SILSOE RESEARCH INSTITUTE

Wrest Park, Silsoe,
Bedford MK45 4HS

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Report on test in accordance with the OECD STANDARD CODE 2 (RESTRICTED CODE) for the Official Testing of Agricultural and Forestry Tractors

Massey Ferguson 290 Four-Wheel Drive Tractor with 8-speed Transmission (40km/h)



Manufactured by:	AGCO Limited P.O Box 62 Banner Lane Coventry West Midlands CV4 9GF
Submitted for test by:	The Manufacturer
Report No:	816
Date:	August 2000

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OECD/6016/2000

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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
Place of running in:	Coventry, England
Duration of running in:	70 hours
Location of test:	Silsoe Research Institute Wrest Park, Silsoe, MK45 4HS, United Kingdom

1. SPECIFICATIONS OF TRACTOR

1.1 Identification

Make:	Massey Ferguson
Model:	MF 290 with 8 speed Transmission (40 km/h)
Type:	Four-wheel drive, unit construction
Serial No:	H36034
1st Serial No:	H36034
Tractor type code:	Not Applicable

1.2 Engine

Make:	Perkins
Model:	4.41
Type:	4 stroke direct injection, naturally aspirated diesel
Serial No:	U894742F
Type number:	LM31457
1st Serial No:	U894742F

1.2.1 Cylinders

Number/disposition:	4 vertical in-line
Bore/stroke:	101mm/127mm
Capacity:	4070 cm^3
Compression ratio:	17.25:1
Arrangement of valves:	Overhead
Cylinder liners:	Dry

1.2.2 Supercharging

Make:	None
Model:	---
Type:	---
Pressure:	---

1.2.3 Fuel system

Fuel feed system:	Mechanical Fuel Feed Pump
Make, type and model of fuel filter:	CAV Filter with transparent sediment bowl
Capacity of fuel tank:	80 litres
Make, type and model of injection pump:	Lucas Distributor type with mechanical governor 1142
Serial No:	03114 DTG
Manufacturer's production setting of injection pump:	16.44 -17.46 dm^3/h
Flow rate (rated engine speed and full load):	64.2 ± 3% mm^3 per stroke at 2200 min^{-1} (rev/min) rated engine speed and full load
Timing:	TDC ± 2 degrees
Make, type and model of injectors:	LUCAS – Code HL Atomisers – Perkins 2645A010 Nozzle – Perkins 2645AK604 Nozzle – Lucas JB6801027
Injection pressure:	29.4 ± 0.5 MPa

1.2.4 Governor

Make:	Lucas
Model:	Not Applicable
Type:	Mechanical incorporated in fuel injection pump
Governed range of engine speed:	750 to 2354 min^{-1}(rev/min)
Rated engine speed:	2200 min^{-1}(rev/min)

1.2.5 Air cleaner

Pre-cleaner	Spin tube
Main cleaner	
Make:	Nelson Burgess or Donaldson
Type:	2 stage dry paper element Removable main and safety element or oil type
Model:	None
Location of air intake:	Behind front grill in front of radiator
Maintenance indicator:	Warning light on instrument panel

1.2.6 Lubrication system

Type of feed pump:	Forced feed from eccentric rotor pump
Type of filter:	Full flow, replaceable canister
Number:	1

1.2.7 Cooling system

Type of coolant:	Water or water and antifreeze solution
Type of pump:	Centrifugal
Specification of fan:	Belt driven pulley
Number of fan blades:	6
Fan diameter:	410 mm
Coolant capacity:	14.2 litres
Type of temperature control:	Thermostat
System pressure:	69 kPa

1.2.8 Starting system

Make:	Magneti Marelli
Model:	M 127
Type:	Electrical, pre-engaged, solenoid operated
Starter motor power rating:	2.2 kW
Cold starting aid:	CAV, or SINTEROM, or ISKRA induction heater
Safety device:	Starting operable when all gear levers are in neutral

1.2.9 Electrical system

Voltage:	12 V
Generator:	Alternator
Make:	Magneti Marrelli
Model:	A 127-70
Type:	Belt driven
Power:	0.84 kW
Batteries:	1 570 CCA
Rating:	120 Ah at 20 hours

1.2.10 Exhaust system

Make:	Tecnov
Model:	Straight through
Type:	Vertical silencer
Location:	Righthand side of bonnet
Height of outlet above ground:	2582 mm

1.3 Transmission

1.3.1 Clutch (Travel alone)

Make:	LUK
Model:	None
Type:	Dual
Number of plates:	2
Diameter of plates:	Main 305 mm, PTO 254 mm
Method of operation:	Mechanical by pedal

1.3.2 Gear box

Make:	Massey Ferguson
Model:	None
Description:	Mechanical manual operation, 4 forward and 1 reverse speeds with high and low range selector

	Forward	Reverse
Number of gears	4	1
Number of ranges/groups	2	2
Total of arrangements	8	2

Available options: 12 x 4 Synchromesh gearbox

1.3.3 Rear axle final drivers

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

1.3.4 Front axle and final drives

Make:	Dana Spicer Europe
Model:	AG 85
Type:	Crown wheel and pinion with differential and outboard epicyclic reduction gear final drives
Differential lock:	
Type:	None
Method of engagement:	None
Method of disengagement:	None

1.3.5 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	L	210.380	3.04
2	L	143.458	4.45
3	L	105.011	6.08
4	L	78.256	8.16
1	H	51.426	12.42
2	H	35.067	18.21
3	H	25.669	24.88
4	H	19.129	33.38
Reverse			
1	L	154.504	4.13
2	H	37.768	16.91

Range selection: L = Low range H = High range

(*) Calculated with a tyre dynamic radius index of 770 mm (ISO 4251/1-1992)

Number of revolutions of front wheels for one revolution of rear wheels: 1.3669

1.4 Power take-off

1.4.1 Main power take-off

Type:	Semi-independent
Method of engagement:	Engaged by hand-lever and second plate of main clutch
Number of shafts:	1 spline to ISO 500/1991
Method of changing power take-off speeds:	Not applicable

Clutch

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

1.4.1.1 Power take-off proportional to engine speed

Power take-off at 540 min^{-1} (rev/min)

Location:	Rear of tractor
Diameter of power take-off shaft:	34.9 mm
Number of splines:	6 in conformity with ISO 500/1991
Height above ground:	640 mm
Distance from the median plane of the tractor:	Central
Distance behind rear wheel axis:	333 mm
Pto speed at rated engine speed:	706 min^{-1}(rev/min)
Engine speed at standard power take-off speed:	1683 min^{-1}(rev/min)
Ratio of rotation speeds:	3.1176
Power restriction:	None
Maximum torque:	258.09 Nm
Direction of rotation (viewed from behind tractor):	Clockwise

1.4.1.2 Power take-off proportional to ground speed

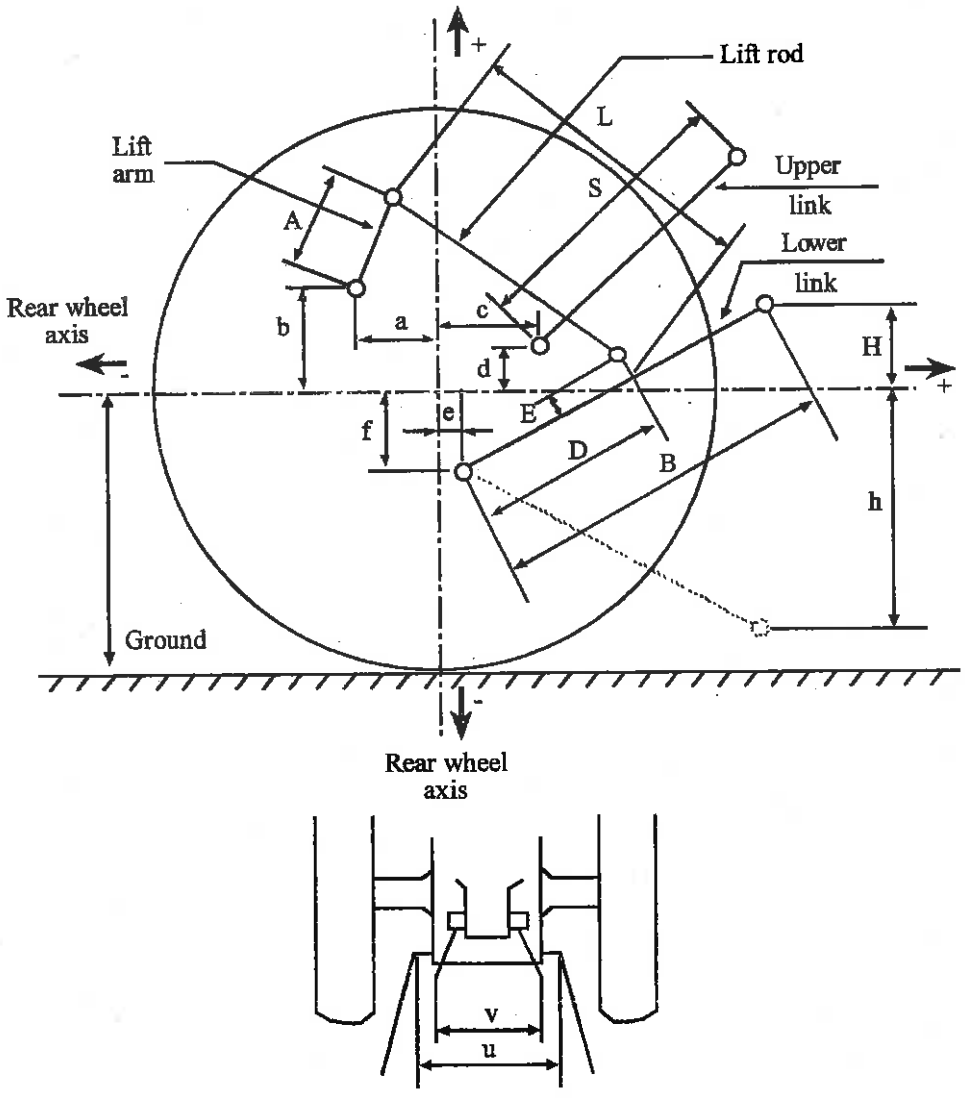
Power take-off proportional to ground speed:	None

1.5 **Hydraulic 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:	20.7 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 which is independent of main clutch
Type and number filters:	140 micron washable strainer
Site of oil reservoir:	Transmission
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 coupling
Maximum volume of oil available to external cylinders:	20 litres

1.6 **Three-point linkage**

Category:	2 in conformity with ISO 730-1:1994+Cor.1:1995
Category adapter:	None
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 mm	Setting used in Test 3.2.2	Test 3.2.2.1	Test 3.2.2.2
Length of lift arms:		(A)	225	225	225	225
Length of lower links:		(B)	1005	1005	1005	1005
Distance of lift arm pivot point from Rear wheel centre line:	horizontally: vertically:	(a) (b)	196 233	196 233	196 233	196 233
Horizontal distance between the two Lower link points:		(u)	492	492	492	492
Horizontal distance between the two lift arm end points:		(v)	584	584	584	584
Length of upper link:		(S)	725-825	810	810	810
Distance of upper link pivot point From rear wheel centre line:	horizontally: vertically:	(c) (d)	186-200-216 205-171-132	186 205	186 205	186 205
Distance of lower link pivot point from rear wheel centre line:	horizontally: vertically:	(e) (f)	32 forward 212	32 forward 212	32 forward 212	32 forward 212
Distance of lower link points to lift rod pivot points on lower link centre line:	horizontally:	(D)	568	568	568	568
Length of lift rods:		(L)	633-735	723	678	633
Height of lower hitch points (*) Relative to the rear wheel centre line, situated 770 mm above the ground level:						
- In low position		(h)	340-595	575	445	340
- In high position		(H)	60-228	80	168	228
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 770 mm ISO 4251/1-1992

1.7 Swinging drawbar

Type:	Clevis
Height above ground:	
Unballasted Maximum:	600 mm
Minimum:	407 mm
Type of adjustment:	Inverting drawbar
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:	40 mm 134 mm 139 mm 233 mm
Horizontally:	250 mm 350 mm 400 mm
Lateral adjustment (centre of Clevis):	
Right-hand:	169 mm 196 mm 210 mm
Left-hand:	169 mm 196 mm 210 mm
Distance of pivot point from rear axles horizontally:	30 mm forward
Width of Clevis:	65 mm
Diameter of drawbar pin hole:	33 mm
Maximum vertical permissible load:	
Clevis uppermost:	11.6 kN
Clevis underneath:	11.6 kN

1.8 Trailer hitch

Type:	None fitted

1.9 Holed drawbar

Type:	None fitted

Front towing hitch

Type:	Clevis in front weight frame
Vertical height to centre of Clevis:	668 mm
Width of Clevis:	50 mm
Diameter of pin hole:	33 mm

1.10 Steering

Make:	Own make
Model:	None
Type:	Hydrostatic
Method of operation:	
Pump:	
Motor:	Danfoss OSPC-100-0N
Ram:	1 double acting operating both track rods
Filter:	None
Working pressure:	14 MPa

1.11 Brakes

1.11.1 Service brake

Make:	Girling
Model:	None
Type:	Oil-immersed multi plate discs, 5 per side
Method of operation:	Independent on rear wheels
Trailer braking take-off:	None

1.11.2 Parking brake

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

1.12 Wheels

Number: 4

Front: 2 driving/steering

Rear: 2 driving

Wheelbase: 2288 mm

Track width adjustment:

	Minimum, mm	Maximum, mm	Adjustment method
Front *	1407	1908	Reversing wheels and offset lug rims
Rear	1525	2130	Reversing wheels and offset lug rims

* 55° steering angle available only on 1860 mm and larger track settings

1.13 Protective structure (if fitted)

Make: GKN

Model: 600C/601C

Type: Folding/Non Folding

Manufacturer's name and address: GKN Cab Systems
Hadley Castle Works, P.O Box 86
Telford TF1 4RE

Protective device: Frame

Tiltable/Not tiltable: Tiltable/Not Tiltable

OECD approval

Approval number: 4/0529

Date of approval: 11 June 1998

Nos. minor modification certificates, if any: OECD/7755/0199(30/06/1999)

1.14 Seat

1.14.1 Driver's seat

Make/model/Type:	Grammer MSG44/520
Seat and steering wheel reversible:	No
Type of suspension:	Spring
Type of damping:	Hydraulic
Range of adjustment:	
Longitudinal:	160 mm
Vertical:	75 mm
Safety belt:	No

1.14.2 Passenger seat

Make:	None
Type:	

1.15 Lighting

In accordance with EEC directive 78/933/EEC

Unrestricted beam angle of headlight in plan view: 110°

	Height above ground to centre mm	**Size mm**	**Distance from outside edge of lights to median plane of tractor mm**
Headlights	1053	120 dia	217
Sidelights	1645	90 x 75	715
Rear lights	1615	90 x 75	700
Axle reflectors	725	80 dia	500
Rear fender reflectors	1615	43 x 52	725

2. TEST CONDITIONS

2.1 Overall dimensions

	Length	Width		Height at top of	
	mm	Minimum mm	Maximum mm	Protective Structure mm	Exhaust pipe mm
Unballasted	3930	2005	2610	–	2582

2.2 Ground clearance (unballasted tractor) 350 mm

Clearance-limiting part: Drawbar clevis in lowest position

2.3 Tractor mass

	Unballasted		Ballasted	
	Without driver kg	With driver kg	Without driver kg	With driver kg
Front	1372	1383	---	---
Rear	1613	1677	---	---
Total	2985	3060	---	---

2.4 Track specifications Not applicable

2.5 Tyres and track width specification

	Front	Rear
Tyres dimensions ply rating type	 14.9 R24 136A8 Radial	 18.4 R 34 153A8 Radial
Maximum load (tyre manufacturer's), kN	16.7	27.5
Maximum load (tractor manufacturer's), kN	17.8	29.4
Inflation pressure (tyre manufacturer's), kPa	160	160
Dynamic radius index, mm	590	770
Chosen track width (manufacturer's nominal), mm	1700	1725

2.6 Fuel

Type: Diesel oil to Class D, 1.5 to 5.5 cSt.
Density at 15°C: 0.8370 g/cm^3 at 15°C

2.7 Oils and lubrication

2.7.1 Capacity and change interval

	Capacity l	Oil change h	Filter change h
Engine	7.1	250	250
Front axle differential	5.0	1000	None
Front axle hub (each)	1.2	1000	None
Gearbox	40.0	1000	1000
Rear axle Hydraulic system Final drives (rear) Steering	Integral with gearbox		
Brakes	–	Top-up	None

2.7.2 Specifications

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

2.7.3 *Grease*

Grease Points Type	Consistency 2 Lithium Based	As recommended
Number of lubrication points:	19	

3. COMPULSORY TESTS RESULTS

3.1 Main power take-off

Date and location of tests: 27 July 2000
Silsoe Research Institute
Wrest Park, Silsoe, Bedford

Type of dynamometer bench: Eddy Current, Borghi and Saveri

Power	Speed		Fuel consumption			Specific energy
	Engine	P.T.O.	Hourly		specific	
kW	min^{-1} (rev/min)		kg/h	l/h	g/kWh	kWh/l
3.1.1 MAXIMUM POWER – TWO-HOUR TEST						
56.4	2205	707	14.74	17.61	261	3.20
3.1.2 POWER AT RATED ENGINE SPEED						
56.4	2205	707	14.74	17.61	261	3.20
3.1.3 STANDARD POWER TAKE-OFF SPEED [540±10 min^{-1} (rev/min)]						
47.6	1684	540	11.59	13.84	243	3.44
3.1.4 PART LOADS 3.1.4.1 the torque corresponding to maximum power at rated engine speed						
56.4	2205	707	14.74	17.61	261	3.20
3.1.4.2 85% of torque obtained in 3.1.4.1						
48.9	2250	722	12.88	15.39	263	3.18
3.1.4.3 75% of torque defined in 3.1.4.2						
37.2	2283	732	10.34	12.35	278	3.02
3.1.4.4 50% of torque defined in 3.1.4.2						
25.0	2302	738	8.14	9.72	326	2.57
3.1.4.5 25% of torque defined in 3.1.4.2						
12.7	2321	745	5.87	7.02	463	1.81
3.1.4.6 unloaded						
0	2339	750	3.79	4.52	-	-
3.1.5 PART LOADS AT STANDARD POWER TAKE-OFF SPEED [540±10 min^{-1} (rev/min)] 3.1.5.1 the torque corresponding to maximum power						
47.6	1684	540	11.59	13.84	243	3.44
3.1.5.2 85% of torque obtained in 3.1.5.1						
42.4	1762	565	10.31	12.32	243	3.44
3.1.5.3 75% of torque obtained in 3.1.5.2						
32.7	1811	581	8.10	9.68	248	3.38
3.1.5.4 50% of torque obtained in 3.1.5.2						
22.2	1844	591	6.19	7.39	279	3.00
3.1.5.5 25% of torque obtained in 3.1.5.2						
11.3	1873	601	4.28	5.11	380	2.20
3.1.5.6 unloaded						
0	1904	611	2.49	2.98	-	-

No load maximum engine speed: 2339 min^{-1} (rev/min)

Torque (equivalent crankshaft) at maximum power: 244.4 Nm

At rated engine speed: 244.4 Nm

Maximum torque (equivalent crankshaft): 284.2 Nm
(engine speed: 1200 min^{-1} (rev/min)

Mean atmospheric conditions:	
Temperature	24 °C
Pressure	100.8 kPa
Relative humidity	47 %
Maximum temperatures:	
Coolant	88 °C
Engine oil	122 °C
Fuel	59 °C
Engine air intake	30 °C

3.2 Hydraulic power and lifting force

Date of tests: 14 August 2000

3.2.1 *Hydraulic power test*

Sustained pressure with relief valve open: 23.9 MPa

Pump stalled: Not applicable

Pump delivery rate at minimum pressure 21.3 l/min

	Flow rate	Pressure	Power
	l/min	MPa	kW
Flow rate corresponding to a hydraulic pressure equivalent to 90% of the actual relief valve pressure setting and corresponding hydraulic power	13.0	21.5	4.66
Flow rate and hydraulic pressure corresponding to maximum hydraulic power	18.4	19.5	5.98

Tapping point used for test: Auxiliary service connection

Temperature of hydraulic fluid, if different from 65±5°C Not applicable

Opening pressure of the unloading valve: Not applicable

Closing pressure of the unloading valve: Not applicable

3.2.2 Power lift test – (To ISO 730-1:1994)

Linkage settings for test – see Table 2.1 and Figures 2.1 and 2.2.

	At the hitch point	on the frame
Height of lower hitch points above ground in down position	195 mm	195 mm
Vertical movement	655 mm	800 mm
Maximum corrected force exerted through full range	21.4 kN	18.1 kN
Corresponding pressure of hydraulic fluid	21.5 MPa	21.5 MPa
Moment about rear-wheel axis	20.8 kNm	28.6 kNm
Maximum tilt angle of mast from vertical	--	10 degrees

Lifting heights relative to the horizontal plane including the lower link pivot points											
mm	-428	-363	-300	-200	-100	0	100	200	250	292	372
Lifting forces (the values of force measured shall be corrected to correspond to a hydraulic pressure equivalent to 90% of the actual relief valve pressure setting of the hydraulic lift system):											
at the hitch points kN	--	21.4	22.3	23.8	24.7	25.6	25.7	26.1	26.2	26.3	--
Corresponding pressure: 21.5 MPa											
at the frame kN	18.8	19.7	20.0	20.3	20.4	20.4	20.0	19.4	19.2	18.9	18.1
Corresponding pressure: 21.5 MPa											

3.2.2.1 Additional Power lift test – (To manufacturers lift rod setting of 678 mm)

Linkage settings for test – see Table 2.1 and Figures 2.1 and 2.2.

	At the hitch point	on the frame
Height of lower hitch points above ground in down position	325 mm	325 mm
Vertical movement	613 mm	807 mm
Maximum corrected force exerted through full range	24.5 kN	18.7 kN
Corresponding pressure of hydraulic fluid	21.5 MPa	21.5 MPa
Moment about rear-wheel axis	23.8 kNm	29.6 kNm
Maximum tilt angle of mast from vertical	--	14 degrees

Lifting heights relative to the horizontal plane including the lower link pivot points											
mm	-275	-233	-200	-100	0	100	200	300	380	442	532
Lifting forces (the values of force measured shall be corrected to correspond to a hydraulic pressure equivalent to 90% of the actual relief valve pressure setting of the hydraulic lift system):											
at the hitch points kN	--	24.5	25.4	26.5	26.9	27.4	27.4	27.5	27.3	--	--
Corresponding pressure: 21.5 MPa											
at the frame kN	20.9	21.1	21.2	21.5	21.2	21.0	20.6	19.8	19.4	19.0	18.7
Corresponding pressure: 21.5 MPa											

3.2.2.2 Additional Power lift test – (To manufacturers lift rod setting of 633 mm)

Linkage settings for test – see Table 2.1 and Figures 2.1 and 2.2.

	At the hitch point	on the frame
Height of lower hitch points above ground in down position	430 mm	430 mm
Vertical movement	568 mm	736 mm
Maximum corrected force exerted through full range	27.0 kN	18.7 kN
Corresponding pressure of hydraulic fluid	21.5 MPa	21.5 MPa
Moment about rear-wheel axis	26.3 kNm	29.6 kNm
Maximum tilt angle of mast from vertical	--	18 degrees

Lifting heights relative to the horizontal plane including the lower link pivot points											
mm	-149	-128	-64	0	50	150	250	350	440	500	587
Lifting forces (the values of force measured shall be corrected to correspond to a hydraulic pressure equivalent to 90% of the actual relief valve pressure setting of the hydraulic lift system):											
at the hitch points kN	--	27.0	27.7	28.2	28.2	28.4	28.4	28.5	28.6	--	--
Corresponding pressure: 21.5 MPa											
at the frame kN	22.8	22.6	22.5	22.5	22.2	21.8	21.1	20.4	19.6	19.1	18.7
Corresponding pressure: 21.5 MPa											

3.3 Drawbar power test (unballasted tractor)

Massey Ferguson 290 (4WD)

Date and Location of tests: 1 August 2000
Silsoe Research Institute
Wrest Park
Silsoe
Bedford MK45 4HS

Type of track: Concrete

	Height of drawbar above ground	Tyre inflation pressure	
		Front	Rear
	mm	kPa	kPa
Unballasted	400 mm	89	83

Gear and Range	Power	Drawbar Pull	Speed	Engine Speed	Slip of wheels or track	Specific fuel cons	Specific Energy	Temperature			Atmospheric conditions		
								Fuel	Coolant	Engine oil	Temp	Relative humidity	Pressure
	kW	kN	km/h	min^{-1}	%	g/kWh	kWh/l	°C	°C	°C	°C	%	kPa
3.3.1 MAXIMUM POWER IN TESTED GEARS													
1L	24.8	32.2	2.77	2291	14.9	372	2.25	52	82	112	22	54	101.1
2L	35.1	31.0	4.08	2266	13.6	332	2.52	47	82	113	24	48	101.0
3L	47.0	30.7	5.51	2220	12.7	318	2.63	50	83	114	24	46	101.0
4L	48.8	22.3	7.87	2203	6.5	304	2.75	51	86	113	23	55	101.1
1H	48.7	14.3	12.24	2201	4.3	300	2.79	52	85	116	21	60	101.1
3.3.2 FUEL CONSUMPTION													
3.3.2.1 In selected gear, at maximum power at rated speed													
4L	48.8	22.3	7.87	2203	6.5	304	2.75	51	86	113	23	55	101.1
3.3.2.1.1 75% of pull at maximum power at rated speed													
4L	38.0	16.7	8.19	2257	5.0	314	2.67	52	83	115	22	58	101.1
3.3.2.1.2 50% of pull at maximum power at rated speed													
4L	26.1	11.2	8.41	2283	3.4	352	2.38	49	82	114	22	57	101.1
3.3.2.1.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.1.1													
1H	38.0	16.7	8.19	1483	4.9	273	3.06	55	86	107	23	45	101.0
3.3.2.1.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.1.2													
1H	26.2	11.2	8.43	1504	3.4	269	3.12	53	82	104	23	50	101.0
3.3.2.2 In selected gear nearest to 7.5 km/h, at maximum power at rated engine speed													
4L	48.8	22.3	7.87	2203	6.5	304	2.75	51	86	113	23	55	101.1
3.3.2.2.1 75% of pull at maximum power at rated speed													
4L	38.0	16.7	8.19	2257	5.0	314	2.67	52	83	115	22	58	101.1
3.3.2.2.2 50% of pull at maximum power at rated speed													
4L	26.1	11.2	8.41	2283	3.4	352	2.38	49	82	114	22	57	101.1
3.3.2.2.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.2.1													
1H	38.0	16.7	8.19	1483	4.9	273	3.06	55	86	107	23	45	101.0
3.3.2.2.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.2.2													
1H	26.2	11.2	8.43	1504	3.4	269	3.12	53	82	104	23	50	101.0

Drawbar power test (unballasted tractor)

Massey Ferguson 290 (4WD with front axle disengaged)

Date and Location of tests: 1 August 2000
Silsoe Research Institute
Wrest Park
Silsoe
Bedford MK45 4HS

Type of track: Concrete

	Height of drawbar above ground	Tyre inflation pressure	
		Front	Rear
	mm	kPa	kPa
Unballasted	600 mm	89	83

Gear and Range	Power	Drawbar Pull	Speed	Engine Speed	Slip of wheels or track	Specific fuel cons	Specific energy	Temperature			Atmospheric conditions		
								Fuel	Coolant	Engine oil	Temp	Relative humidity	Pressure
	kW	kN	km/h	min^{-1}	%	g/kWh	kWh/l	°C	°C	°C	°C	%	kPa
3.3.1 MAXIMUM POWER IN TESTED GEARS													
1L	16.4	21.7	2.72	2307	15.0	459	1.83	52	82	116	24	44	101.0
2L	23.9	21.7	3.97	2292	15.0	378	2.22	47	82	113	24	44	101.0
3L	32.4	21.2	5.49	2272	13.5	343	2.44	50	82	112	24	44	101.0
4L	43.3	20.3	7.65	2243	9.0	315	2.66	54	83	115	24	44	101.0
1H	48.2	14.7	11.85	2203	5.7	307	2.73	55	86	113	24	45	101.0
3.3.2 FUEL CONSUMPTION													
3.3.2.1 In selected gear, at maximum power at rated speed													
1H	48.2	14.7	11.85	2203	5.7	307	2.73	55	86	113	24	45	101.0
3.3.2.1.1 75% of pull at maximum power at rated speed													
1H	37.7	11.0	12.34	2265	4.5	315	2.65	55	85	114	24	45	101.0
3.3.2.1.2 50% of pull at maximum power at rated speed													
1H	25.7	7.3	12.64	2292	3.3	359	2.33	55	85	114	24	44	101.0
3.3.2.1.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.1.1													
2H	37.7	11.0	12.34	1544	4.5	286	2.92	55	86	109	25	43	100.9
3.3.2.1.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.1.2													
2H	25.6	7.3	12.62	1560	3.2	295	2.84	54	82	107	25	41	100.9
3.3.2.2 In selected gear nearest to 7.5 km/h, at maximum power at rated engine speed													
*													
3.3.2.2.1 75% of pull at maximum power at rated speed													
3.3.2.2.2 50% of pull at maximum power at rated speed													
3.3.2.2.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.2.1													
3.3.2.2.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.2.2													

*Gear nearest 7.5 km/h is a slip gear
Maximum power was not possible in 2H because of the speed of tractor and limitations of test equipment

4. OPTIONAL TESTS RESULTS

4.1 Turning area and turning circle

Wheel equipment if several sets of tyres are tested.

	With brakes		Without brakes	
	Right-hand	Left-hand	Right-hand	Left-hand
	m	m	m	m
Radius of turning area	8.325	8.375	9.466	9.535
Radius of turning circle	7.945	7.995	9.086	9.155

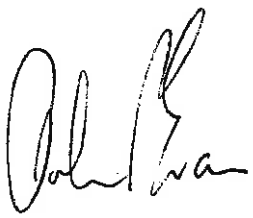
4.2 Location of centre of gravity

-Height above ground: 924 mm
-Distance from the vertical plane containing the axis of the rear-wheels: 1037 mm
-Distance from the median longitudinal plane of the tractor: 18 mm

5. REPAIRS AND ADJUSTMENTS DURING TESTS: None

6. REMARKS: None

Test carried out by: S J Devonshire

Signed: 

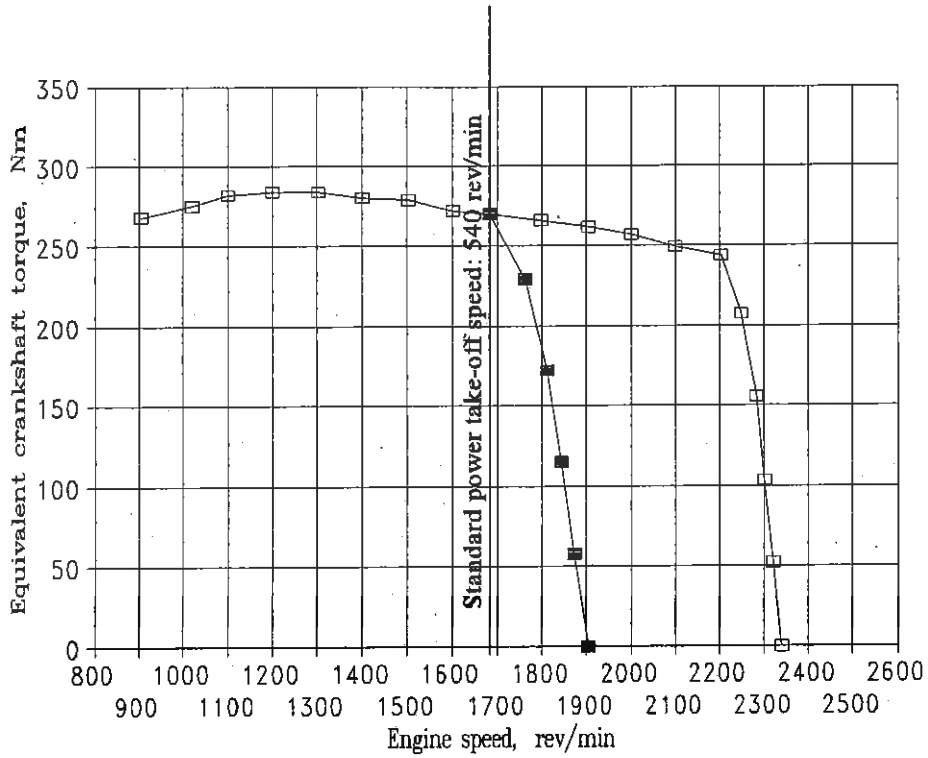
Officer in charge

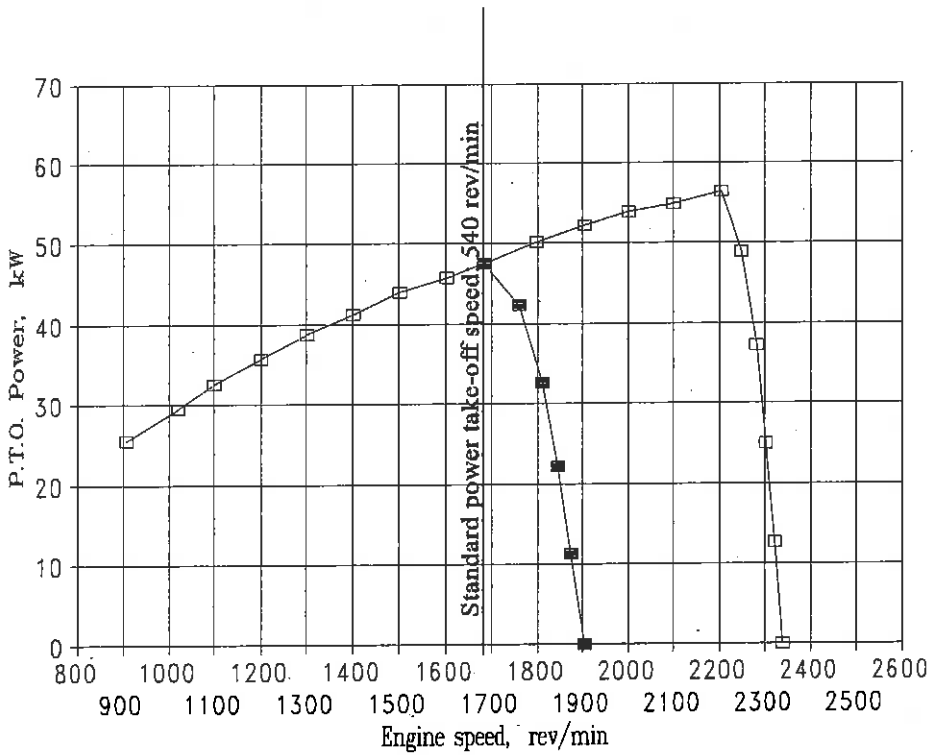
J P Evans
Senior Test Engineer
Test Engineering group

Date: 5/9/00

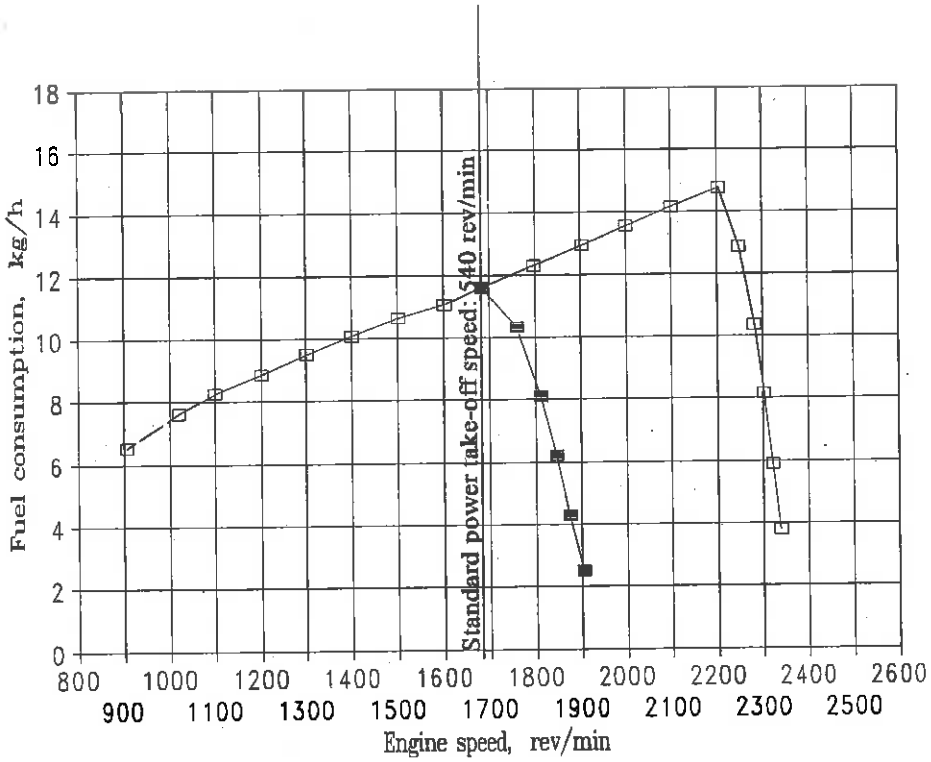
7. ANNEX 1 MAIN POWER TAKE-OFF CURVES

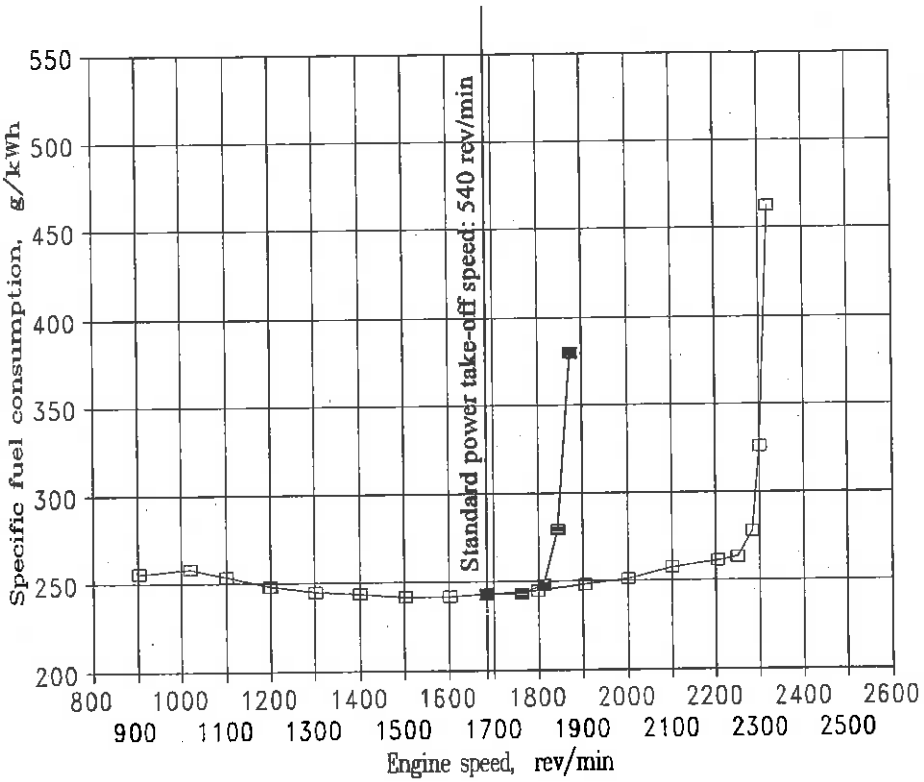
Massey Ferguson 290 Four-Wheel Drive





Massey Ferguson 290 Four-Wheel Drive





Massey Ferguson 290 Four-Wheel Drive

