SILSOE RESEARCH INSTITUTE
Wrest Park, Silsoe,
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Report No: R93/71674/OECD
OECD Approval No: 1496 Restricted Code
Approval Date: 6 December 1993

Test in accordance with the OECD Restricted Standard Code for the Official Testing of Agricultural Tractors

Massey-Ferguson 352 Four-Wheel Drive Tractor with 12-speed Transmission



Manufactured by: Massey-Ferguson Tractors Limited
Banner Lane
Coventry
West Midlands CV4 9GF
England

Submitted for test by: The manufacturer

Report No: 764

Date: July 1993

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Tractor manufacturer's name and address:	Massey-Ferguson Tractors Limited 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:	134 hours
Location of test:	Silsoe Research Institute Wrest Park, Silsoe, England

I. SPECIFICATION OF TRACTOR

TRACTOR

Make:	Massey-Ferguson
Model:	MF-352 with 12-speed transmission
Type:	Four wheel drive, unit construction
Serial No:	9206 B05263
1st Serial No:	9206 B05263

ENGINE

Make:	Perkins
Model:	A3 152.4
Type:	4 stroke, direct injection, diesel, turbocharged
Serial No:	CN31256 U906951W
Ist Serial No:	CN31256 U899214W

Cylinders

Number/disposition:	3 vertical In-line
Bore/stroke:	91.5 mm/127 mm
Capacity:	2505 cm^3
Compression ratio:	15.5:1
Arrangement of valves:	Overhead
Cylinder liners:	Dry

Supercharging

Make:	Schwitzer
Model:	S2A
Type:	Exhaust driven
Pressure:	0.07 MPa

Fuel system

Fuel feed system:	ISKRA mechanical feed pump
Make, type and model of fuel filter:	CAV paper, element filter with transparent sediment bowl
Capacity of fuel tank:	68 litres
Make, type and model of injection pump:	CAV distributor, DPA Type 649 Perkins 2643B141DW/5/2470
Serial No:	24762LKG
Manufacturer's production setting of injection pump:	11.14 to 11.75 l/hr
. Flow rate	55-58 mm^3/stroke at 2250 rev/min engine speed at full load and 50°C pump inlet temperature
. Timing	Delivery starts 17° before T.D.C. static
. Timing advance	4° start retard, all in by 1000 750 rpm, 5° to 6° by 1800 rpm and 7° by 2250 rpm
Make, type and model of injectors:	CAV 4-hole, LRB6701503 Code HX
Injection pressure:	21.3 MPa

Governor

Make:	CAV
Model:	Not applicable
Type:	Mechanical incorporated in injection pump
Governed range of engine speed:	750 ± 50 to 2430 ± 45 rpm
Rated engine speed:	2250 rev/min

Air cleaner

Pre-cleaner:	None
Main cleaner:	
. Make	Donaldson
. Type	2 stage, dry paper element
. Model	FL6-06 - 5337
. Location of air intake	Under bonnet 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 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:	4
Fan diameter:	394 mm
Coolant capacity:	9.8 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:	ISKRA induction heater 12V
Safety device:	Operable only when high/low gear lever and pto selector are in neutral position

Electrical system

Voltage:	12
Generator:	Alternator
. Make	Massey-Ferguson Powerpart
. Model	A 127-70
. Type	Belt driven
. Power	0.84 kW
Batteries:	1 M-F Powerpart, type 372 lead acid maintenance free
. Rating	420 CCA rating or equivalent 70 Ah at 20 hour rating

Exhaust system

Make:	Nelson Burgess
Model:	MF85
Type:	Oval baffle silencer
Location:	Vertical on left hand side
Height of outlet above ground:	2453 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:	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 with synchromesh. Three floor mounted levers selects forward and reverse, and range changes.
Number of gears:	12 forward, 4 reverse
Available options:	8 speed syncromesh, 8 speed shuttle, all 3 optional with creep, available on 2WD only

Rear axle final drives

Make:	Own make
Model:	None
Type:	Crown wheel and pinion

Differential lock:	
. Type	Mechanical dog clutch on differential gears
. Method of engagement	Hydraulically operated in response to panel mounted electrical switch
. Method of disengagement	Reverse of above

Front axle and final drives

Make:	GKN Comaxle
Model:	AG65
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 switch on side console
. 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:* 2250 rev/min km/h
Forward			
1	Ll	288.281	2.04
1	Lh	227.637	2.59
2	Ll	192.187	3.07
2	Lh	151.758	3.88
3	Ll	104.830	5.62
3	Lh	82.777	7.12
1	Hl	72.703	8.11
1	Hh	56.909	10.36
2	Hl	48.047	12.27
2	Hh	37.939	15.54
3	Hl	26.207	22.49
3	Hh	20.694	28.49
R	Ll	192.187	3.07
R	Lh	151.758	3.88
R	Ll	48.047	12.27
R	Lh	37.939	15.54

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

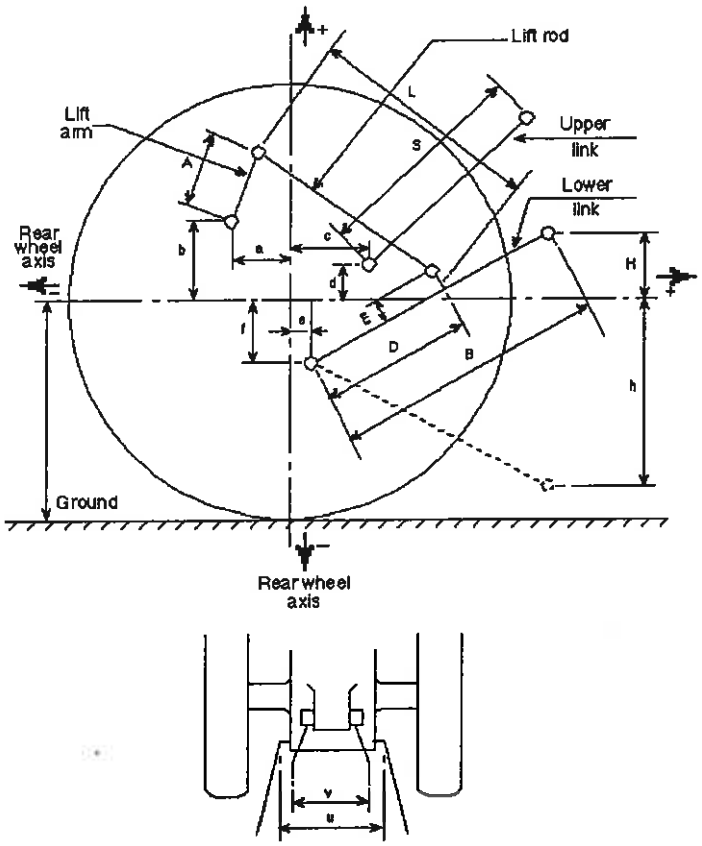
(*) Calculated with a tyre dynamic radius index of 695 mm (ISO 4251/1-1984)
Number of revolutions of front wheels for one revolution of rear wheels: 1.4411:1

AUXILIARY HYDRAULIC SYSTEM

Make:	Eaton Hydraulics Limited
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 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 valve and separate return to ISO Standard. A valve allows combination with main system up to auxiliary relief valve pressure
Maximum volume of oil available to external cylinders:	20 litres

THREE-POINT LINKAGE

Category:	1 or 2 to ISO standard 730-1:1990
Category adaptor:	Interchangeable balls
Controls:	Draught or position control with top link sensing



LIFT TEST
Linkage geometry

Fig 2.1

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
Method of changing power take-off speeds:	None

Clutch

Make:	Own make
Model:	None
Type:	Hydraulically actuated wet multiplate
Number of plates:	7
Diameter of plates:	128 mm

Power take-off proportional to engine speed
(Main Test)

540 rev/min

Location:	Rear of tractor
Diameter of power take-off shaft:	34.9 mm
Number of splines:	6 to ISO 500
Height above ground:	570 mm
Distance from the median plane of the tractor:	Central
Distance behind rear wheel axis:	296 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
Power restriction and maximum torque:	ISO recommendation 48 kW
Direction of rotation (viewed from behind tractor):	Clockwise

POWER LIFT

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:	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:	20 litres

Table 2.1

Dimensions of linkage when attached to the standard frame (ISO 730-1:1990 CAT 2)

			Dimensions or range	Setting used in Main Test
Length of lift arms:		(A)	267 mm	267 mm
Length of lower links:		(B)	959 mm	959 mm
Distance of lift arm pivot point from rear wheel centre line:	horizontally: vertically:	(a) (b)	196 mm 233 mm	196 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 - 831 mm	765 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
Distance of lower link pivot point from rear wheel centre line:	horizontally: vertically:	(e) (f)	32 mm forward 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)	428 mm on centre line	428 mm 0 mm
Length of lift rods:		(L)	600 - 635 mm (620 nominal setting)	625 mm
Height of lower hitch points (*) relative to the rear wheel centre line, situated 695 mm above the ground level:				
- in low position		(h)	430 mm 523 mm	495 mm
- in high position		(H)	190 mm 250 mm	220 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 4251/1-1984

SWINGING DRAWBAR

Type:	Clevis
Height above ground, maximum:	538 mm
minimum:	343 mm
Type of adjustment:	Inverting drawbar and clevis
Distance of hitch point from rear-wheel axis, horizontally:	536 - 651 - 701 mm
Distance of hitch point from power take-off shaft ends:	
. Vertically:	32 - 227 mm
. Horizontally:	240 - 355 - 405 mm
Lateral adjustment (centre of clevis):	
. Right-hand:	200 mm drawbar in, 235 mm, 250 mm out
. Left-hand	200 mm drawbar in, 235 mm, 250 mm out
Distance of pivot point from rear axles horizontally:	130 mm forward
Width of clevis:	65 mm
Diameter of drawbar pin hole:	26 mm
Maximum vertical permissible load:	7.6 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:	572 mm
Width of clevis:	65 mm
Diameter of pin hole:	33 mm

STEERING

Make:	Own make
Model:	None
Type:	Hydrostatic
Method of operation:	
. Pump	Eaton gear type mounted on engine in tandem with auxiliary hydraulic system pump
. Motor	Danfoss OSPC-100-ON
. Ram	1 double acting operating both track rods
. Filter	1 replaceable canister in shared circuit with auxiliary hydraulics
Working pressure:	14.0 MPa

BRAKES

Service brake

Make:	Girling
Model:	None
Type:	Oil-immersed multiplate discs, 3 per side
Method of operation:	Independent on rear wheels or combined pedal giving compensated 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:	2124 mm

Track width adjustment:

	Minimum, mm	Maximum, mm	Adjustment method
Front	1321	1626	By reversing wheels and offset lug rims
Rear	1519	1814	By reversing wheels and offset lug rims

PROTECTIVE STRUCTURE

Make:	GKN Sankey Industrial Products
Model:	Lo-Line 041 632 520 002
Type:	Safety cab
Manufacturer's name and address:	GKN Sankey Industrial Productions, Hadley Castle Works, P O Box 86, Telford TF1 4RE
Protective device:	
. Rollguard	Safety cab
. Tiltable/Not tiltable	Non tiltable
OECD approval number:	CSS 0257/7 Massey-Ferguson 352 Narrow Axle (4WD) with seat KAB XH2/U4

DRIVER'S SEAT

Make/Model/Type:	KAB XH2/U4
Type of suspension:	Spring
Type of damping:	Hydraulic
Range of adjustment:	
. Longitudinal	140 mm
. Vertical	60 mm

LIGHTING

Unrestricted beam angle of headlight in plan view:

	Height above ground to centre, mm	Size, mm	Distance from outside edge to median plane of tractor, mm
Headlight	1110	90 x 150	220
Sidelights	1556	30 x 110	708
Rear lights	1497	85 x 65	719
Axle reflectors	703	80 dia	434
Cab reflectors	1497	42 x 50	740

II. TEST CONDITIONS

Overall dimensions (overall width at 1596 measured front track)

Length mm	Width		Height at top of	
	Minimum mm	Maximum mm	Protective structure mm	Exhaust pipe mm
3604	1979	2274	2466	2453

Ground clearance (unballasted tractor) 285 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	1142	1158	--	--
Rear	1635	1694	--	--
Total	2777	2852	--	--

Tyres and track width specification

	Front	Rear
Tyres . dimensions . ply rating . type	9.5 x 24 A8 Radial	16.9 x 30 A8 Radial
Maximum load (tyre manufacturer's), kg	1110	2245
Maximum load (tractor manufacturer's), kg	1000	2245
Inflation pressure (tyre manufacturer's), Bar	2.8	1.7
Dynamic radius index, mm	495	695
Chosen track width (manufacturer's nominal), mm	1596	1519

Oils and lubrication

Capacity and change interval

	Capacity l	Oil change h	Filter change h
Engine	6.8	250	250
Front axle	3.8	1000	None
Final drive (front)	0.6 per side	1000	None
Gearbox	46	1000	250
Rear axle Hydraulic system) Final drives (rear)) Steering	Integral with rear axle		
Brakes	--	Top-up	None

Fuels and lubricants used in tests

Fuel

Type: Diesel oil with cetane index of 50.0 and kinematic viscosity of 3.246 cSt at 40°C.

Specific gravity: 0.8571 kg/l 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:	54 cSt at 50°C	
Classification:	MIL-L-2104-C	
Rear final drives		
Type:	SAE 15W/30	As recommended
Viscosity:	54 cSt 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

A. COMPULSORY TEST RESULTS

1. MAIN POWER TAKE-OFF (540)

Date and location of tests: 8 July 1993
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						
35.9	2250	679	9.54	11.13	266	3.23
1.2 POWER AT RATED ENGINE SPEED						
35.9	2250	679	9.54	11.13	266	3.23
1.3 STANDARD POWER TAKE-OFF SPEED (540 ± 10 rev/min)						
32.7	1788	540	8.06	9.40	246	3.48
1.4 PART LOADS 1.4.1 The torque corresponding to maximum power at rated engine speed						
35.9	2250	679	9.54	11.13	266	3.23
1.4.2 85% of the torque defined in 1.4.1						
31.1	2287	691	8.66	10.10	278	3.08
1.4.3 75% of the torque defined in 1.4.2						
23.6	2314	698	7.24	8.44	307	2.79
1.4.4 50% of the torque defined in 1.4.2						
15.9	2340	706	5.78	6.74	363	2.36
1.4.5 25% of the torque defined in 1.4.2						
8.0	2365	714	4.35	5.07	544	1.58
1.4.6 Unloaded						
0	2392	722	3.04	3.55	--	--

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 1.5.1	PART LOADS AT STANDARD POWER TAKE-OFF SPEEDS (540 ± 10 rev/min) The torque corresponding to maximum power					
32.7	1788	540	8.06	9.40	246	3.48
1.5.2	85% of the torque obtained in 1.5.1					
28.4	1824	551	7.09	8.27	250	3.43
1.5.3	75% of the torque obtained in 1.5.2					
21.7	1863	562	5.78	6.75	266	3.22
1.5.4	50% of the torque obtained in 1.5.2					
14.7	1896	572	4.51	5.27	306	2.80
1.5.5	25% of the torque obtained in 1.5.2					
7.5	1931	583	3.24	3.78	432	1.98
1.5.6	Unloaded					
0	1970	595	2.06	2.40	--	--

No load, maximum engine speed: 2392 rev/min

Torque (equivalent crankshaft) at maximum power: 152.5 Nm

Maximum torque (equivalent crankshaft) (engine speed 1500 rev/min): 179.9 Nm

Mean atmospheric conditions:

- Temperature 22°C
- Pressure 1013 m bar
- Relative humidity 37%

Maximum temperatures:

- Coolant 84°C
- Engine oil 112°C
- Fuel 63°C
- Engine air intake 28°C

2. HYDRAULIC POWER AND LIFTING FORCE

Date of tests: 12 July 1993

2.1 Hydraulic power test

Sustained pressure with relief valve open: 23.4 MPa

Pump delivery rate at minimum pressure: 18.3 l/min

	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	15.0	21.1	5.28
Flow rate and hydraulic pressure corresponding to maximum hydraulic power	15.2	21.0	5.32

Tapping point used for test: 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	200 mm	200 mm
Vertical movement	715 mm	948 mm
Maximum corrected force exerted through full range	16.8 kN	14.5 kN
Corresponding pressure of hydraulic fluid	21.1 MPa	21.1 MPa
Moment about rear-wheel axis	15.6 kNm	22.3 kNm
Maximum tilt angle of mast from vertical	--	18 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	-348	-283	-200	-100	0	100	200	300	400	432	600
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	--	16.8	18.2	19.7	20.9	21.7	22.5	23.2	23.9	24.3	--
Corresponding pressure: 21.1 MPa											
at the frame kN	14.5	15.3	16.0	16.6	16.8	16.9	16.9	16.9	16.7	16.5	15.7
Corresponding pressure: 21.1 MPa											

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

Date and location of tests: 14 July 1993
Silsoe Research Institute
Wrest Park
Silsoe

Type of track: Concrete

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

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													
2Ll*	20.7	27.5	2.71	2295	14.5	381	2.25	56	79	104	23	61	100.2
2Lh*	25.9	27.6	3.39	2274	14.9	363	2.36	60	81	107	22	67	100.2
3Ll	30.1	20.1	5.39	2250	5.3	319	2.68	56	80	104	20	72	100.1
3Lh	30.0	15.6	6.92	2251	4.2	323	2.65	58	79	102	23	62	100.2
1Hl	30.6	13.8	7.99	2252	3.7	311	2.75	63	82	109	23	61	100.2
1Hh	29.0	10.2	10.21	2251	2.8	330	2.60	60	82	108	21	72	100.1
2Hl	29.1	8.6	12.15	2253	2.4	327	2.62	61	81	108	21	69	100.1
2Hh	28.4	6.6	15.46	2251	1.8	339	2.53	59	80	107	20	73	100.1
3.2 FUEL CONSUMPTION 3.2.1 In selected gear, at maximum power at rated speed													
1Hl	30.6	13.8	7.99	2252	3.7	311	2.75	63	82	109	23	61	100.2
3.2.1.1 75% of pull at maximum power at rated speed													
1Hl	23.6	10.3	8.22	2298	3.0	347	2.47	63	82	109	23	61	100.2
3.2.1.2 50% of pull at maximum power at rated speed													
1Hl	16.3	7.0	8.39	2326	2.2	406	2.11	62	79	109	23	64	100.2
3.2.1.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.1.1													
1Hh	23.6	10.4	8.14	1798	3.0	302	2.84	62	82	108	24	62	100.2
3.2.1.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.1.2													
1Hh	16.3	7.1	8.30	1817	2.0	340	2.52	60	79	103	24	63	100.2
3.2.2 In selected gear nearest to 7.5 km/h, at maximum power at rated engine speed													
3Lh	30.0	15.6	6.92	2251	4.2	323	2.65	58	79	102	23	62	100.2
3.2.2.1 75% of pull at maximum power at rated speed													
3Lh	23.5	11.8	7.14	2300	3.3	355	2.41	57	79	104	23	64	100.2
3.2.2.2 50% of pull at maximum power at rated speed													
3Lh	15.9	7.8	7.31	2331	2.2	413	2.07	57	79	104	23	64	100.2
3.2.2.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.2.1													
1Hl	23.6	11.8	7.20	2018	3.2	314	2.73	57	79	103	22	65	100.2
3.2.2.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.2.2													
1Hl	15.9	7.8	7.36	2044	2.3	362	2.37	57	78	101	23	64	100.2

Maximum power limited by wheelslip and bounce

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

te and location of tests: 20 July 1993
Silsoe Research Institute
Wrest Park
Silsoe

pe of track: Concrete

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

Gear and range	Power	Drawbar Pull	Speed	Engine Speed	Slip of wheels or track	Spec fuel cons	Spec energy	Temperature Fuel	Coolant	Eng oil	Atmospheric conditions 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													
L*	16.9	22.8	2.67	2310	15.5	427	2.01	49	76	98	18	62	100.7
2Lh*	21.0	22.5	3.36	2293	15.5	392	2.19	51	78	101	16	67	100.6
3Ll	28.7	19.9	5.20	2254	8.0	334	2.56	50	79	104	14	78	100.5
3Lh	29.1	15.6	6.75	2249	5.6	331	2.59	54	80	103	15	73	100.6
1Hl	30.0	13.8	7.82	2252	4.9	321	2.67	55	80	105	16	68	100.6
1Hh	29.3	10.6	9.99	2249	3.9	331	2.59	55	80	105	16	68	100.6
2Hl	29.3	8.9	11.88	2247	3.4	330	2.60	53	80	105	15	72	100.6
2Hh	27.9	6.6	15.15	2248	2.8	346	2.48	54	80	105	15	71	100.8
3.2 FUEL CONSUMPTION													
3.2.1 In selected gear, at maximum power at rated speed													
1Hl	30.0	13.8	7.82	2252	4.9	321	2.67	55	80	105	16	68	100.6
3.2.1.1 75% of pull at maximum power at rated speed													
1Hl	23.2	10.3	8.09	2303	3.8	351	2.44	57	80	106	16	65	100.6
3.2.1.2 50% of pull at maximum power at rated speed													
...	15.7	6.9	8.25	2327	2.9	425	2.02	56	79	106	16	65	100.6
3.2.1.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.1.1													
1Hh	23.0	10.3	8.03	1806	3.8	309	2.77	54	79	97	18	65	100.7
3.2.1.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.1.2													
1Hh	15.6	6.9	8.18	1822	2.9	354	2.42	54	78	97	18	65	100.7
3.2.2 In selected gear nearest to 7.5 km/h, at maximum power at rated engine speed													
3Lh	29.1	15.6	6.75	2249	5.6	331	2.59	54	80	103	15	73	100.6
3.2.2.1 75% of pull at maximum power at rated speed													
3Lh	22.8	11.7	7.00	2300	4.2	362	2.37	56	79	105	16	71	100.6
3.2.2.2 50% of pull at maximum power at rated speed													
3Lh	15.5	7.8	7.17	2328	3.1	434	1.97	54	78	104	16	72	100.6
3.2.2.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.2.1													
1Hl	23.0	11.7	7.05	2016	4.2	322	2.66	54	78	100	17	64	100.7
3.2.2.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.2.2													
1Hl	15.5	7.7	7.21	2040	3.1	371	2.31	52	78	99	17	65	100.7

ximum power limited by wheelslip and bounce

C. OPTIONAL TESTS

C1. LOCATION OF CENTRE OF GRAVITY

Height above ground, mm	835
Distance forward from the vertical plane containing the axis of the rear wheels, mm	862
Distance from the median plane of the tractor, mm (to left viewed from rear)	3

REPAIRS AND ADJUSTMENTS DURING TESTS: None

REMARKS: None

Test carried out by: S J Devonshire

Officer in charge: P C Seward

Signed: H M R Proctor — Head of Test Engineering Group

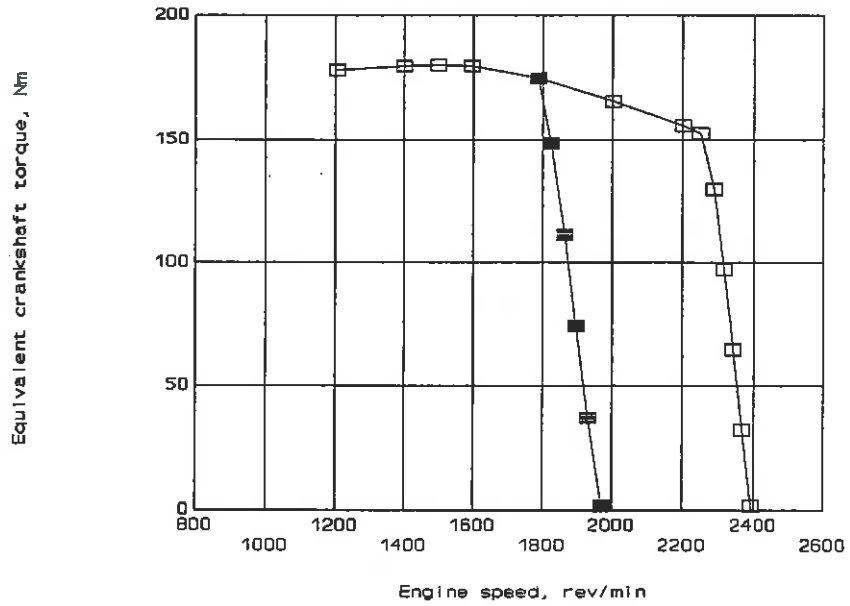
H M R Proctor — for the Director

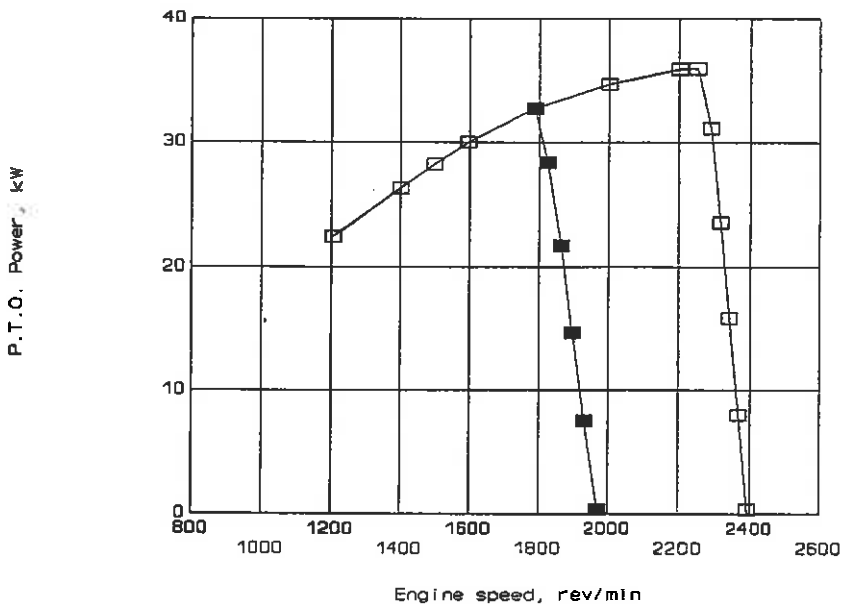
Date: 6/1/94

ANNEX 1 MAIN POWER TAKE-OFF CURVES (540)

P.T.O. POWER TEST - MASSEY FERGUSON 352, 4 WHEEL DRIVE

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

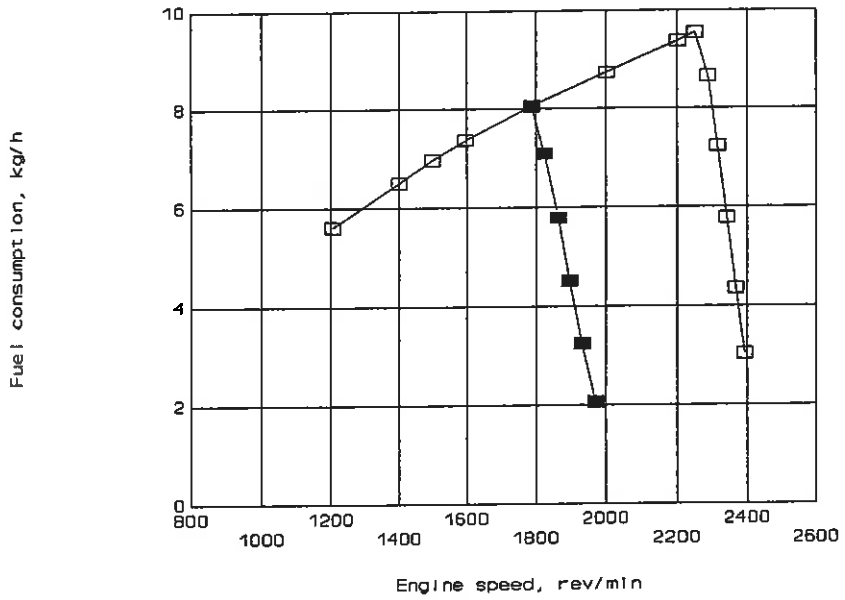


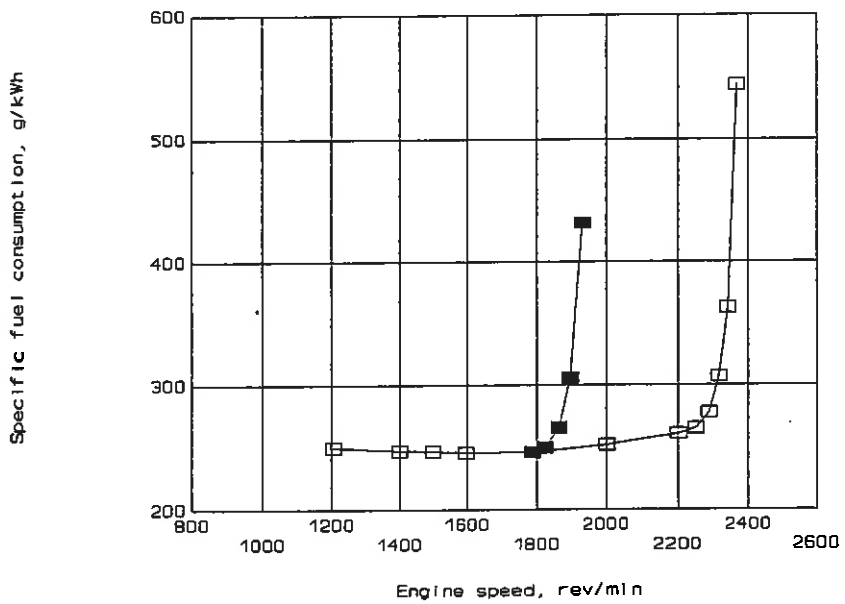


ANNEX 1 MAIN POWER TAKE-OFF CURVES (540)

P.T.O. POWER TEST - MASSEY FERGUSON 382, 4 WHEEL DRIVE

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





ANNEX 1 MAIN POWER TAKE-OFF CURVES (540)

P.T.O. POWER TEST - MASSEY FERGUSON 382, 4 WHEEL DRIVE

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

