in front weight frame
Vertical height to centre of clevis:	755 mm
Width of clevis:	50 mm
Diameter of pin hole:	33 mm

STEERING

Make:	Own make
Model:	None
Type:	Hydrostatic
Method of operation:	
Pump:	Bosch/Sundstrand, gear type mounted on transmission case in tandem with auxiliary hydraulic system pump
Motor:	Danfoss OSPC-100-ON
Ram:	1 double acting operating both track rods
Filter:	None

BRAKES

Service brake

Make:	Girling
Model:	None
Type:	Oil-immersed multiplate discs, 4 per side
Method of operation:	Independent on rear wheels or combined pedal giving compensated actuation and automatic engagement of 4WD providing 4-wheel braking
Trailer braking take-off:	Connection fitted to ISO 5676-1983

Parking brake

Type:	Mechanical via cable
Method of operation:	Hand lever with ratchet, acts on all 4 wheels due to automatic 4WD engagement

WHEELS

Number:	4
Front:	2 steering and driving
Rear:	2 driving
Wheelbase:	2227 mm

Track width adjustment:

	Minimum, mm	Maximum, mm	Adjustment method
Front	1134	1605	By reversing wheels and offset lug rims
Rear	1519	1831	By reversing wheels and offset lug rims

PROTECTIVE STRUCTURE

Make:	GKN Sankey Ltd
Model:	5003
Type:	Safety cab
Manufacturer's name and address:	GKN Sankey Ltd, Industrial Products Division (Cab Systems), Hadley Castle Works, P O Box 86, Telford TF1 4RE
Protective device:	Safety cab
Tiltable/Not tiltable:	Non tiltable
OECD approval number:	CSS 0443/1, 17 July 1997

DRIVERS SEAT

Make/Model/Type:	KAB XH2/T6-1
Type of suspension:	Spring
Type of damping:	Hydraulic
Range of adjustment:	
Longitudinal:	150 mm
Vertical:	70 mm

LIGHTING

Unrestricted beam angle of headlight in plan view: 110°

	Height above ground to centre mm	Size mm	Distance from outside edge to median plane of tractor mm
Headlight	1020	160 x 100	196
Sidelights	1543	110 x 35	777
Rear lights	1475	145 x 52	708
Axle reflectors	--	--	--
Cab reflectors	1475	43 x 52	753

II TEST CONDITIONS

Overall dimensions

Length mm	Width		Height at top of	
	Minimum mm	Maximum mm	Protective structure mm	Exhaust pipe mm
3785	1982	2294	2438	2515

Ground clearance (unballasted tractor) 210 mm

Clearance-limiting part: Drawbar clevis in lowest position

Tractor mass (with safety cab)

	Unballasted		Ballasted	
	Without driver kg	With driver kg	Without driver kg	With driver kg
Front	1219	1233	--	--
Rear	1867	1928	--	--
Total	3086	3161	--	--

Tyres and track width specification

	Front	Rear
Tyres dimensions ply rating type	11.2 R 24 A8 Radial	16.9 R 30 A8 Radial
Maximum load (tyre manufacturer's), kg	1180	2360
Maximum load (tractor manufacturer's), kg	1100	2268
Inflation pressure (tyre manufacturer's), Bar	1.6	1.0
Dynamic radius index	515	695
Chosen track width (manufacturer's nominal)	1400	1630

Oils and lubrication

Capacity and change interval

	Capacity litre	Oil change hours	Filter change hours
Engine	7.25	250	250
Front axle differential	5.5	1000	None
Front axle hub (each)	0.8	1000	None
Gearbox	50	1000	1000
Rear axle Hydraulic system Final drives (rear) Steering	Integral with gearbox		
Brakes	- -	Top-up	None

Fuels and lubricants used in tests

Fuel

Type:

PTO Test: Diesel oil to Class A2 and Class D, 1.5 to 5.5 cST Specific gravity: 0.8500 g/cm³ at 15°C
Drawbar Test: Diesel oil to Class D, 1.5 to 5.5 cST Specific gravity: 0.8390 g/cm³ at 15°C

Oils	Recommended	Used during test
Engine oil		
Type:	SAE 15W/30, 15W/50 or 10W/40	SAE 15W/30
Viscosity:	54 cSt at 50°C	
Classification:	MIL-L-2104-2C, API. CD. Min	
Transmission oils		
Type:	SAE 15W/30	As recommended
Viscosity:	54 cSt at 50°C	
Classification:	MF 1139 or MF 1135	
Rear final drives		
Type:	SAE 15W/30	As recommended
Viscosity:	54 cSt at 50°C	
Classification:	MF 1139 or MF 1135	
Front differential and final drives		
Type:	SAE 15W/30	As recommended
Viscosity:	54 cSt at 50°C	
Classification:	MF 1139 or MF 1135	
Hydraulic brakes		
Type:	Mineral	As recommended
Viscosity:	7.2 cSt at 50°C	
Classification:	MF CMS 1151A	
Hydraulic fluid		
Type:	SAE 15W/30	As recommended
Viscosity:	54 cSt at 50°C	
Classification:	MF 1139 or MF 1135	
Steering oil		
Type:	SAE 15W/30	As recommended
Viscosity:	54 cSt at 50°C	
Classification:	MF 1139 or MF 1135	
Recommended grease:	Consistency 2 lithium	As recommended
Number of lubrication points:	19	

III. TEST RESULTS

A. COMPULSORY TESTS

1. MAIN POWER TAKE-OFF (540)

Date and location of tests: 9 October 1997
Silsoe Research Institute,
Wrest Park, Silsoe, Bedford

Type of dynamometer: Eddy Current, Borghi and Saveri

Power kW	Speed		Fuel consumption			Specific energy kWh/l
	Engine rev/min	P.T.O. rev/min	Hourly kg/h	Hourly l/h	Specific g/kWh	
1.1 MAXIMUM POWER - TWO HOUR TEST						
42.2	2251	679	11.09	13.05	263	3.24
1.2 POWER AT RATED ENGINE SPEED						
42.2	2251	679	11.09	13.05	263	3.24
1.3 STANDARD POWER TAKE-OFF SPEED (540 ± 10 rev/min)						
38.3	1789	540	9.23	10.86	241	3.53
1.4 PART LOADS 1.4.1 The torque corresponding to maximum power at rated engine speed						
42.2	2251	679	11.09	13.05	263	3.24
1.4.2 85% of the torque defined in 1.4.1						
36.7	2299	694	10.18	11.98	277	3.06
1.4.3 75% of the torque defined in 1.4.2						
27.9	2326	702	8.45	9.94	303	2.80
1.4.4 50% of the torque defined in 1.4.2						
18.8	2349	709	6.49	7.63	345	2.46
1.4.5 25% of the torque defined in 1.4.2						
9.5	2371	716	4.48	5.27	469	1.81
1.4.6 Unloaded						
0	2386	720	2.73	3.22	--	--

Power kW	Speed		Fuel consumption			Specific energy kWh/l
	Engine rev/min	P.T.O. rev/min	Hourly kg/h	l/h	Specific g/kWh	
1.5	PART LOADS AT STANDARD POWER TAKE-OFF SPEEDS (540 ± 10 rev/min)					
1.5.1	The torque corresponding to maximum power					
38.3	1789	540	9.23	10.86	241	3.53
1.5.2	85% of the torque obtained in 1.5.1					
33.6	1848	558	8.33	9.80	248	3.43
1.5.3	75% of the torque obtained in 1.5.2					
25.6	1885	569	6.79	7.98	265	3.21
1.5.4	50% of the torque obtained in 1.5.2					
17.5	1917	579	5.17	6.08	296	2.88
1.5.5	25% of the torque obtained in 1.5.2					
8.9	1954	590	3.51	4.13	396	2.15
1.5.6	Unloaded					
0	1992	602	1.99	2.34	--	--

No load, maximum engine speed: 2386 rev/min

Torque (equivalent crankshaft) at maximum power: 179.1 Nm

Torque (equivalent crankshaft) at rated speed: 179.1 Nm

Maximum torque (equivalent crankshaft): 223.1 Nm
(engine speed 1402 rev/min)

Mean atmospheric conditions:

- Temperature 22°C
- Pressure 996 m bar
- Relative humidity 59%

Maximum temperatures:

- Coolant 82°C
- Engine oil 91°C
- Fuel 64°C
- Engine air intake 22°C

2. HYDRAULIC POWER AND LIFTING FORCE

Date of tests: 25 June 1997

2.1 Hydraulic power test

	1 Lift system only	2 Auxiliary only	3 Auxiliary combination
Sustained pressure with relief valve open:	23.0 MPa	20.7 MPa	20.9 MPa
Pump delivery rate at minimum pressure:	20.9 l/min	40.0 l/min	61.5 l/min

	Test	Flow rate l/min	Pressure MPa	Power kW
Flow rate corresponding to a hydraulic pressure equivalent to 90% of the actual relief valve pressure setting and corresponding hydraulic power	1	17.3	20.7	5.97
	2	33.8	18.7	10.53
	3	49.2	18.8	15.42
Flow rate and hydraulic pressure corresponding to maximum hydraulic power	1	17.7	20.4	6.02
	2	36.5	18.0	10.95
	3	55.8	18.0	16.74

Tapping point used for test: 1 — Tapping into assister ram circuit (for test only)
2 and 3 — Auxiliary service connection

Temperature of hydraulic fluid if different from 65 ± 5°C: — °C

Opening pressure of the unloading valve: — MPa

Closing pressure of the unloading valve: — MPa

2.2 Power lift test - (To ISO 730-1:1990)

	At the hitch point	On the frame
Height of lower hitch points above ground in down position	198 mm	198 mm
Vertical movement	707 mm	924 mm
Maximum corrected force exerted through full range	16.3 kN	13.7 kN
Corresponding pressure of hydraulic fluid	20.7 MPa	20.7 MPa
Moment about rear-wheel axis	15.8 kNm	21.6 kNm
Maximum tilt angle of mast from vertical	--	17 degrees

Linkage settings for test - see Table 2.1 and Figure 2.1

Lifting heights relative to the horizontal plane including the lower link pivot points											
mm	-347	-285	-200	-100	0	100	200	250	350	422	577
Lifting forces (the values measured are corrected to correspond to a hydraulic pressure equivalent to 90% of the actual relief valve pressure delivered by the hydraulic system)											
at the hitch points kN	--	16.3	17.0	19.5	21.0	22.0	22.9	23.2	23.7	24.3	--
Corresponding pressure: 20.7 MPa											
at the frame kN	13.7	14.5	15.5	16.1	16.5	16.6	16.7	16.6	16.4	16.2	15.5
Corresponding pressure: 20.7 MPa											

3.DRAWBAR POWER AND FUEL CONSUMPTION TEST (UNBALLASTED TRACTOR), 4 WHEEL DRIVE

Date and Location of tests: 22 October 1997
Silsoe Research Institute
Wrest Park
Silsoe
Bedford MK45 4HS

Type of track: Concrete

Height of drawbar above ground	Tyre inflation pressure (kPa) Front	Rear
230 mm	83	90

Gear and Range	Power	Drawbar Pull	Speed	Engine Speed	Slip of wheels or track	Spec Fuel cons	Spec energy	Temperature			Atmospheric conditions		
								Fuel	Coolant	Eng oil	Temp	Rel Humidity	Pressure
	kW	kN	km/h	rev/min	%	g/kwh	kWh/l	Deg C	Deg C	Deg C	Deg C	%	kPa
3.1 MAXIMUM POWER IN TESTED GEARS													
1L*	20.8	33.6	2.22	2321	15.4	409	2.05	48	81	93	11	63	100.9
2L	30.7	32.8	3.37	2285	13.1	350	2.40	45	81	93	10	64	100.9
3L	34.4	23.6	5.24	2253	5.5	324	2.59	44	81	89	9	64	100.9
4L	34.1	16.2	7.56	2252	3.9	330	2.54	37	80	81	2	77	100.9
1H	33.6	11.9	10.12	2255	3.1	334	2.51	37	80	82	3	78	100.9
2H	31.4	7.4	15.30	2253	2.3	358	2.34	41	81	82	4	78	100.9
3.2 FUEL CONSUMPTION 3.2.1 In selected gear, at maximum power at rated speed													
3L	34.4	23.6	5.24	2253	5.5	324	2.59	44	81	89	9	64	100.9
3.2.1.1 75% of pull at maximum power at rated speed													
3L	26.7	17.7	5.44	2306	4.3	369	2.27	47	81	91	9	64	100.9
3.2.1.2 50% of pull at maximum power at rated speed													
3L	18.2	11.8	5.57	2334	3.2	421	1.99	46	79	91	9	64	100.9
3.2.1.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.1.1													
4L	26.7	17.7	5.43	1626	4.5	290	2.89	49	81	89	11	60	100.9
3.2.1.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.1.2													
4L	18.3	11.8	5.57	1648	3.2	321	2.61	50	81	88	12	61	100.9
3.2.2 In selected gear nearest to 7.5 km/h, at maximum power at rated engine speed													
4L	34.1	16.2	7.56	2252	3.9	330	2.54	37	80	81	2	77	100.9
3.2.2.1 75% of pull at maximum power at rated speed													
4L	26.5	12.2	7.82	2308	3.1	369	2.27	38	80	80	2	78	100.9
3.2.2.2 50% of pull at maximum power at rated speed													
4L	18.0	8.1	7.96	2331	2.3	444	1.89	38	79	83	2	78	100.9
3.2.2.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.2.1													
1H	26.5	12.2	7.81	1744	3.2	303	2.77	50	81	89	12	59	100.9
3.2.2.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.2.2													
1H	17.9	8.1	7.97	1762	2.4	344	2.44	48	81	87	12	60	100.9

* Maximum power limited by wheelslip

TEST RESULTS

B. SUPPLEMENTARY TESTS

2. POWER LIFT TESTS

I Power lift test - (To manufacturers lift rod setting of 606 mm)

	At the hitch point	On the frame
Height of lower hitch points above ground in down position	353 mm	353 mm
Vertical movement	637 mm	883 mm
Maximum corrected force exerted through full range	18.4 kN	15.1 kN
Corresponding pressure of hydraulic fluid	20.7 MPa	20.7 MPa
Moment about rear-wheel axis	17.8 kNm	23.8 kNm
Maximum tilt angle of mast from vertical	--	23 degrees

- Linkage settings for test - see Table 2.1 and Figure 2.1

Lifting heights relative to the horizontal plane including the lower link pivot points											
mm	-163	-130	-100	0	100	200	300	400	507	600	720
Lifting forces (the values measured are corrected to correspond to a hydraulic pressure equivalent to 90% of the actual relief valve pressure delivered by the hydraulic system)											
at the hitch points kN	--	18.4	19.2	20.9	22.3	23.4	24.1	24.7	25.3	--	--
Corresponding pressure: 20.7 MPa											
at the frame kN	15.1	15.5	15.7	16.5	17.0	17.2	17.2	16.9	16.4	16.0	15.3
Corresponding pressure: 20.7 MPa											

3. DRAWBAR POWER AND FUEL CONSUMPTION TEST (UNBALLASTED TRACTOR), 2 WHEEL DRIVE

Date and Location of tests: 22 October 1997
Silsoe Research Institute
Wrest Park
Silsoe
Bedford MK45 4HS

Type of track: Concrete

Height of drawbar above ground	Tyre inflation pressure (kPa)	
	Front	Rear
420 mm	83	90

Gear and Range	Power	Drawbar Pull	Speed	Engine Speed	Slip of wheels or track	Spec Fuel cons	Spec energy	Temperature			Atmospheric conditions		
								Fuel	Coolant	Eng oil	Temp	Rel Humidity	Pressure
	kW	kN	km/h	rev/min	%	g/kwh	kWh/l	Deg C	Deg C	Deg C	Deg C	%	kPa
3.1 MAXIMUM POWER IN TESTED GEARS													
1L	16.1	25.4	2.28	2340	12.3	437	1.92	46	80	91	13	53	100.8
2L	23.6	24.5	3.46	2314	10.2	375	2.24	49	80	95	13	56	100.8
3L	33.0	23.9	4.97	2273	9.4	337	2.49	51	81	95	13	55	100.8
4L	34.6	16.9	7.36	2245	4.4	317	2.65	49	81	91	13	59	100.8
1H	34.8	12.7	9.87	2245	3.3	320	2.62	49	82	94	13	57	100.8
2H	32.9	7.9	15.02	2256	2.3	328	2.56	49	81	95	13	57	100.8
3.2 FUEL CONSUMPTION 3.2.1 In selected gear, at maximum power at rated speed													
1H	34.8	12.7	9.87	2245	3.3	320	2.62	49	82	94	13	57	100.8
3.2.1.1 75% of pull at maximum power rated speed													
1H	26.8	9.5	10.20	2304	2.5	351	2.39	51	81	95	13	58	100.8
3.2.1.2 50% of pull at maximum power at rated speed													
1H	18.5	6.4	10.39	2331	1.9	417	2.01	51	80	95	13	57	100.8
3.2.1.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.1.1													
2H	26.7	9.5	10.18	1533	2.7	279	3.00	48	82	83	13	54	100.8
3.2.1.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.1.2													
2H	18.7	6.4	10.42	1558	1.9	315	2.67	49	80	82	13	55	100.8
3.2.2 In selected gear nearest to 7.5 km/h, at maximum power at rated engine speed													
4L	34.6	16.9	7.36	2245	4.4	317	2.65	49	81	91	13	59	100.8
3.2.2.1 75% of pull at maximum power at rated speed													
4L	26.9	12.7	7.65	2307	3.3	354	2.37	50	81	93	13	57	100.8
3.2.2.2 50% of pull at maximum power at rated speed													
4L	18.5	8.5	7.82	2337	2.4	414	2.03	50	80	93	13	56	100.8
3.2.2.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.2.1													
1H	27.0	12.7	7.65	1742	3.3	291	2.89	47	81	89	14	53	100.8
3.2.2.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.2.2													
1H	18.4	8.5	7.84	1768	2.4	317	2.65	48	81	89	14	53	100.8

C. OPTIONAL TESTS

C1. LOCATION OF CENTRE OF GRAVITY

Height above ground, mm	852
Distance forward from the vertical plane containing the axis of the rear wheels, mm	878
Distance from the median plane of the tractor, mm (to left viewed from rear)	0

REPAIRS AND ADJUSTMENTS DURING TESTS: None

REMARKS: None

Test carried out by: S J Devonshire

Signed: Officer in charge of tests

P C Seward

Signed: for the Director

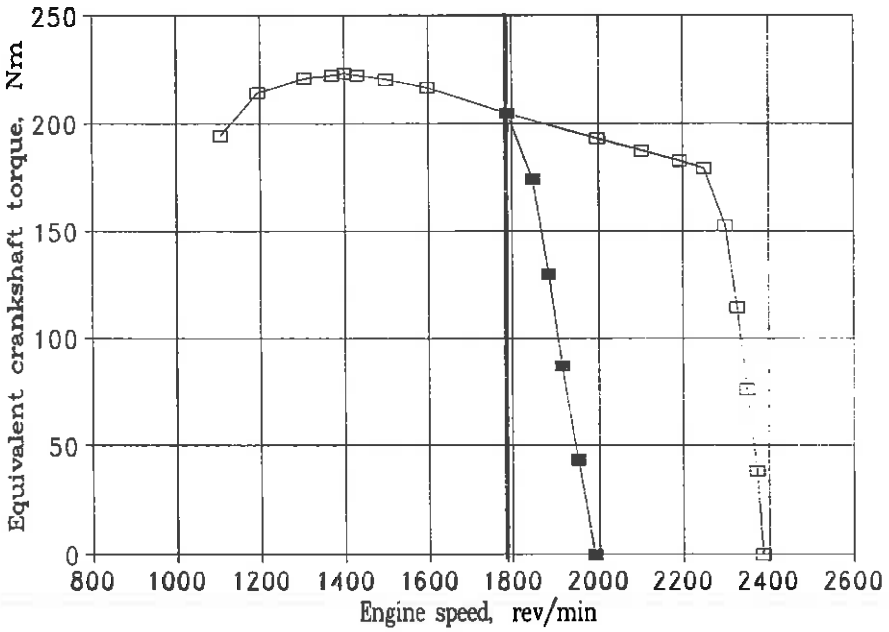
P C Seward
Head of Test Engineering Group

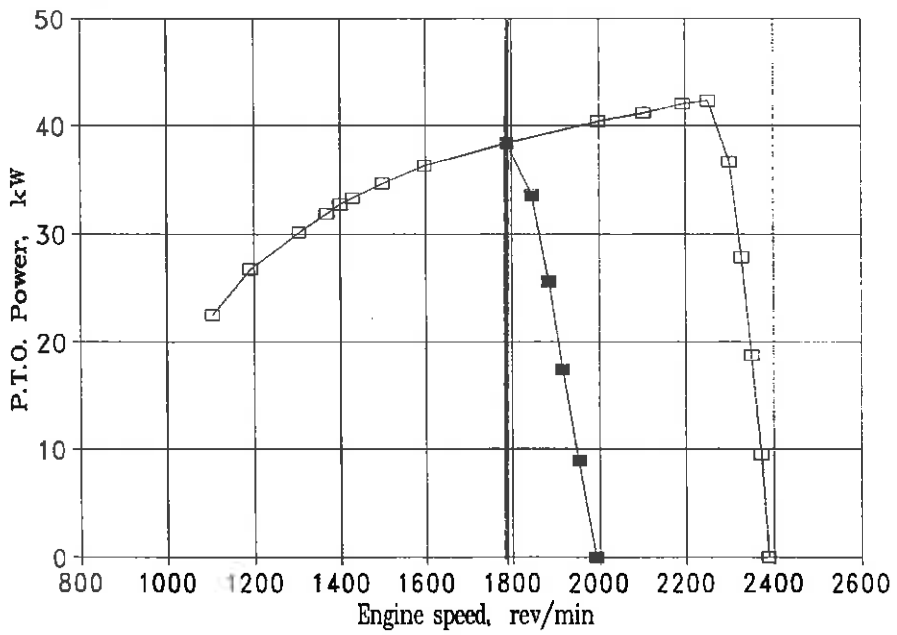
Date: 15/12/97

ANNEX 1 MAIN POWER TAKE-OFF CURVES

P.T.O. POWER TEST - MASSEY FERGUSON 4220 FOUR-WHEEL DRIVE (540 rev/min)

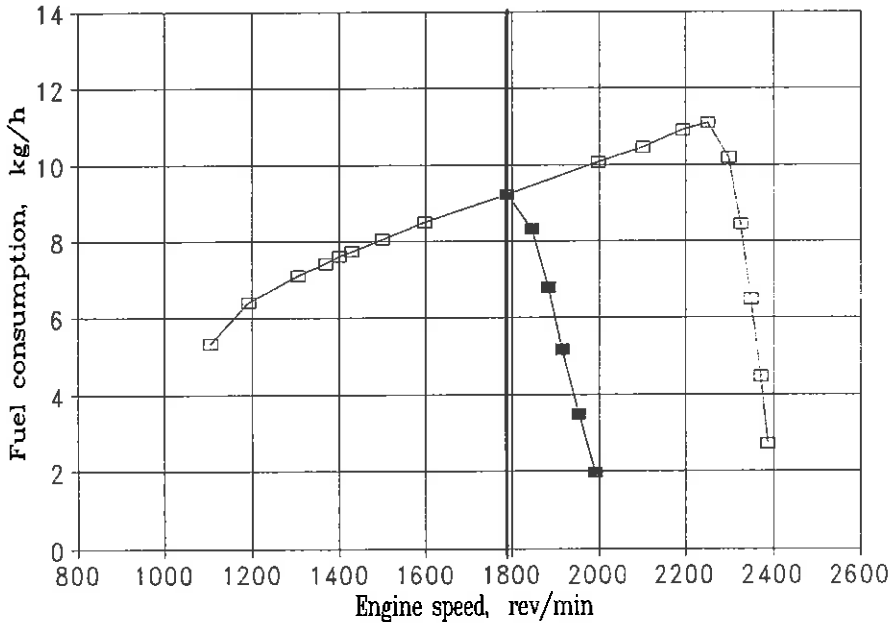
Governor set for maximum power at rated speed □
Governor set for maximum power at pto speed ■
Standard power take-off speed (540 rev/min) |

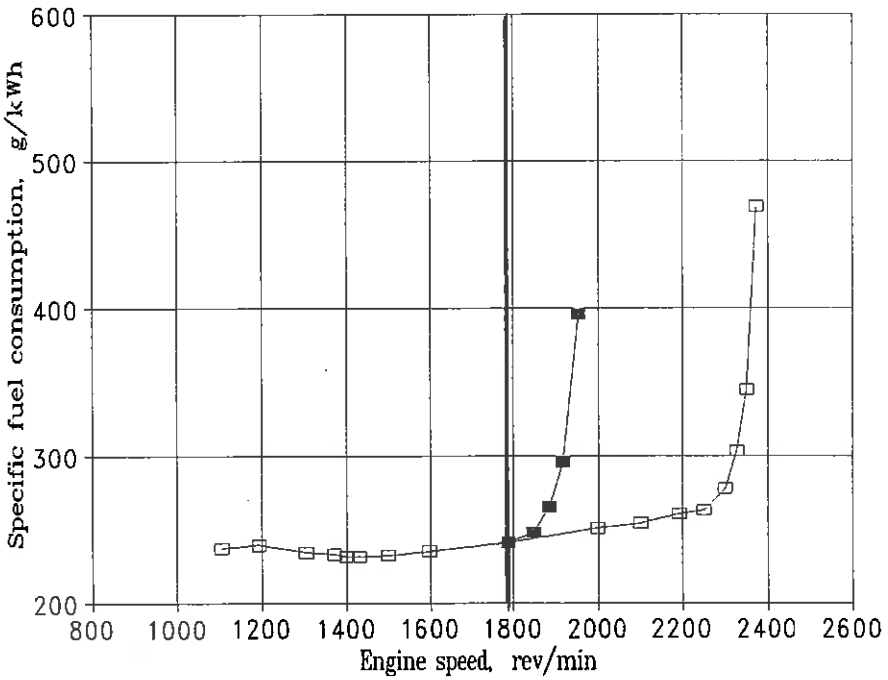




P.T.O. POWER TEST - MASSEY FERGUSON 4220 FOUR-WHEEL DRIVE (540 rev/min)

Governor set for maximum power at rated speed □
Governor set for maximum power at pto speed ■
Standard power take-off speed (540 rev/min) ▮





P.T.O. POWER TEST - MASSEY FERGUSON 4220 FOUR-WHEEL DRIVE (540 rev/min)

Governor set for maximum power at rated speed □
Governor set for maximum power at pto speed ■

