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SILSOE RESEARCH INSTITUTE
Wrest Park, Silsoe,
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Report No: OECD/7588/0198
OECD Approval No: 2/1827
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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

New Holland 618615 (TS 90) Four-Wheel Drive Tractor with 16-speed Manual Transmission (30 km/h)



Manufactured by:

New Holland UK Ltd
Basildon
Essex
United Kingdom

Submitted for test by: The manufacturer

Report No: 803

Date: April 1999

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OECD/7588/0198

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Tractor manufacturer's name and address:	New Holland UK Ltd Basildon, Essex, United Kingdom
Location of tractor assembly:	Basildon, Essex
Submitted for test by:	The manufacturer
Selected for test by:	The manufacturer
Place of running in:	Basildon, Essex
Duration of running in:	46 hours
Location of test:	Silsoe Research Institute Wrest Park, Silsoe, United Kingdom

1. SPECIFICATION OF TRACTOR

1.1 Identification

Make:	New Holland
Model:	618615 (TS 90) with 16-speed Manual Transmission
Type:	Four wheel drive unit construction
Serial No:	086306B
1st Serial No:	082846B

1.2 Engine

Make:	New Holland
Model:	450/NE
Type:	4 stroke direct injection naturally aspirated diesel
Serial No:	NE762682

1.2.1 Cylinders

Number/disposition:	4 vertical In-line
Bore/stroke:	111.8 mm/127.0 mm
Capacity:	4987 cm^3
Compression ratio:	17.5 :1
Arrangement of valves:	Overhead
Cylinder liners:	None, monobloc construction

1.2.2 Supercharging

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

1.2.3 Fuel system

Fuel feed system:	Stanadyne electric
Make, type and model of fuel filter:	Plastic strainer in tank and one disposable canister filter with sediment bowl and water seperator plus secondary disposable canister filter between tank and injection pump
Capacity of fuel tank:	130 litres
Make, type and model of injection pump:	Lucas/CAV Rotary, DP 203, DSA 1259
Serial No:	30275 GRG
Manufacturer's production setting of injection pump:	
Flow rate:	68.0+/-2.7 mm^3 per stroke at 2170 rev/min speed and full load
Timing:	Delivery starts 3° before T.D.C (dynamic)
Make, type and model of injectors:	Lucas/CAV, multihole, LP054B
Injection pressure:	292-300 bar

1.2.4 Governor

Make:	Lucas
Model:	None
Type:	Mechanical incorporated in fuel injection pump
Governed range of engine speed:	700 rev/min to 2345 rev/min
Rated engine speed:	2170 rev/min

1.2.5 Air cleaner

Pre-cleaner	Optional
Main cleaner	
Make:	Locker Air Maze or Donaldson
Type:	3 stage dry paper element with replaceable cartridge
Model:	None
Location:	Under engine bonnet above engine
Location of air intake:	By side of engine outside bonnet above battery housing
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:	Metal mesh strainer in sump on suction line and full flow disposable canister on pressure line to engine
Number:	1

1.2.7 Cooling system

Type of coolant:	Water or water and antifreeze (50% solution)
Type of pump:	Belt driven centrifugal impeller
Specification of fan:	Thermal controlled with viscous clutch
Number of fan blades:	4
Fan diameter:	480 mm
Coolant capacity:	14.0 litres
Type of temperature control:	Thermostat with full flow bypass
System pressure:	90 kPa

1.2.8 Starting system

Make:	Bosch JF
Model:	JF
Type:	Electrical, positive engagement, solenoid operated
Starter motor power rating:	3.1/3.6 kW
Cold starting aid:	CAV Thermostart - Lucas 357-33 or Iskra 11-720-375
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:	MME A 127
Type:	Belt driven
Power:	55/100 amps at 6000 rev/min
Batteries:	1 x 800 cca lead acid, mounted on right-hand side under footplate (2 x 800 option)
Rating:	107 AH at 20 hours rating

1.2.10 Exhaust system

Make:	Nelson Burgess
Model:	None
Type:	Underhood horizontal silencer with vertical stack pipe
Location:	Left-hand side of engine, under bonnet
Height of outlet above ground:	2848 mm

1.3 Transmission

1.3.1 Main clutch (Travel alone)

Make:	AP
Model:	None
Type:	Dry single plate
Number of plates:	1
Diameter of plates:	330 mm
Method of operation:	Mechanical pedal rod operation

1.3.2 Gear box

Make:	New Holland (Econoshift™ with Dual Command)
Model:	16 x 4 Non- Synchromesh
Type:	Mechanical non synchromesh operation 4 forward speeds, 1 reverse 2 ranges mechanical, 2 ranges electrcal Selected in combination with two centrally mounted levers and electric switch on instrument panel
Number of gears:	16 forward, 4 reverse (30 km/h)
Available options:	8 x 2 Econoshift 12 x 12 with 24 x 24 Synchroshift™

1.3.3 Rear axle final drives

Make:	New Holland
Model:	None
Type:	Crown wheel and pinion with differential and inboard epicyclic reduction gear final drive
Differential lock:	
Type:	Mechanical
Method of engagement:	Foot operated "button" via rod on right hand side of floor
Method of disengagement:	Self disengaging / spring return

1.3.4 Front axle and final drives

Make:	New Holland
Model:	None
Type:	Crown wheel and pinion with differential and outboard epicyclic reduction gear final drives
Drive engagement:	
Type:	Multiplate clutch - located within the gearbox
Method of operation:	Electro-hydraulic actuation in response to signal from switch on the LH side of the instrument panel
Differential lock:	
Type:	Limited slip
Method of engagement:	Automatic
Method of disengagement:	Automatic

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:* 2170 rev/min km/h
Forward			
1	1LI	279.25	2.26
2	2LI	223.75	2.81
3	1Lh	217.19	2.90
4	2Lh	174.03	3.62
5	3LI	127.48	4.93
6	3Lh	99.15	6.35
7	4LI	93.66	6.73
8	1HI	78.16	8.07
9	4Lh	72.85	8.65
10	2HI	62.62	10.07
11	1Hh	60.79	10.37
12	2Hh	48.71	12.94
13	3HI	35.68	17.67
14	3Hh	27.75	22.72
15	4HI	26.21	24.04
16	4Hh	20.39	30.91
Reverse			
1	1LI	194.26	3.25
2	1Lh	151.09	4.17
3	2HI	54.37	11.59
4	2Hh	42.29	14.90

L = Low range H = High range I = low h = high

(*) Calculated with a tyre dynamic radius index of 770mm (ISO 421/1-1992)

Number of revolutions of front wheels for one revolution of rear wheels: 1.366

1.4 Power take-off

1.4.1 Main power take-off

Type:	Independent
Method of engagement:	Mechanical lever operates multi-plate clutch
Number of shafts:	1, 6 spline to ISO 500/1991
Method of changing power take-off speeds:	None
Clutch	
Make:	New Holland
Model:	None
Type:	Multiplate, wet
Number of plates:	5
Diameter of plates:	148.6 mm

1.4.1.1 Power take-off proportional to engine speed

Single speed power take-off	
(Fitted for test)	*540 rev/min*
Location:	Rear of tractor
Diameter of power take-off shaft:	34.9 mm
Number of splines:	6
Height above ground:	723 mm
Distance from the median plane of the tractor:	Central
Distance behind rear wheel axis:	457 mm
Pto speed at rated engine speed:	616 rev/min at 2170
Engine speed at standard power take-off speed:	1902 rev/min
Ratio of rotation speeds:	3.522:1
Power restriction and maximum torque:	None
Direction of rotation (viewed from behind tractor):	Clockwise

1.4.2 Optional PTO system available (not fitted for test)

Two speed power take-off selected by exchanging shafts

540 rev/min

Location:	Rear of tractor
Diameter of power take-off shaft:	34.9 mm
Number of splines:	6
Height above ground:	723 mm
Distance from the median plane of the tractor:	Central
Distance behind rear wheel axis:	457 mm
PTO speed at rated engine speed:	620 rev/min at 2170
Engine speed at standard power take-off speed:	1890 rev/min
Ratio of rotation speeds:	3.50:1
Power restriction and maximum torque:	None
Direction of rotation (viewed from behind tractor):	Clockwise

1000 rev/min

Location:	Rear of tractor
Diameter of power take-off shaft:	34.9 mm
Number of splines:	21
Height above ground:	723 mm
Distance from the median place of the tractor:	Central
Distance behind rear wheel axis:	457 mm
PTO speed at rated engine speed:	1059 rev/min at 2170
Engine speed at standard power take-off speed:	2049 rev/min
Ratio of rotation speeds:	2.049:1
Power restriction and maximum torque:	None
Direction of rotation (viewed from behind tractor):	Clockwise

1.5 Hydraulic power lift - standard

Pump - standard

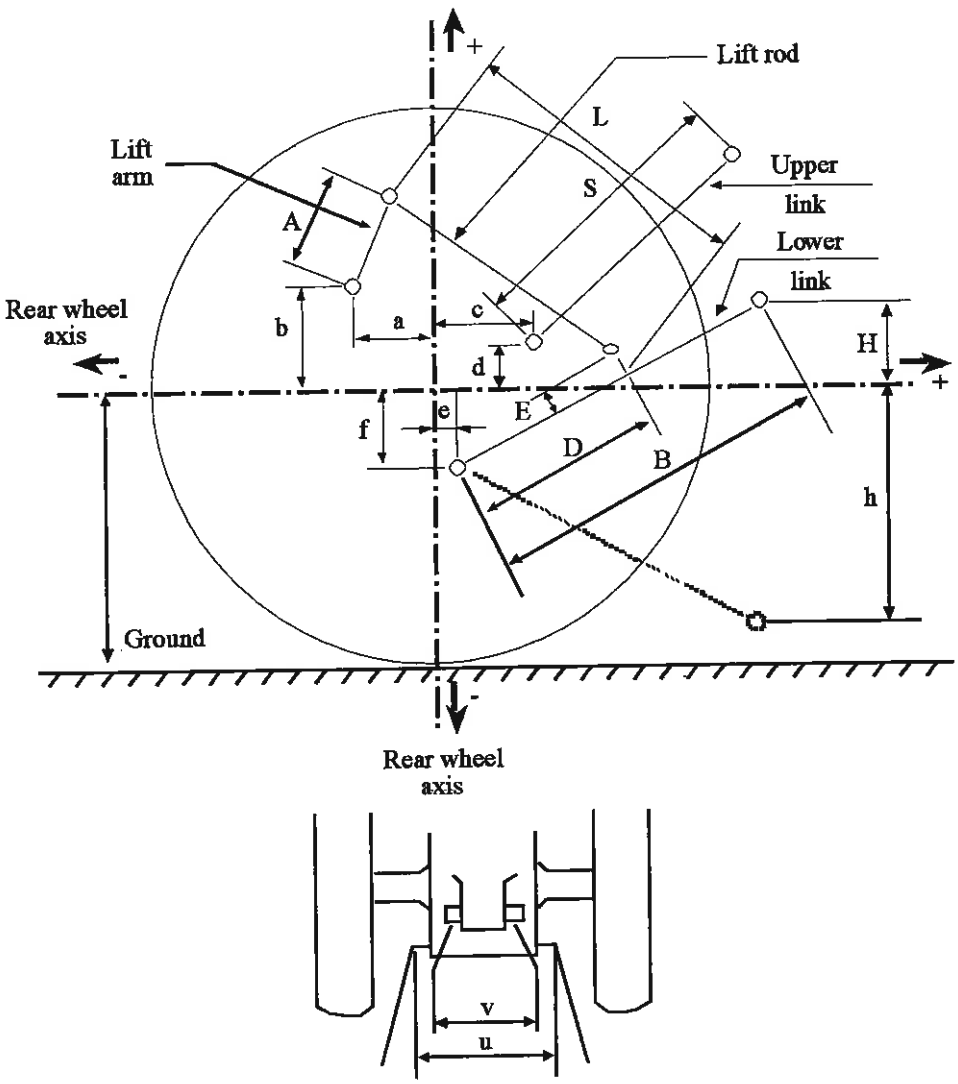
Make:	Sauer Sundstrand
Model:	None
Type:	Gear driven fixed displacement closed centre load sensing system
Type and number of cylinders:	1 located inside transmission housing plus the option of 1 or 2 single acting, externally mounted assistor rams (None fitted for test)
Type of linkage lock for transport:	Hydraulic
Relief valve pressure setting:	17.6 - 18.3 MPa
Opening pressure of cylinder safety valve:	19.7 MPa
Lift pump type:	Gear driven fixed displacement closed centre load sensing system
Transmission between pump and engine:	Gear driven from pto shaft, independent of main and pto clutches
Type and number of filters:	1 replaceable paper element filter canister
Site of oil reservoir:	Rear axle housing
Type, number and position of tapping points:	1 on front face of hydraulic top cover if no remote valves are fitted, (3 remote valves fitted to test tractor)
Maximum volume of oil available to external cylinders:	18.2 litres

1.5.1 Auxilliary hydraulic system

Make:	Sauer Sundstrand
Model:	None
Type:	Gear
Relief valve pressure setting:	17.6 - 18.3 Mpa
Opening pressure of cylinder safety valve:	None
Lift pump type:	None
Transmission between pump and engine:	Direct drive from camshaft gear
Type and number of filters:	1, replaceable paper element canister
Site of oil reservoir:	Rear axle housing

1.6 Three point linkage

Category:	2 to ISO standard 730-1:1994
Category adaptor:	None
Controls:	Draught or position control sensed through top link



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)
(B2.3 ISO mast height from 730/3-1982 CAT 2)

			Dimensions or range	Settings used test		
				Main test	B2.2	B2.3
ength of lift arms		(A)	254	254	254	254
ength of lower links		(B)	915	915	915	915
istance of lift arm pivot point from rear wheel	horizontally:	(a)	102	102	102	102
entre line:	vertically:	(b)	341	341	341	341
orizontal distance between the two lower link oints:		(u)	527	527	527	527
orizontal distance between the two lift arm end oints:		(v)	610	610	610	610
ength of upper link:		(S)	610 - 830	715	710	685
istance of upper link pivot point from rear wheel	horizontally:	(c)	325	325	325	325
entre line:	vertically:	(d)	149 - 205	149	149	205
istance of lower link pivot point from rear wheel	horizontally:	(e)	102	102	102	102
entre line:	vertically:	(f)	229	229	229	229
istance of lower link points to lift rod pivot	horizontally:	(D)	412 - 520	466	466	520
oints on lower link centre line:	vertically:	(E)	on centre line	on centre line	on centre line	on centre line
ength of lift rods:		(L)	743 - 879	810	795	743
SO mast height				610	610	510
leight of lower hitch points (*) relative to the rear heel centre line, situated 770 mm above the round level:						
- In low position		(h)	308 to 794	577	544	288
- in high position		(H)	-77 to 224	64	95	223
leight of lower hitch points when locked in ransport position (*)		Any height within lift range (hydraulic transport lock)				

* Assuming r = tyre dynamic radius index of 770 mm ISO 4251/1-1984
+ or 740 mm for supplementary test (B2.2)

1.7 Swinging drawbar
(Stand alone type)

Type:	Clevis		
Height above ground, unballasted maximum:	530 mm		
minimum:	415 mm		
Type of adjustment:	Inverting drawbar		
Distance of hitch point from rear-wheel axis, horizontally:	690 mm	805 mm	855 mm
Distance of hitch point from power take-off shaft ends:			
Vertically:	193mm	308mm	
Horizontally:	233 mm	348 mm	398 mm
Lateral adjustment from the (centre of clevis):			
Right-hand	210 mm	250 mm	260 mm
Left-hand	210 mm	250 mm	260 mm
Distance of pivot point from rear axles horizontally:	13 mm behind rear axle		
Width of clevis:	70 mm		
Diameter of pin hole:	29/33 mm		
Maximum vertical permissible load - Clevis uppermost:	1630 kg	1065 kg	910 kg
Clevis underneath:	1135 kg	1065 kg	910 kg

1.8 Trailer Hitch

Type: None fitted

1.9 Holed drawbar

Type: None fitted

Front Towing Hitch

Type None fitted

1.10 Steering

Make:	New Holland
Model:	None
Type:	Hydrostatic
Method of operation:	
Pump:	Sauer Sundstrand
Motor:	Danfoss OSPC-150-OR/160-OR
Ram:	2 double acting balanced cylinders, one operating on each steering arm
Filter:	Integral with hydraulic power lift system
Working pressure:	170 - 175 bar

1.11 Brakes

1.11.1 Service brake

Make:	New Holland
Model:	None
Type:	Oil-immersed multi plate discs
Method of operation:	Hydraulic, independent on rear wheels
Trailer braking take-off:	None

1.11.2 Parking brake

Make:	New Holland
Type:	Mechanical ratchet mounted on service brakes pedal, rod operation
Method of operation:	Hand lever to pedal ratchet

1.12 Wheels

Number: 4

Front: 2 steering and driving

Rear: 2 driving

Wheelbase: 2362 mm

Track width adjustment:

	Minimum mm	Maximum mm	Adjustment method
Front	1404	2115	Reversing wheels and offset lug rims
Rear	1525	2028	Reversing wheels and offset lug rims

1.13 Protective structure

Make:	New Holland
Model:	New Holland 618/A or B
Type:	Rear mounted - 2 post folding ROPS
Manufacturer's name and address:	New Holland UK Ltd Basildon
Protective device:	
Rollguard:	ROPS
Tiltable/Not tiltable:	Tiltable
OECD approval	
Approval number:	CSD-1414/1-36
Date of approval:	7 April 1997
Nos. of minor modification certificates, if any:	

1.14 Seat

1.14.1 Drivers seat

Make/Model/Type:	Grammer MSG 44/520
Seat and steering wheel reversible:	No
Type of suspension:	Low frequency, parallelogram suspension spring
Type of damping:	Double acting, hydraulic
Range of adjustment:	
Longitudinal:	± 75 mm
Vertical:	± 30 mm
Safety belt:	Yes

1.15 Lighting

In accordance with EEC Directive 78/933/EEC

Unrestricted beam angle of headlight in plan view: 140°

	Height above ground to centre mm	Size mm	Distance from outside edge to median plane of tractor mm
Headlight	1325	150 x 90	210
Sidelights	----	----	----
Rear lights	1688	125x 80	685
Rear axle reflectors	----	----	----
Rear fender reflectors	1627	125 x 45	855

2. TEST CONDITIONS

2.1 Overall dimensions

Length mm	Width		Height at top of	
	Minimum mm	Maximum mm	Protective structure mm	Exhaust pipe mm
4059	2092	2527	2925	2848

2.2 Ground clearance (unballasted tractor) 375 mm

Clearance-limiting part: Drawbar clevis in lowest position

2.3 Tractor mass (with ROPS)

	Unballasted		Ballasted	
	Without driver kg	With driver kg	Without driver kg	With driver kg
Front	1471	1482	--	--
Rear	2211	2275	--	--
Total	3682	3757	--	--

2.5 Tyres and track width specification

	Front	Rear
Tyres dimensions ply rating type	14.9 R 24 126A8 Radial	18.4 R 34 144A8 Radial
Maximum load (tyre manufacturer's), kg 30 km/h	1820	2995
Maximum load (tractor manufacturer's), kg	1820	2995
Inflation pressure (tyre manufacturer's), Bar	1.6	1.6
Dynamic radius index, mm	590	770
Chosen track width (manufacturer's nominal), mm	1710	1625

2.6 Fuel

Type: Diesel oil to Class D, 1.5 to 5.5 cSt

Density at 15° C: 0.8370 g/cm^3

2.7 Oils and lubricants

2.7.1 Capacity and change interval

	Capacity litre	Oil change hours	Filter change hours
Engine	11.4	300	300
Front axle differential	6.2	1200	None
Final drive (front) - per side	3.0	1200	None
Rear axle	60.6	1200	300
Gearbox Hydraulic system Final drives (rear) Steering	Integral with rear axle		
Brakes	---	None	None

2.7.2 Specifications

	NH spec	Recommended	Used during test
Engine oil			
Type:	82922933	SAE 10W/30	As recommended
Viscosity:		11.5 cSt at 100°C	
Classification:		API CE/SF	
Transmission oils			
Type:	85700812	Not specified	As recommended
Viscosity:		9 cSt at 100°C	
Classification:		API GL-4	
Rear final drives			
Type:	85700812	Not specified	As recommended
Viscosity:		9 cSt at 100°C	
Classification:		API GL-4	
Hydraulic fluid			
Type:	85700812	Not specified	As recommended
Viscosity:		9 cSt at 100°C	
Classification:		API GL-4	
Steering oil			
Type:	85700812	Not specified	As recommended
Viscosity:		9 cSt at 100°C	
Classification:		API GL-4	
Front differential and final drives			
Type:	85700812	Not specified	As recommended
Viscosity:		9 cSt at 100°C	
Classification:		API GL-4	
Hydraulic brakes			
Type:	82865344	Not specified	As recommended
Viscosity:		6 cSt at 100°C	
Classification:		No equivalent	

2.7.3 Grease

Type:	82948889	Lithium based	As recommended
Classification:		NLG1 2	

Number of lubrication points: 12

3. COMPULSORY TESTS RESULTS

3.1 Main power take-off (540)

Date and location of tests: 17 December 1998
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	
3.1.1 MAXIMUM POWER - TWO HOUR TEST						
59.0	2053	583	14.95	17.86	254	3.30
3.1.2 POWER AT RATED ENGINE SPEED						
58.2	2168	616	14.79	17.67	254	3.29
3.1.3 STANDARD POWER TAKE-OFF SPEED (540 ± 10 rev/min)						
57.3	1903	540	14.36	17.16	250	3.34
3.1.4 PART LOADS 3.1.4.1 The torque corresponding to maximum power at rated engine speed						
58.2	2168	616	14.79	17.67	254	3.29
3.1.4.2 85% of the torque defined in 3.1.4.1						
51.4	2247	638	13.26	15.84	258	3.24
3.1.4.3 75% of the torque defined in 3.1.4.2						
38.6	2256	641	10.74	12.83	278	3.01
3.1.4.4 50% of the torque defined in 3.1.4.2						
25.9	2273	645	8.42	10.06	325	2.58
3.1.4.5 25% of the torque defined in 3.1.4.2						
13.0	2291	650	6.21	7.42	476	1.76
3.1.4.6 Unloaded						
0	2307	655	4.20	5.01	--	--

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	
3.1.5 PART LOADS AT STANDARD POWER TAKE-OFF SPEED (540 ± 10 rev/min)						
3.1.5.1 The torque corresponding to maximum power						
57.3	1903	540	14.36	17.16	250	3.34
3.1.5.2 85% of the torque obtained in 3.1.5.1						
50.8	1968	559	12.51	14.95	247	3.39
3.1.5.3 75% of the torque obtained in 3.1.5.2						
38.7	2001	568	10.05	12.01	260	3.22
3.1.5.4 50% of the torque obtained in 3.1.5.2						
26.1	2027	576	7.75	9.26	297	2.82
3.1.5.5 25% of the torque obtained in 3.1.5.2						
13.2	2052	583	5.50	6.57	416	2.01
3.1.5.6 Unloaded						
0	2079	590	3.43	4.09	--	--

No load, maximum engine speed: 2307 rev/min

Torque (equivalent crankshaft) at maximum power: 274.4 Nm

Torque (equivalent crankshaft) at rated speed: 256.2 Nm

Maximum torque (equivalent crankshaft): 318.1 Nm
(engine speed 1446 rev/min)

Mean atmospheric conditions:

- Temperature 26°C
- Pressure 101.4 kPa
- Relative humidity 32%

Maximum temperatures:

- Coolant 86°C
- Engine oil 106°C
- Fuel 53°C
- Engine air intake 35°C

3.2 Hydraulic power and lifting force

Date of tests: 23 December 1998

3.2.1 Hydraulic power test

Sustained pressure with relief valve open: 18.4 MPa

Pump delivery rate at minimum pressure: 72.2 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	57.3	16.6	15.85
Flow rate and hydraulic pressure corresponding to maximum hydraulic power	59.9	16.2	16.18

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

Sustained pressure with relief valve open: 18.4 MPa

Pump delivery rate at minimum pressure: 39.4 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	29.2	16.6	8.08
Flow rate and hydraulic pressure corresponding to maximum hydraulic power	31.5	16.0	8.40

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

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

	At the hitch point	On the frame
Height of lower hitch points above ground in down position	193 mm	193 mm
Vertical movement	641 mm	868 mm
Maximum corrected force exerted through full range	21.2 kN	15.0 kN
Corresponding pressure of hydraulic fluid	16.6 MPa	16.6 MPa
Moment about rear-wheel axis	21.6 kNm	24.4 kNm
Maximum tilt angle of mast from vertical	--	14 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	-444	-348	-300	-200	-100	0	100	200	250	293	424
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	--	21.2	21.2	22.0	22.9	23.4	23.5	23.6	23.7	23.8	--
Corresponding pressure: 16.6 MPa											
at the frame kN	16.5	17.0	17.4	17.8	17.6	17.6	17.0	16.5	16.2	15.3	15.0
Corresponding pressure: 16.6 MPa											

3.3 Drawbar power test (unballasted tractor), 4 wheel drive

Date and Location of tests: 9 April 1999
Silsoe Research Institute
Wrest Park
Silsoe
Bedford MK45 4HS

Type of track: Concrete

Height of drawbar above ground	Tyre inflation pressure (kPa)	
	Front	Rear
390 mm	103	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
3.3.1 MAXIMUM POWER IN TESTED GEARS													
1LI	23.2	40.4	2.07	2267	14.7	390	2.15	36	79	95	16	62	101.6
2LI	29.5	39.7	2.68	2256	11.2	356	2.35	35	79	93	15	62	101.7
1Lh	30.4	39.3	2.78	2254	10.3	355	2.36	34	79	94	15	63	101.7
2Lh	37.5	38.9	3.47	2237	9.8	334	2.51	35	80	95	15	66	101.7
3LI	49.6	37.8	4.72	2176	7.4	303	2.76	36	80	98	15	65	101.7
3Lh	51.0	31.0	5.93	2050	4.1	292	2.86	41	82	102	14	67	101.7
4LI	53.1	30.4	6.30	2052	3.9	282	2.96	39	81	100	14	66	101.7
1HI	53.8	25.6	7.58	2045	3.2	278	3.01	39	81	100	14	67	101.7
4Lh	52.3	23.1	8.16	2046	2.8	287	2.92	39	81	100	14	67	101.7
2HI	54.1	20.4	9.55	2050	2.4	279	3.00	38	80	100	14	67	101.7
1Hh	52.7	19.3	9.85	2050	2.3	284	2.95	39	81	100	14	66	101.7
2Hh	51.9	15.1	12.36	2053	1.9	288	2.91	39	81	100	14	67	101.7
3.3.2 FUEL CONSUMPTION 3.3.2.1 In selected gear, at maximum power at rated speed													
2HI	52.8	18.8	10.12	2169	2.4	285	2.94	40	81	100	14	66	101.7
3.3.2.1.1 75% of pull at maximum power at rated speed													
2HI	41.3	14.1	10.51	2241	1.8	303	2.76	37	80	99	14	66	101.7
3.3.2.1.2 50% of pull at maximum power at rated speed													
2HI	27.7	9.4	10.66	2263	1.2	356	2.35	36	79	98	14	66	101.7
3.3.2.1.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.1.1													
2HH	41.3	14.1	10.51	1744	1.7	282	2.96	40	81	94	16	60	101.6
3.3.2.1.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.1.2													
2HH	27.7	9.4	10.66	1759	1.3	309	2.71	38	79	92	16	62	101.6
3.3.2.2 In selected gear nearest to 7.5 km/h, at maximum power at rated speed													
1HI	53.2	23.8	8.06	2169	2.8	282	2.97	39	81	99	14	66	101.7
3.3.2.2.1 75% of pull at maximum power at rated speed													
1HI	41.5	17.8	8.39	2241	2.1	293	2.86	38	80	98	14	67	101.7
3.3.2.2.2 50% of pull at maximum power at rated speed													
1HI	28.2	11.9	8.53	2263	1.5	345	2.43	36	79	97	14	67	101.7
3.3.2.2.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.2.1													
2HI	41.5	17.8	8.41	1802	2.2	274	3.05	40	81	95	15	61	101.6
3.3.2.2.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.2.2													
2HI	28.2	11.9	8.51	1812	1.6	301	2.78	40	80	95	16	61	101.6

SUPPLEMENTARY TESTS

3.2 Hydraulic power and lifting force

3.2.2 Power lift test

I. B 2.2 Power lift test - (To ISO 730-1:1994, alternative rear tyre size 13.6 R38)

	At the hitch point	On the frame
Height of lower hitch points above ground in down position	196 mm	196 mm
Vertical movement	639 mm	865 mm
Maximum corrected force exerted through full range	21.3 kN	14.7 kN
Corresponding pressure of hydraulic fluid	16.6 MPa	16.6 MPa
Moment about rear-wheel axis	21.7 kNm	23.9 kNm
Maximum tilt angle of mast from vertical	--	15 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	-408	-315	-250	-150	-50	0	100	200	300	324	457
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	--	21.3	21.5	22.3	23.1	23.5	23.6	23.9	23.9	23.7	--
Corresponding pressure: 16.6 MPa											
at the frame kN	16.9	17.0	17.3	17.7	17.7	17.7	17.2	16.3	15.8	15.6	14.7
Corresponding pressure: 16.6 MPa											

II. B 2.3 Power lift test - (To manufacturers lift rod setting and original tyres)

	At the hitch point	On the frame
Height of lower hitch points above ground in down position	482 mm	482 mm
Vertical movement	511 mm	637 mm
Maximum corrected force exerted through full range	27.8 kN	17.6 kN
Corresponding pressure of hydraulic fluid	16.6 MPa	16.6 MPa
Moment about rear-wheel axis	28.3 kNm	28.6 kNm
Maximum tilt angle of mast from vertical	--	14 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	-68	-59	0	100	200	250	300	400	452	500	569
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	--	28.5	28.4	29.3	29.3	29.1	28.7	28.2	27.8	--	--
Corresponding pressure: 16.6 MPa											
at the frame kN	25.5	25.4	24.9	24.2	23.3	22.5	21.8	20.3	19.7	19.0	17.6
Corresponding pressure: 16.6 MPa											

3.3 Drawbar power test (unballasted tractor), 2 wheel drive

Date and Location of tests: 16 April 1999
Silsoe Research Institute
Wrest Park
Silsoe
Bedford MK45 4HS

Type of track: Concrete

Height of drawbar above ground	Tyre inflation pressure (kPa) Front	Rear
490 mm	103	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
3.3.1 MAXIMUM POWER IN TESTED GEARS													
1LI	18.6	32.4	2.07	2275	14.5	438	1.91	30	78	93	12	43	99.6
2LI	23.7	31.8	2.68	2267	11.1	388	2.16	30	78	94	12	41	99.6
1Lh	24.0	30.9	2.79	2266	9.9	386	2.17	30	79	94	13	41	99.6
2Lh	29.8	30.5	3.52	2256	8.6	354	2.36	29	79	92	14	39	99.6
3LI	40.6	30.4	4.81	2238	7.7	296	2.83	29	79	94	14	35	99.6
3Lh	49.9	29.7	6.05	2177	7.3	305	2.74	29	80	92	14	34	99.6
4LI	52.2	29.1	6.44	2167	6.2	291	2.88	31	80	94	12	37	99.6
1HI	54.0	26.0	7.47	2050	4.1	278	3.01	30	80	94	10	45	99.6
4Lh	52.6	23.4	8.09	2055	3.5	288	2.91	31	80	95	10	45	99.6
2HI	54.7	20.9	9.44	2049	2.9	278	3.01	32	80	98	9	51	99.6
1Hh	52.9	19.5	9.78	2057	2.7	284	2.94	32	80	97	9	49	99.6
2Hh	53.5	15.7	12.28	2059	2.3	277	3.02	32	80	97	9	50	99.6
3.3.2 FUEL CONSUMPTION 3.3.2.1 In selected gear, at maximum power at rated speed													
2HI	54.0	19.4	10.02	2172	2.7	276	3.03	31	80	95	9	47	99.6
3.3.2.1.1 75% of pull at maximum power at rated speed													
2HI	42.2	14.6	10.40	2240	2.1	304	2.75	31	79	94	10	47	99.6
3.3.2.1.2 50% of pull at maximum power at rated speed													
2HI	28.6	9.7	10.56	2262	1.6	352	2.38	30	79	94	10	46	99.6
3.3.2.1.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.1.1													
2Hh	42.2	14.6	10.40	1743	2.2	272	3.07	33	80	93	12	37	99.6
3.3.2.1.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.1.2													
2Hh	28.7	9.7	10.59	1765	1.5	304	2.75	34	79	93	12	37	99.6
3.3.2.2 In selected gear nearest to 7.5 km/h, at maximum power at rated speed													
1HI	53.4	24.1	7.97	2177	3.6	281	2.98	31	80	96	10	45	99.6
3.3.2.2.1 75% of pull at maximum power at rated speed													
1HI	41.9	18.1	8.31	2244	2.6	301	2.79	30	79	96	10	45	99.6
3.3.2.2.2 50% of pull at maximum power at rated speed													
1HI	28.4	12.1	8.45	2265	1.9	343	2.44	30	79	95	10	44	99.6
3.3.2.2.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.2.1													
2HI	42.0	18.2	8.29	1796	2.6	269	3.11	33	80	90	11	39	99.6
3.3.2.2.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.2.2													
2HI	28.5	12.1	8.46	1818	1.9	293	2.85	31	79	90	12	38	99.6

5. REPAIRS AND ADJUSTMENTS DURING TESTS: None

6. REMARKS: None

Test carried out by: S J Devonshire

Signed: Officer in charge of tests

J P Evans

Signed: for the Director

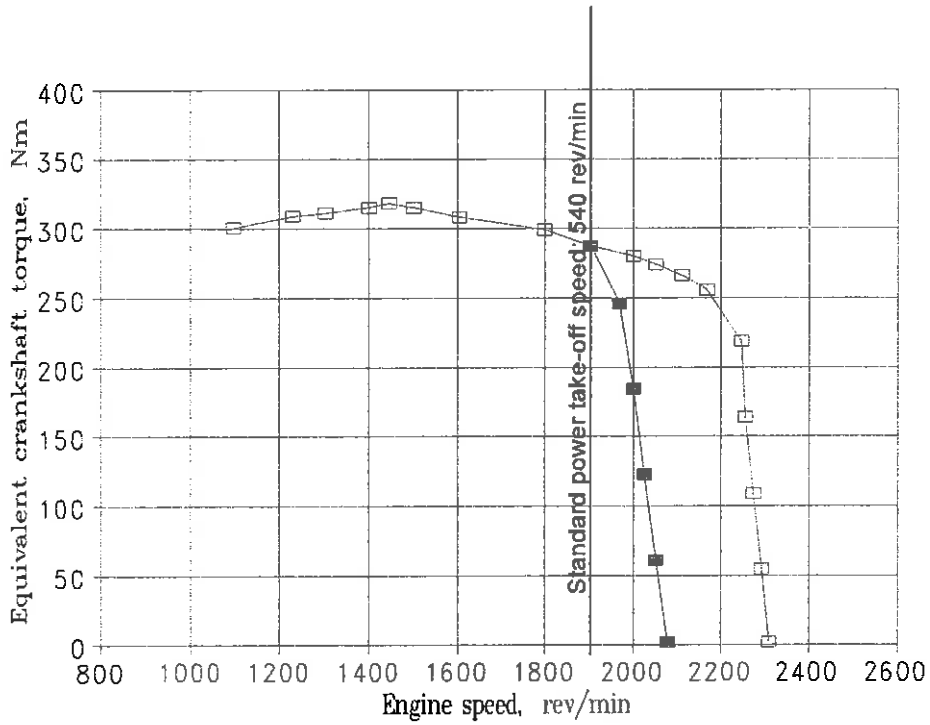
A G Douglass
Interim Manager - Test Engineering Group

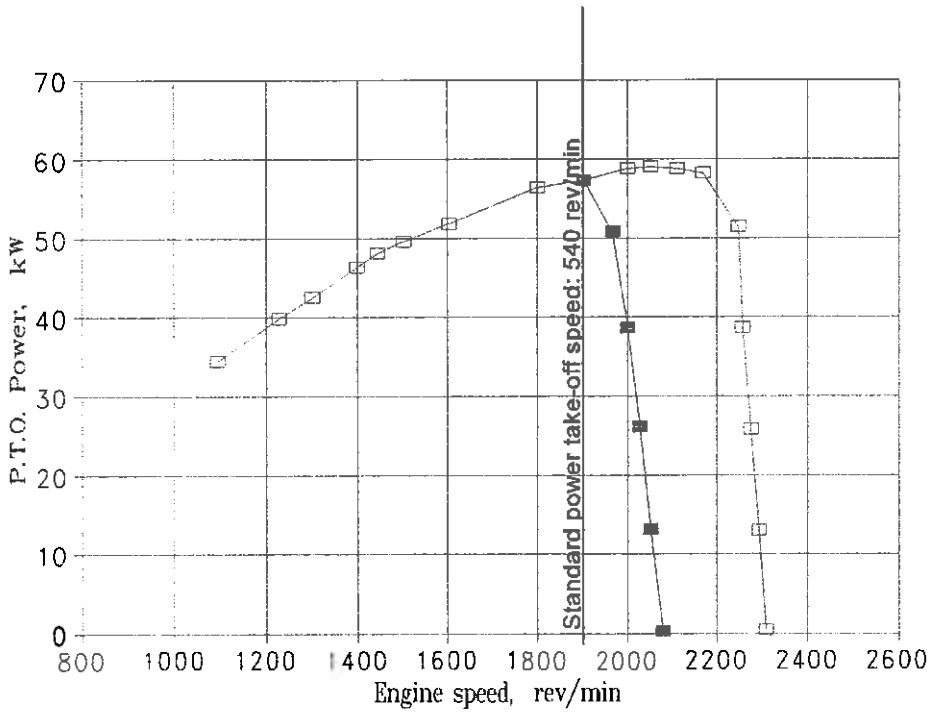
Date: 6/5/99

7. ANNEX 1 MAIN POWER TAKE-OFF CURVES

P.T.O. POWER TEST - NEW HOLLAND TS 90 FOUR-WHEEL DRIVE (540 rev/min)

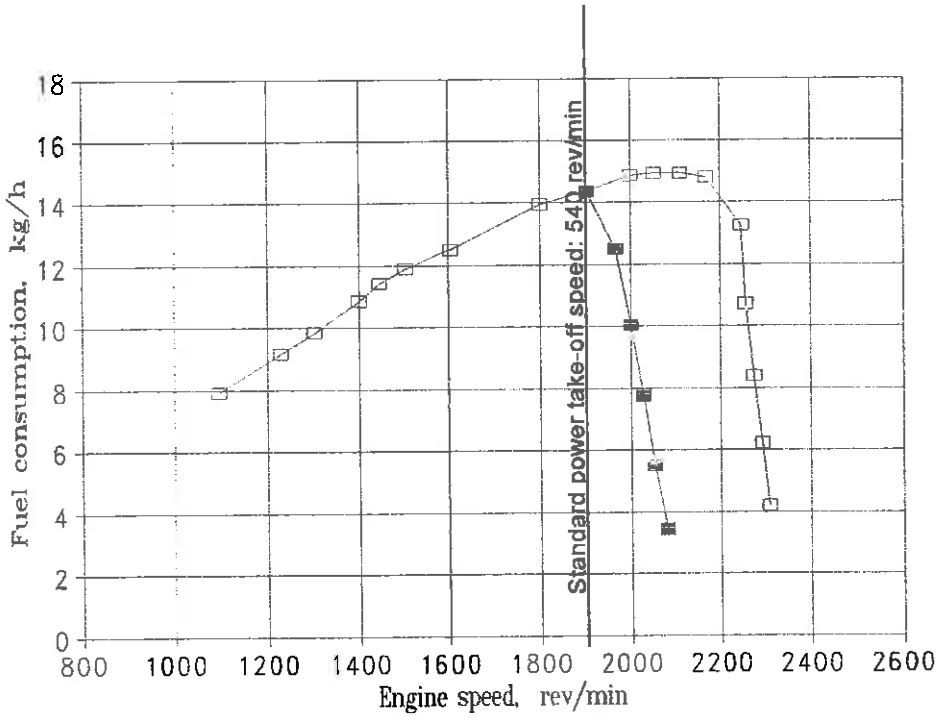
Governor set for maximum power at rated speed □
Governor set for maximum power at pto speed ■

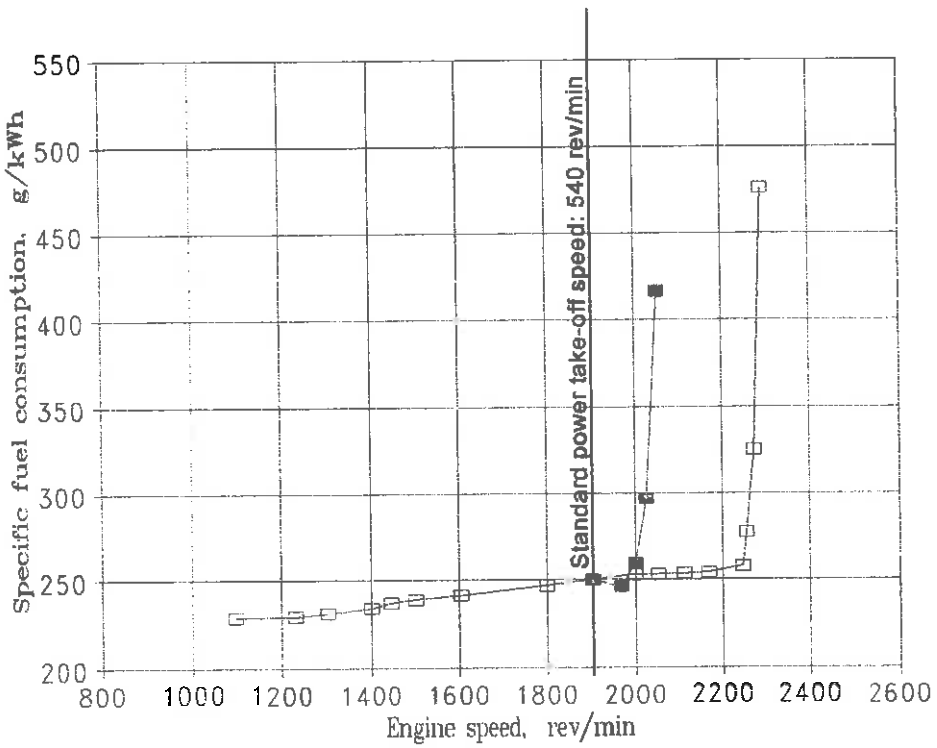




P.T.O. POWER TEST - NEW HOLLAND TS 90 FOUR-WHEEL DRIVE (540 rev/min)

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





P.T.O. POWER TEST - NEW HOLLAND TS 90 FOUR-WHEEL DRIVE (540 rev/min)

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

