SILSOE RESEARCH INSTITUTE

OECD Report

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CODE 2

Tests in accordance with the OECD RESTRICTED STANDARD CODE for the Official Testing of Agricultural and Forestry Tractors

New Holland MCC7BE1 (TM140) Four-Wheel Drive Tractor with
18-speed Semi Power Shift Transmission (40 km/h)



Manufactured by: CNH UK Limited
Basildon
Essex SS14 3AD
United Kingdom

Reference No: 826

Date: January 2004

ENGINEERING for Life

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Statement

The information opposite each item has been validated by the Testing Station. An item marked [C] indicates to the test report user that the information declared by the manufacturer has been checked; an item marked [D] indicates that the manufacturer's declaration has been endorsed.

[C]	Tractor manufacturer's name and address:	CNH UK Limited Basildon, Essex, SS14 3AD United Kingdom
[C]	Location of tractor assembly:	Basildon, Essex
[D]	Submitted for test by:	The manufacturer
[C]	Selected for test by:	The manufacturer with the agreement of the testing station
[D]	Place of running in:	Basildon. Essex
[D]	Duration of running in:	70 hours
[C]	Location of test:	Silsoe Research Institute Wrest Park, Silsoe, MK45 4HS United Kingdom

1. SPECIFICATIONS OF TRACTOR

1.1 Identification

1.1.1

[C]	Make of tractor:	New Holland
[C]	Model (trade name):	TM 140
[C]	Type:	Four- wheel drive, unit construction

1.1.2 *Numbers*

[D]	1st Serial No or prototype:	ACM186090
[C]	Serial No:	170899B

1.1.3 *Other specifications (if applicable)*

[D]	Model(s) for other countries:	None
[C]	Transmission type or gears x ranges:	18-Speed Semi-Power Shift
[C]	Speed version:	40 km/h
[C]	Manufacturer identification or Technical type number:	MCC7BE1

1.2 Engine

[C]	Make:	CNH
[C]	Model:	675TA/HB
[C]	Type:	4 stroke turbocharged direct injection and after cooled diesel
[C]	Serial No:	957504

1.2.1 *Cylinders*

[C]	Number/disposition:	6 vertical in-line
[D]	Bore/stroke:	111.8mm/127.0mm
[D]	Capacity:	7480 cm^3
[D]	Compression ratio:	17.0 : 1
[D]	Arrangement of valves:	Overhead
[D]	Cylinder liners:	None, monobloc construction

1.2.2 *Supercharging*

[D]	Make/Model:	Borg Warner/K27
[C]	Type:	Exhaust driven
[D]	Pressure:	0.088 MPa at rated speed/load

1.2.3 *Fuel system*

[D]	Fuel feed system:	Stanadyne electronic lift pump
[C]	Make, type and model of fuel filter:	One disposable canister filter with sediment bowl and water separator plus plastic strainer in tank
[D]	Capacity of fuel tank:	285 dm^3
[C]	Make, type and model of injection pump:	Bosch, VE Rotary, 0 460 426 343
[C]	Serial No:	87802535
	Manufacturer's production setting of injection pump	
[C]	Flow rate (rated engine speed and full load):	77 mm^3 ±3% per stroke at 2200 min^{-1} (rev/min) 29.58–31.41 dm^3/h
[D]	Timing:	T.D.C
[D]	Make, type and model of injectors:	Bosch, differential needle, DSLA 143 PV 338 5300
[D]	Injection pressure:	27.0-28.2 MPa

1.2.4 *Governor*

[C]	Make:	Bosch
[D]	Model:	None
[C]	Type:	Mechanical incorporated in fuel injection pump
[C]	Governed range of engine speed:	775 to 2400 min^{-1} (rev/min)
[C]	Rated engine speed:	2200 min^{-1} (rev/min)

1.2.5 *Air cleaner*

[C]	Pre-cleaner	Optional fitted
[C]	Type:	Spin tube
[C]	Location:	Air cleaner canister inlet
	Main cleaner	
	Make:	Locker Filtration
[C]	Type:	3 stage dry paper element with replaceable cartridge Exhaust Aspirated
[D]	Model:	None
[C]	Location of air intake:	Under engine bonnet on front and above radiator.
[C]	Maintenance indicator:	Warning light on instrument

1.2.6 *Lubrication system*

[D]	Type of feed pump:	Forced feed from eccentric rotor pump
[D]	Type of filter:	Metal mesh strainer in sump on suction line and full flow disposable canister on pressure line to engine
[C]	Number:	1

1.2.7 *Cooling system*

[C]	Type of coolant:	Water and antifreeze (50% solution)
[D]	Type of pump:	Belt driven centrifugal impeller
	Specification of fan	
[C]	Number of fan blades:	7
[C]	Fan diameter:	550 mm
[D]	Coolant capacity:	25.5 dm^3
[D]	Type of temperature control:	Thermostat with full flow bypass
[D]	System pressure:	100 kPa

1.2.8 *Starting system*

[C]	Make:	Bosch JF/Iskra
[D]	Model:	JF
[C]	Type:	Electrical, positive engagement, solenoid operated
[D]	Starter motor power rating:	3.1/3.6 kW 3.0 kW (Reduction geared)
[D]	Cold starting aid:	Lucas – Type 357-33
[C]	Safety device:	Starting inoperable unless shuttle lever in neutral, clutch pedal depressed and seat presence switch is activated

1.2.9 *Electrical system*

[C]	Voltage:	12 V
	Generator:	Alternator
[C]	Make:	Magneti Marrelli/Denso
[C]	Model:	MME / A 127
[C]	Type:	Belt driven
[C]	Power:	100/120 amps at 6000 min^{-1} (rev/min)
	Batteries	
[C]	Number:	1 Exide lead acid, mounted on RHS fuel tank
[D]	Rating:	176 Ah at 20 hours

1.2.10 *Exhaust system*

[C]	Make:	COR.TUBI
[D]	Model:	None
[C]	Type:	Under bonnet horizontal silencer with vertical stack pipe
[C]	Location:	Rear left hand side above engine, under bonnet
[C]	Height of outlet above ground:	3000 mm

1.3 Transmission

1.3.1 *Clutch (Travel alone)*

[D]	Make:	CNH
[D]	Model:	None
[D]	Type:	Wet multiplate in gearbox, for travel only
[D]	Number of plates:	7
[D]	Diameter of plates:	160 mm
[C]	Method of operation:	Electro-hydraulic with pedal override

1.3.2 *Gear box*

[D]	Make:	CNH
[C]	Model:	Range command (semi power shift)
[C]	Description:	Electro/Hydraulic, synchromesh (range) operation. 6 powershift speeds with 3 ranges selected by 3 buttons on an adjustable lever mounted on the right-hand console. Forward/reverse is actuated by a steering column mounted shuttle lever.

		Forward	Reverse
[C]	Number of gears	6	6
[C]	Number of ranges/groups	3	1
[C]	Total of arrangements	18	6

Available options:

17 x 6 with creep (30 km/h)
18 x 6 with creep (40 km/h)
20 x 16 40km/h
24 x 12 40km/h

1.3.3 *Rear axle and final drivers*

[D]	Make:	CNH
[D]	Model:	None
[D]	Type:	Crown wheel pinion with differential and inboard epicyclic reduction gear final drive
	Differential lock:	
[D]	Type:	Mechanical
[C]	Method of engagement:	Electro-hydraulic actuation in response to signal from switch on right-hand control panel
[C]	Method of disengagement:	Via panel switch or in response to signal from brakes on application

1.3.4 *Front axle and final drives*

[D]	Make:	CNH
[D]	Model:	None
[D]	Type:	Crown wheel and pinion with differential and outboard epicyclic reduction gear final drives
	Drive engagement:	
[D]	Type:	Multiplate clutch – located within the gearbox
[C]	Method of operation:	Electro-hydraulic actuation in response to signal from switch on right-hand control panel
	Differential lock:	
[D]	Type:	Mechanical or multiplate clutch
[C]	Method of engagement:	Electro-hydraulic actuation in response to signal from switch on right-hand control panel
[C]	Method of disengagement:	Via panel switch or in response to signal from brakes on application, or steering movement, or axle lift

1.3.5 *Total ratios and travelling speeds*

	Gear	Group or range	Number of engine revolutions for one revolution of the driving wheels	Nominal travelling speed at rated engine speed:* 2200 rev/min km/h
	Forward			
[C]	1	A	287.73	2.46
[C]	2	A	239.28	2.96
[C]	3	A	199.20	3.56
[C]	4	A	165.66	4.28
[C]	5	A	137.72	5.14
[C]	6	A	114.53	6.19
[C]	1	B	123.88	5.72
[C]	2	B	103.02	6.88
[C]	3	B	85.77	8.27
[C]	4	B	71.32	9.94
[C]	5	B	59.29	11.96
[C]	6	B	49.31	14.38
[C]	1	C	43.67	16.24
[C]	2	C	36.32	19.52
[C]	3	C	30.23	23.46
[C]	4	C	25.14	28.20
[C]	5	C	20.90	33.93
[C]	6	C	17.38	40.80
	Reverse			
[C]	1	R	147.48	4.80
[C]	2	R	122.64	5.78
[C]	3	R	102.10	6.94
[C]	4	R	84.91	8.35
[C]	5	R	70.59	10.05
[C]	6	R	58.70	12.08

Range selection: A = Low range B = Medium range C = High range

(*) Calculated with a tyre dynamic radius index of 855 mm (ISO 4251/1-1998)

[C] Number of revolutions of front wheels for one revolution of rear wheels: 1.321

1.4 Power take-off

1.4.1 *Main power take-off*

[C]	Type:	Independent
[C]	Method of engagement:	Electro – hydraulic operated multi-plate clutch in response to a signal from switch on the right – hand control panel
[C]	Number of shafts:	1 interchangeable shaft, 6 or 21 splines to ISO 500/1991
[C]	Method of changing power take-off speeds:	Two speed shiftable, 540 or 1000 min^{-1} (rev/min) by lever on right-hand console
	Clutch	
[D]	Make:	CNH
[D]	Model:	None
[D]	Type:	Multiplate, wet
[D]	Number of plates:	6
[D]	Diameter of plates:	140.0 mm

1.4.1.1 Power take-off proportional to engine speed

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

[C]	Location:	Rear of tractor
[C]	Diameter of power take-off shaft:	34.9 mm
[C]	Number of splines:	6 in conformity with ISO 500/1991 (available option 21)
[C]	Height above ground:	838 mm
[C]	Distance from the median plane of the tractor:	Central
[C]	Distance behind rear wheel axis:	602 mm
[C]	PTO speed at rated engine speed:	603 min^{-1} (rev/min)
[C]	Engine speed at standard power take-off speed:	1969 min^{-1} (rev/min)
[C]	Ratio of rotation speeds:	3.65
[D]	Power restriction:	None
[D]	Maximum torque transmissible:	None
[C]	Direction of rotation (viewed from behind tractor):	Clockwise

Power take-off at 1000 min^{-1} (rev/min)

[C]	Location:	Rear of tractor
[C]	Diameter of power take-off shaft:	34.9 mm
[C]	Number of splines:	21 in conformity with ISO 500/1991 (available option 6)
[C]	Height above ground:	838 mm
[C]	Distance from the median plane of the tractor:	Central
[C]	Distance behind rear wheel axis:	602 mm
[C]	PTO speed at rated engine speed:	1038 min^{-1} (rev/min)
[C]	Engine speed at standard power take-off speed:	2120 min^{-1} (rev/min)
[C]	Ratio of rotation speeds:	2.12
[D]	Power restriction	None
[D]	Maximum torque transmissible:	None
[C]	Direction of rotation (viewed from behind tractor):	Clockwise

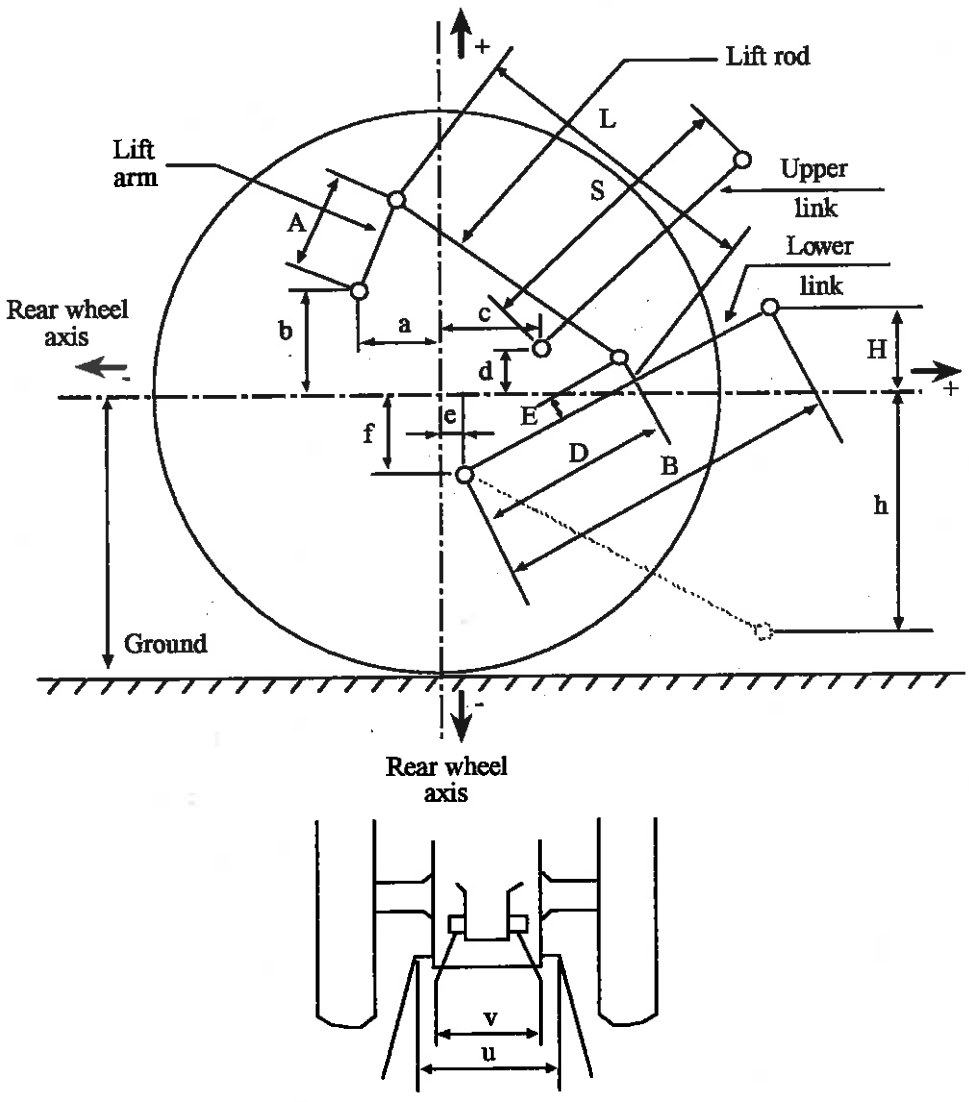
1.4.1.2 Power take-off proportional to ground speed — Not applicable

1.5 Hydraulic power lift

[C]	Make:	CNH
[D]	Model:	None
[D]	Type:	Electro-hydraulic closed centre load sensing
[C]	Type and number of cylinders:	1 single acting inside transmission housing plus the option of single acting, externally mounted assistor ram/s. (Two fitted for test)
[C]	Type of linkage lock for transport:	Hydraulic
[D]	Pump maximum pressure / Relief valve pressure setting:	20.0 – 20.7 MPa
[D]	Opening pressure of cylinder safety valve:	22.0 – 23.0 MPa
[D]	Lift pump type:	Variable displacement piston pump
[D]	Transmission between pump and engine:	Gear driven from PTO shaft, independent of main and PTO clutches
[C]	Type and number filters:	2 disposable canister filters
[C]	Site of oil reservoir:	Rear axle housing
[C]	Type, number and location of tapping points:	2 or 4 remote couplers at rear of tractor (4 Remote valves fitted on test tractor)
[D]	Maximum volume of oil available to external cylinders:	20 –24 litres under normal conditions (flat fields) 35-39 litres when operating stationary on level ground

1.6 Three-point linkage

[C]	Category:	2 in conformity with ISO 730-1:1994 + Cor.1:1995
[C]	Category adapter:	None
[C]	Controls:	Electronic draught/ position link. (Optional draught/position control, lower 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 ranges	Settings used in tests		
					3.2.2	7.1	7.2
				mm	mm	mm	mm
[C]	Length of lift arms:		(A)	230	230	230	230
[C]	Length of lower links:		(B)	974	974	974	974
[C]	Distance of lift arm pivot point from rear wheel centre line:	horizontally: vertically:	(a) (b)	156 363	156 363	156 363	156 363
[C]	Horizontal distance between the two lower link points:		(u)	544	544	544	544
[C]	Horizontal distance between the two lift arm end points:		(v)	560	560	560	560
[C]	Length of upper link:		(S)	658 – 942	754	768	760
[C]	Distance of upper link pivot point from rear wheel centre line:	horizontally: vertically:	(c) (d)	430 – 455 208 – 275	455 208	430 275	430 275
[C]	Distance of lower link pivot point from rear wheel centre line:	horizontally: vertically:	(e) (f)	220 250	220 250	220 250	220 250
[C]	Distance of lower link points to lift rod pivot points on lower link centre line:		(D)	435 – 504	435	504	504
[C]	Length of lift rods:		(L)	635 – 787	750	787	787/730
	Height of lower hitch points (*) Relative to the rear wheel centre line, situated 855 mm above the ground level:						
[C]	- in low position		(h)	238 – 740	657	617	617/455
[C]	- in high position		(H)	45 – 283	50	15	15/133
[C]	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 855 mm ISO 4251/1-1998

1.7 Swinging drawbar
(Incorporating Slider Germany & Swinging drawbar EEC)

[C]	Type:		Clevis		
[C]	Height above ground:	Unballasted Maximum:	585 mm		
		Minimum:	465 mm		
[C]	Type of adjustment:		Inverting drawbar		
[C]	Distance of hitch point from rear-wheel axis, horizontally:		842 mm	958 mm	1008 mm
[C]	Distance of hitch point from power take-off shaft end:				
		Vertically:	253 mm	373 mm	
		horizontally:	240 mm	356 mm	406 mm
[C]	Lateral adjustment (centre of clevis):				
		Right-hand:	-- --	180 mm	192 mm
		Left-hand:	-- --	180 mm	192 mm
[C]	Distance of pivot point from rear axles	horizontally:	190 mm	behind rear axle	
[C]	Width of clevis:		70 mm		
[C]	Diameter of drawbar pin hole:		33 mm		
[D]	Maximum vertical permissible load:	Clevis uppermost:	2575 kg	1680 kg	1440 kg
		Clevis underneath:	1305 kg	1225 kg	1045 kg

1.8 Trailer hitch

[C]	Type:		Coupling
[C]	Hole diameter:		33 mm
[C]	Height above ground:		520 mm to 1040 mm
[C]	Distance of hitch point from rear wheel axis, horizontally:		806 mm
[C]	Distance of hitch point from power take-off shaft end		
		Vertically:	-318 mm to +200 mm
		horizontally:	204 mm
[D]	Maximum vertical permissible load:		2000 kg

1.9 Holed drawbar

	Type:	None fitted

1.10 Steering

[D]	Make:	CNH
[D]	Model:	None
[D]	Type:	Hydrostatic
	Method of operation	
[C]	Pump:	Sauer Danfoss
[C]	Motor:	Sauer Danfoss OSPC-160-OR
[C]	Ram:	2, balanced system with double acting cylinders one operating each steering arm
[D]	Filter:	Integral with hydraulic power lift system
[D]	Working pressure:	17 MPa

1.11 Brakes

1.11.1 *Service brake*

[D]	Make:	CNH
[D]	Model:	None
[D]	Type:	Oil-immersed single plate disc
[C]	Method of operation:	Hydraulic, independent on rear wheels (On 4 WD models. When the service brakes are activated the front wheel drive is automatically engaged providing 4-wheel braking)
[C]	Trailer braking take-off:	Hydraulic connector fitted to ISO 5676-1983

1.11.2 *Parking brake*

[D]	Type:	Fully independent four plate disc operating on bevel pinion shaft
[C]	Method of operation:	Hand lever with ratchet

1.12 Wheels

Number

[C] Front: 2 driving/steering

[C] Rear: 2 driving

[C] Wheelbase: 2723 mm

Track width adjustment:

		Minimum mm	Maximum mm	Adjustment method
[C]	Front*	1538/1560	2238/2260	Reversing wheels and offset lug rims
[C]	Rear	1530	2230	Reversing wheels and offset lug rims/ Optional bar axle fitted

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

1.13 Protective structure

[C] Make: CNH

[C] Model: SLTV 9

[C] Type: Cab safety frame - suspended

[C] Manufacturer's name and address: CNH UK Ltd
Cranes Farm Road
Basildon
Essex
SS14 3AD

Protective device

[C] Cab/frame/rollguard/ other: Cab

[C] Tiltable/Not tiltable: Not tiltable

OECD approval

[C] Approval number: 4/0698

[C] Date of approval: 18 October 2001

Nos. minor modification certificates, if any: 2

The certificates for minor modifications established by the Danish testing station

1.14 Seat

1.14.1 *Driver's seat*

[C]	Make/model/Type:	Sears SST 1503 EEC approved to 78/764/EEC – e11-1294
[C]	Seat and steering wheel reversible:	No
[C]	Type of suspension:	Low frequency, parallelogram suspension air spring
[C]	Type of damping:	Double acting, hydraulic
	Range of adjustment	
[C]	Longitudinal:	± 100 mm
[C]	Vertical:	± 68 mm
[C]	Safety belt:	Yes

1.14.2 *Optional driver's seat(s)*

1.14.3 *Passenger seat*

[C]	Make:	CNH
[C]	Location:	Soft plastic moulding, folding, on left hand side of inner fender.
[C]	Type:	EEC approved to76/763/EEC – e11 1383
[C]	Capacity (numbers):	1

1.15 Lighting

		Height above ground to centre	Size	Distance from outside edge of lights to medium plane of tractor
		mm	mm	mm
[C]	Headlights	1420	150 x 90	200
[C]	Sidelights	2015	105 x 30	870
[C]	Rear lights	1915	50 x 50	845
[C]	Rear fender reflectors	1915	50 x 50	845
[C]	Rear axle reflectors	825	100 x 35	635

2 TEST CONDITIONS

2.1 Overall dimensions

	length	Width		Height at top of	
		minimum	maximum	Protective structure	Exhaust pipe
	mm	mm	mm	mm	mm
Unballasted	4692	2507	2507	2975	3000

2.2 Ground clearance (unballasted tractor) 390 mm

Clearance-limiting part: Drawbar clevis in lowest position

2.3 Tractor mass

Mass (with or without frame/roll guard/cab/other): With cab

	Unballasted	
	Without driver	With driver
	kg	kg
Front	2272	2278
Rear	3596	3665
Total	5868	5943

2.4 Track specifications Not applicable

2.5 Tyres and track width specification

	Front	Rear
Tyres Dimensions ply rating type	 16.9 R 28 128 A8 Radial	 20.8 R 38 146 A8 Radial
Maximum load (tyre manufacturer's) 30/40/50 km/h	23.5/22.0/20.0 kN	38.3/35.8/32.6 kN
Maximum load (tractor manufacturer's) 30/40/50	23.5/22.0/20.0 kN	38.5/35.8/32.6 kN
Inflation pressure (tyre manufacturer's)	160 kPa	160 kPa
Dynamic radius index	670 mm	855 mm
Chosen track width (manufacturer's nominal)	1765 mm	1807 mm

2.6 Fuel

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

Density at 15° C: 0.8413 g/cm^3

2.7 Oils and lubrication

2.7.1 *Capacity and change interval*

	Capacity	Oil change	Filter change
	dm^3	h	h
Engine	19.0	300	300
Front axle differential	9.0	1200	None
Front axle hub (each)	1.7	1200	None
Gearbox	80.0	1200	600
Rear axle Hydraulic system Final drives (rear) Steering	Integral with gearbox		
Brakes	0.5	Top-up	None

2.7.2 *Specifications(SAE, APL, CCMC, ACEA, MILL, ISO)*

	NH spec	Recommended	Used during test
Engine oil Type: Viscosity Classification:	NH 324H	SAE 10W/30 11.5 cSt at 100° C API CH – 4	As recommended
Transmission oils Type: Viscosity Classification:	NH 410B	SAE 10W/30 9 cSt at 100° C API GL – 4	As recommended
Rear final drives Type: Viscosity: Classification:	NH 410B	SAE 10W/30 9 cSt at 100° C API GL – 4	As recommended
Front differential and final drives Type: Viscosity: Classification:	NH 410B	SAE 10W/30 9 cSt at 100° C API GL – 4	As recommended
Hydraulic brakes Type: Viscosity: Classification:	NH 610A	No equivalent 6 cSt at 100° C No equivalent	As recommended
Hydraulic fluid Type: Viscosity: Classification:	NH 410B	SAE 10W/30 9 cSt at 100° C API GL – 4	As recommended
Steering oil Type: Viscosity: Classification:	NH 410B	] SAE 10W/30 9 cSt at 100° C API GL – 4	As recommended

2.7.3 *Grease*

Type:	NH 720A	Lithium Based [D]	As recommended

Number of lubrication points: 14

3. COMPULSORY TESTS RESULTS

3.1 Main power take-off

Date and location of tests: 17 December 2002
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						
90.3	2061	972	24.01	28.54	266	3.16
3.1.2 POWER AT RATED ENGINE SPEED						
89.3	2201	1038	24.89	29.58	279	3.02
3.1.3 STANDARD POWER TAKE-OFF SPEED [1000 ± 25 min^{-1} (rev/min)]						
90.1	2121	1000	24.44	29.05	271	3.10
3.1.4 PART LOADS 3.1.4.1 the torque corresponding to maximum power at rated engine speed						
89.3	2201	1038	24.89	29.58	279	3.02
3.1.4.2 85% of torque obtained in 3.1.4.1						
80.2	2324	1096	23.89	28.40	298	2.82
3.1.4.3 75% of torque defined in 3.1.4.2						
60.7	2345	1106	20.00	23.78	329	2.55
3.1.4.4 50% of torque defined in 3.1.4.2						
40.6	2350	1109	15.93	18.93	392	2.15
3.1.4.5 25% of torque defined in 3.1.4.2						
20.4	2368	1117	11.70	13.90	574	1.47
3.1.4.6 unloaded						
0	2382	1124	7.74	9.19	-	-
3.1.5 PART LOADS AT STANDARD POWER TAKE-OFF SPEED [1000± 25 min^{-1} (rev/min)] 3.1.5.1 the torque corresponding to maximum power						
90.1	2121	1000	24.44	29.05	271	3.10
3.1.5.2 85% of torque obtained in 3.1.5.1						
80.5	2229	1051	23.19	27.56	288	2.92
3.1.5.3 75% of torque obtained in 3.1.5.2						
61.2	2261	1066	19.36	23.01	317	2.66
3.1.5.4 50% of torque obtained in 3.1.5.2						
40.9	2270	1071	14.93	17.75	365	2.30
3.1.5.5 25% of torque obtained in 3.1.5.2						
20.7	2290	1080	11.05	13.14	534	1.58
3.1.5.6 unloaded						
0	2311	1090	7.15	8.50	-	-

* In the PTO test fan speed was not measured because we do not have the facility to do so at present

No load maximum engine speed: 2382 min^{-1} (rev/min)

Torque (equivalent crankshaft) at maximum power

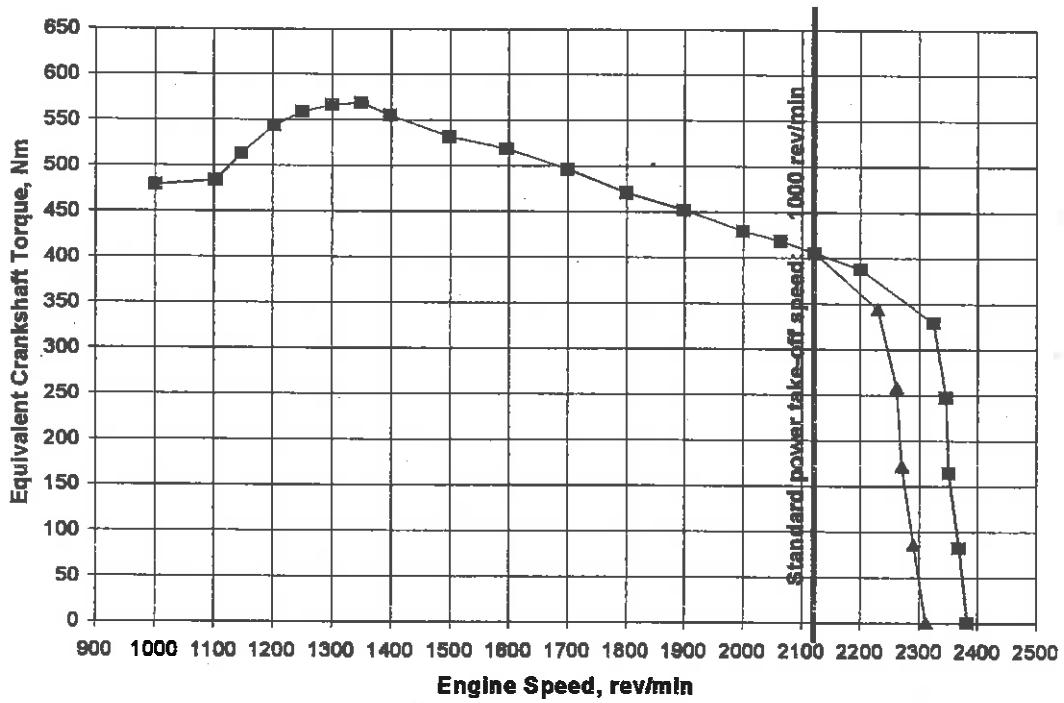
At rated engine speed: 387.6 Nm

At 2-hour test: 418.2 Nm

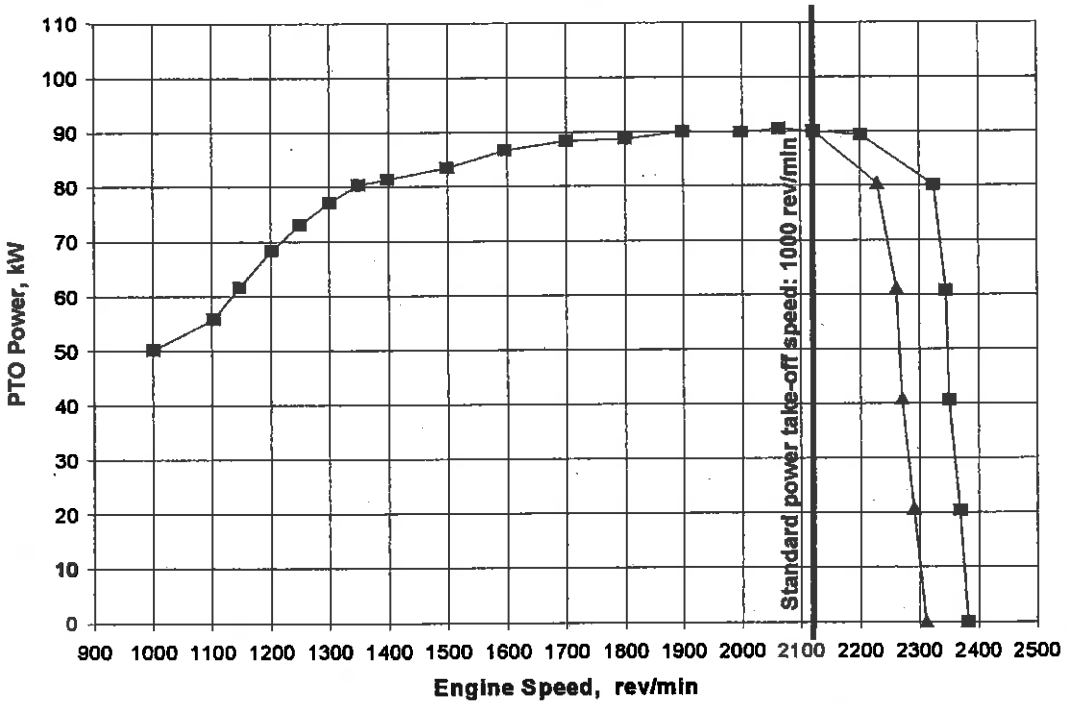
Maximum torque (equivalent crankshaft): 568.6 Nm
(engine speed: 1350 min^{-1} (rev/min)

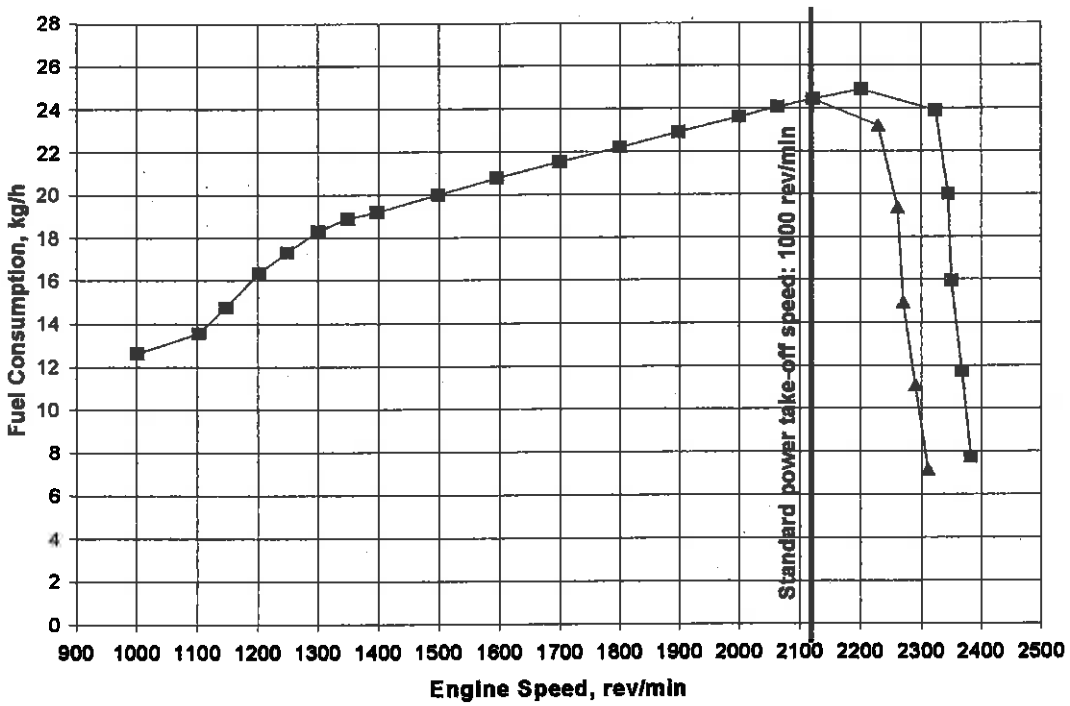
Mean atmospheric conditions:	
Temperature	21 °C
Pressure	102.2 kPa
Relative humidity	34 %
Maximum temperatures:	
Coolant	95 °C
Engine oil	115 °C
Fuel	56 °C
Engine air intake	34 °C

Main power take-off curves

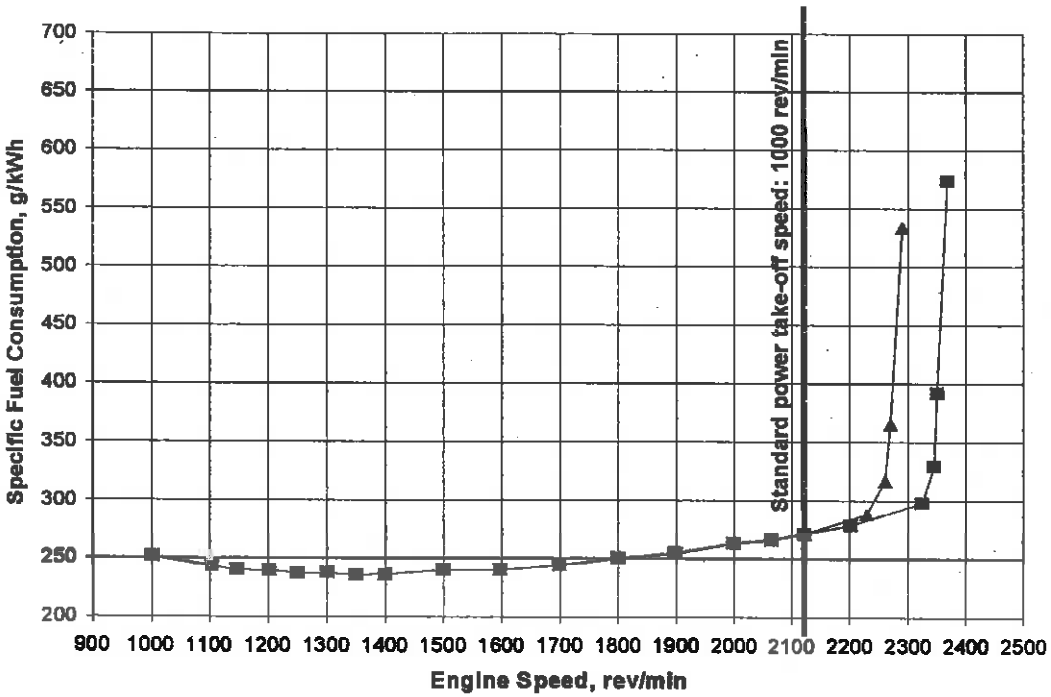


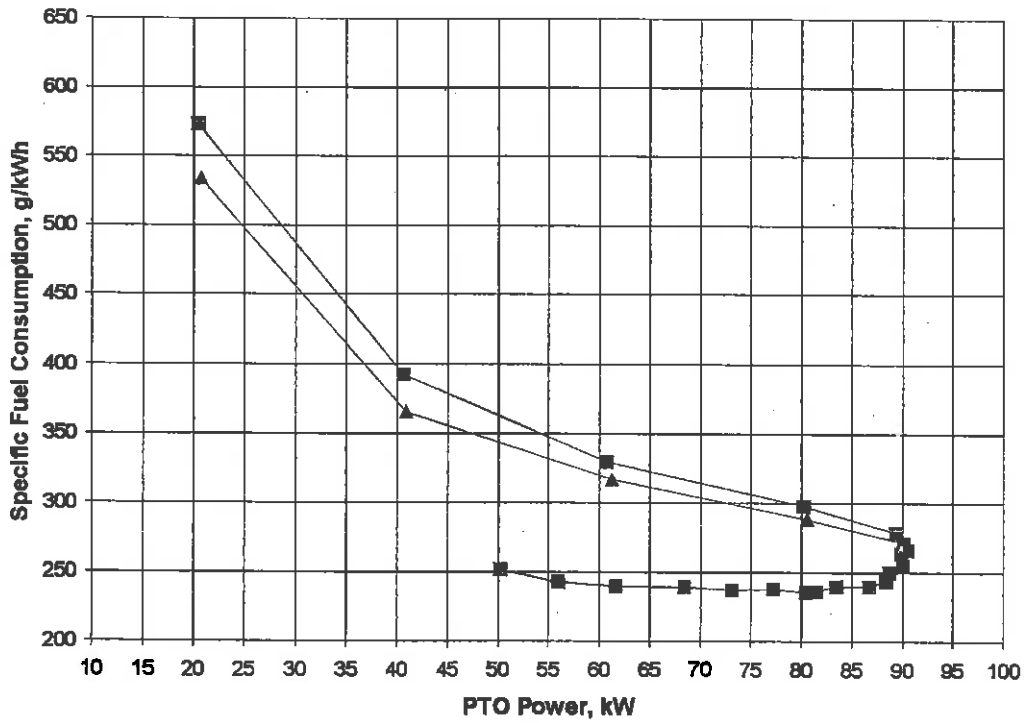
Main power take-off curves





Main power take-off curves





3.2 Hydraulic power and lifting force

Date of tests: 7 February 2003 and 8 January 2004

3.2.1 *Hydraulic power test*

Sustained pressure with relief valve open: 20.4 MPa

Pump stalled: Yes

Pump delivery rate at minimum pressure 121.5 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	77.7	18.4	23.83
Flow rate and hydraulic pressure corresponding to maximum hydraulic power	110.8	16.5	30.47

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: 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	198 mm	198 mm
Vertical movement	707 mm	842 mm
Maximum corrected force exerted through full range	42.8 kN	40.1 kN
Corresponding pressure of hydraulic fluid	18.4 MPa	18.4 MPa
Moment about rear-wheel axis	51.1 kNm	72.3 kNm
Maximum tilt angle of mast from vertical	----	10 degrees

Lifting heights relative to the horizontal plane including the lower link pivot points											
mm	-467	-407	-300	-200	-100	0	+105	+155	+255	+300	+375
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	--	42.8	52.4	60.1	65.3	69.3	72.5	74.2	77.4	78.6	--
Corresponding pressure:18.4 MPa											
at the frame kN	40.1	--	47.5	52.2	55.3	56.7	56.9	56.8	56.7	--	55.9
Corresponding pressure: 18.4 MPa											

3.3 Drawbar power test (unballasted tractor)

(Four-Wheel Drive)

Date and Location of tests: 15 and 28 October 2003
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	435	90	90

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													
1A	39.2	61.8	2.28	2342	14.7	473	1.78	53	88	109	14	72	102.2
2A	47.1	61.2	2.77	2342	13.9	433	1.94	54	91	110	15	47	102.2
3A	57.0	60.2	3.40	2326	11.4	378	2.23	55	90	112	13	62	102.2
4A	67.5	59.7	4.07	2290	10.5	364	2.31	55	89	111	13	62	102.2
5A	73.8	56.6	4.70	2143	8.2	333	2.52	55	93	112	13	63	102.2
1B	75.1	52.8	5.12	2060	6.4	325	2.59	53	92	108	13	63	102.2
6A	75.4	48.4	5.61	2065	5.4	315	2.67	53	91	105	13	63	102.2
2B	76.5	43.8	6.29	2063	4.6	311	2.70	52	92	109	10	79	101.9
3B	76.6	36.1	7.63	2062	3.6	315	2.67	53	92	109	10	80	101.9
4B	76.3	29.8	9.22	2059	2.9	316	2.66	54	93	110	11	81	101.9
5B	75.8	24.5	11.13	2055	2.4	316	2.66	53	88	109	11	80	101.9
6B	73.1	19.5	13.48	2064	2.1	317	2.65	52	93	108	16	56	101.9
1C	74.4	17.6	15.24	2061	1.9	324	2.60	54	95	110	17	53	101.9
3.3.2 FUEL CONSUMPTION													
3.3.2.1 In selected gear, at maximum power at rated speed													
3B	75.5	33.3	8.16	2199	3.3	329	2.55	54	92	112	10	81	101.9
3.3.2.1.1 75% of pull at maximum power at rated speed													
3B	60.5	25.1	8.69	2325	2.6	361	2.33	56	94	112	18	35	101.9
3.3.2.1.2 50% of pull at maximum power at rated speed													
3B	40.9	16.7	8.81	2341	1.9	428	1.96	58	94	113	19	33	101.9
3.3.2.1.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.1.1													
4B	60.5	25.1	8.68	1933	2.6	319	2.64	57	95	109	19	34	101.9
3.3.2.1.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.1.2													
4B	40.8	16.7	8.81	1946	1.9	365	2.31	56	93	108	19	32	101.9
3.3.2.2 In selected gear nearest to 7.5 km/h, at maximum power at rated engine speed													
2B	74.8	40.0	6.73	2197	4.1	329	2.56	53	92	112	10	80	101.9
3.3.2.2.1 75% of pull at maximum power at rated speed													
2B	60.2	30.0	7.22	2330	3.0	366	2.30	54	92	114	10	80	101.9
3.3.2.2.2 50% of pull at maximum power at rated speed													
2B	40.8	20.0	7.34	2345	2.0	426	1.98	55	91	112	10	79	101.9
3.3.2.2.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.2.1													
3B	60.0	30.1	7.19	1935	3.2	306	2.75	55	93	107	19	30	101.9
3.3.2.2.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.2.2													
3B	40.6	20.0	7.31	1947	2.2	361	2.33	54	95	106	19	31	101.9

3.3.1 *Drawbar power test (unballasted tractor)*

(Four-Wheel Drive disengaged)

	Height of drawbar above ground	Tyre inflation pressure	
		Front	Rear
	mm	kPa	kPa
Unballasted	545	90	90

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													
1A	31.3	49.4	2.28	2349	14.2	504	1.67	53	90	110	13	46	100.8
2A	37.2	48.4	2.77	2345	13.2	474	1.77	55	90	109	12	53	100.8
3A	44.9	48.5	3.33	2343	12.9	427	1.97	51	89	106	12	50	100.8
4A	53.3	47.1	4.08	2335	11.1	403	2.09	50	90	108	12	52	100.8
5A	63.2	46.6	4.89	2321	10.9	390	2.16	53	91	110	13	50	100.8
1B	69.3	45.0	5.55	2293	7.8	355	2.37	52	91	111	10	58	100.9
6A	71.7	44.6	5.79	2192	7.1	341	2.47	47	90	108	12	50	100.5
2B	74.1	42.3	6.30	2135	6.6	328	2.57	54	91	109	10	58	100.9
3B	75.9	36.8	7.42	2057	4.9	313	2.68	54	94	111	12	52	100.7
4B	75.4	30.0	9.05	2062	3.7	318	2.65	54	92	110	10	61	101.0
5B	75.4	24.8	10.93	2054	3.0	321	2.62	54	91	110	10	62	101.0
6B	73.7	20.0	13.24	2056	2.5	322	2.61	53	92	107	12	60	101.0
1C	75.8	18.2	15.00	2060	2.3	315	2.67	54	93	110	13	55	101.0
3.3.3 FUEL CONSUMPTION													
3.3.2.1 In selected gear, at maximum power at rated speed													
3B	73.9	33.4	7.97	2198	4.5	333	2.53	54	91	111	11	59	101.0
3.3.2.1.1 75% of pull at maximum power at rated speed													
3B	59.5	25.0	8.57	2330	3.1	367	2.29	51	93	112	10	62	101.0
3.3.2.1.2 50% of pull at maximum power at rated speed													
3B	40.4	16.7	8.70	2345	2.2	447	1.88	53	92	113	10	59	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													
4B	59.3	25.0	8.55	1935	3.1	328	2.57	51	90	107	12	52	100.8
3.3.2.1.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.1.2													
4B	40.3	16.7	8.69	1948	2.2	372	2.26	50	90	107	12	50	100.8
3.3.2.2 In selected gear nearest to 7.5 km/h, at maximum power at rated engine speed													
2B	73.1	40.0	6.57	2208	5.8	338	2.49	52	91	111	10	59	100.9
3.3.2.2.1 75% of pull at maximum power at rated speed													
2B	59.2	30.0	7.10	2332	3.5	344	2.45	53	90	112	11	57	100.9
3.3.2.2.2 50% of pull at maximum power at rated speed													
2B	40.1	20.0	7.22	2344	2.5	463	1.82	54	91	111	10	56	100.9
3.3.2.2.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.2.1													
3B	59.1	30.0	7.09	1935	3.8	310	2.71	53	91	107	13	50	100.8
3.3.2.2.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.2.2													
3B	39.9	20.0	7.20	1947	2.6	340	2.47	54	90	106	12	52	100.8

* In the drawbar test(s) fan speed was not measured because we do not have the facility to do so at present

4. OPTIONAL TESTS RESULTS None

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
Field Machinery Centre

Date: 6/5/2004

7. APPENDIX 1 ADDITIONAL TESTS

7.1 *Power lift test – (To Manufacturers lift rod setting)*

"Not covered by the approval"

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	238 mm	238 mm
Vertical movement	632 mm	680 mm
Maximum corrected force exerted through full range	52.0 kN	53.0 kN
Corresponding pressure of hydraulic fluid	18.4 MPa	18.4 MPa
Moment about rear-wheel axis	62.1 kNm	95.6 kNm
Maximum tilt angle of mast from vertical	--	5 degrees

Lifting heights relative to the horizontal plane including the lower link pivot points											
mm	-390	-367	-300	-200	-95	0	+105	+165	+200	+265	+290
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	--	52.0	58.4	67.0	72.8	76.8	79.6	81.2	81.9	83.2	--
Corresponding pressure: 18.4 MPa											
at the frame kN	53.0	--	56.2	63.1	67.0	68.7	68.6	68.2	67.7	--	67.3
Corresponding pressure: 18.4 MPa											

7.2 *Power lift test – (To SAE J283)*

Linkage settings for test – see Table 2.1

* Lift rods readjusted to 730 mm to allow for lift force to be measured throughout the total lift range

Lifting heights relative to the horizontal plane including the lower link pivot points											
mm	-367	-305	-205	-105	0	+98	+195	+240	+265	---	---
*mm	---	---	-205	-105	0	+98	+195	+240	+265	+333	+383
SAE J283											
kN	73.3	73.3	76.5	78.0	78.5	77.6	76.5	75.5	74.1	---	---
*kN	---	---	70.9	75.0	78.8	79.5	77.2	76.8	76.4	74.1	73.2
Corresponding pressure: 18.0 MPa											

TEST RESULTS (OECD Code 5)

"Not covered by the approval"

Make and type of sound level meter: Bruel and Kjaer 2260

Type of test track: Concrete

Date of tests: 8 October 2003

Four wheel drive engaged Windows closed

Gear	Test Condition	Measured travelling speed km/h	Sound level dB(A)
2B	Light Load	7.6	75

Four wheel drive engaged Windows open

Gear	Test Condition	Measured travelling speed km/h	Sound level dB(A)
2B	Light Load	7.6	82

Four wheel drive dis-engaged Windows closed

Gear	Test Condition	Measured travelling speed km/h	Sound level dB(A)
2B	Light Load	7.6	75

Four wheel drive dis-engaged Windows open

Gear	Test Condition	Measured travelling speed km/h	Sound level dB(A)
2B	Light Load	7.6	82