O.E.C.D. Approval 551
Report 647
February 1977

REPORT OF TEST IN ACCORDANCE WITH O.E.C.D. TEST CODE FOR AGRICULTURAL TRACTORS

FORD 5600 TRACTOR



Test No.: R/77/7931/O.E.C.D.

Manufacturer: Ford Motor Company Limited,
Basildon,
Essex.

NATIONAL INSTITUTE OF AGRICULTURAL ENGINEERING

Wrest Park . Silsoe . Bedford MK45 4HS

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SPECIFICATION OF TRACTOR

Manufacturer:	Ford Motor Company Limited, Basildon, Essex.
Submitted for test by:	The manufacturer
Selected for test by:	The manufacturer with the agreement of the testing station
Place of running-in:	Basildon
Duration of running-in:	140 hours

Tractor

Make:	Ford
Model:	5600
Type:	Four wheel, rear-wheel driven unit construction
Serial No:	B279414

Engine

Make:	Ford
Model:	5600
Type:	4-stroke direct injection diesel
Serial No.:	LO63353
Cylinders:	4 cylinders, vertical, in-line, 106·7 mm (4·2 in) dia bore × 106·7 mm (4·2 in) stroke, capacity 3816 cm^3 (233 in^3), compression ratio 16·3:1 (nominal), monobloc construction, overhead valves
Fuel system:	Gravity feed, C.A.V. twin paper element filter with sediment bowl and water trap, fuel tank capacity 75·5 l (16·6 UK gal), C.A.V. distributor injection pump, Serial No. R14252T, manufacturer's production setting: 11·6-12·3 cm^3 for 200 injections at 900 rev/min pump speed (test bench figures), C.A.V. BDLL 150S6665 injector nozzles, injection pressure 19·4-20.0 MPa (191-197 atm), injectors open 16° before T.D.C.
Governor:	C.A.V., mechanical, incorporated in fuel injection pump, governed range of engine speed 600 to 2375 rev/min, rated engine speed 2100 rev/min.
Air cleaner:	Burgess, oil bath, oil capacity 2·1 l (3·7 pt), situated forward of radiator, centrifugal pre-cleaner above bonnet
Lubrication system:	Forced feed from eccentric rotor pump with metal strainer in sump, full flow replaceable element filter, total oil capacity 8·5 l (15·0 pt), recommended oil Series 3 quality, S.A.E. 30, viscosity 65 cSt at 50°C (122°F), change period 300 hours
Cooling system:	Water cooled, pressurised at 50 kPa (7 lb/in^2), impeller—assisted with 406 mm (16·0 in) dia belt-driven 4-blade fan, thermostat for temperature control, cooling water capacity 12·3 l (21·6 pt)
Starting system:	Electrical, 12V, Lucas M50G solenoid-engaged starter motor, operable only when high-low gear selector lever is in neutral position

Elecrical system
Voltage: 12, negative earth
Generator: Lucas alternator, type 15 ACR
Battery: Ford, lead acid, 120-128 Ah at 20-hour rating

Transmission

Clutch: Borg and Beck, single plate, dry, pedal-operated, 305 mm (12·0 in) dia

Gearbox: Ford, constant mesh, 8 forward and 2 reverse speeds, comprising 4 forward and 1 reverse speed gearbox with high-low range selector

Rear axle and final drive: Ford, crown wheel and pinion with differential and epicyclic reduction gear final drives, pedal-operated differential lock

Oil capacities: Gearbox 11·4 l (20·1 pt), final drive 40·3 l (70·9 pt), recommended oil Mild E.P. S.A.E. 80, viscosity 54 cSt at 50°C (122°F), change period 1200 hours

Gear	*Number of engine revolutions for one revolution of driving wheel*	*Nominal travelling speed for 2100 rev/min rated speed of engine*, km/h*	*(mile/h)*
Forward			
Low 1	217·18	2·41	(1·50)
2	174·12	3·00	(1·86)
3	99·19	5·27	(3·27)
4	72·79	7·18	(4·46)
High 1	60·89	8·58	(5·33)
2	48·76	10·72	(6·66)
3	27·83	18·78	(11·67)
4	20·46	25·54	(15·87)
Reverse			
1	151·05	3·46	(2·15)
2	42·34	12·34	(7·67)

*Calculated with tyre rolling radius of 660 mm (26·0 in)

Power take-off At rear of tractor, in vertical centre plane, 6-spline, 34·9 mm (1⅜ in) dia, to I.S.O. Standard, manually engaged by hand lever, hydraulic clutch independent of main clutch, height above ground 643 mm (25·3 in), proportional engine speed giving 596 rev/min at 2100 rev/min rated engine speed, 540 rev/min (standard p.t.o. speed) at 1902 rev/min engine speed, direction of rotation clockwise viewed facing driving end

Power lift Ford, hydraulic, gear pump driven from power take-off shaft, independent of main and p.t.o. clutches, oil supplied from rear axle housing to ram cylinder and external tapping, Category 2 implement linkage with top link sensing, draught or position control with auxiliary service control and flow control device

Drawbar Swinging drawbar, vertical height to centre of clevis 330 mm (13·0 in) and 431 mm (17·0 in), changed by inverting clevis, distance from rear axle centre 673 mm (26·5 in) and 825 mm (32·5 in) to rear, position relative to p.t.o. 204 mm (8·0 in) and 356 mm (14·0 in) to rear, lateral adjustment 395 mm (15·6 in) and 488 mm (19·2 in), pivot position in line with rear wheel centre, pin hole 27 mm (1·1 in) dia

Steering Recirculating ball, single drop arm and drag link

Brakes Oil-immersed multi-plate disc brakes mounted on planetary shafts, independent or combined pedal-operated, hand lever with ratchet operating both brakes for parking

Wheels

Steering wheels: Two at front, Firestone Ribbed Tractor 7·50-16 cross-ply tyres, 6-ply rating, maximum permissible mass on each tyre 774 kg (1640 lb) at 220 kPa (32 lb/in²), track width 1334 mm (52·5 in) by 102 mm (4·0 in) steps to 2048 mm (80·6 in), changed by extending axle and reversing wheels

Driving wheels: Two at rear, Goodyear Traction Sure Grip 16·9/14-30 cross-ply tyres, 6-ply rating, maximum permissible mass on each tyre 1760 kg (3880 lb) at 110 kPa (16·0 lb/in²), track width 1626 mm (64·0 in) by 102 mm (4·0 in) steps to 2034 mm (80·1 in), changed by reversing wheels and offset lug rims

Wheelbase: 2223 mm (87·5 in)

Lighting Unrestricted beam angle of headlights in plan view 130°

	Height above ground of centre, *mm*	*(in)*	*Size,* *mm*	*(in)*	*Distance from outside edge of tractor at 1626 mm (64·0 in) wheel track, to centre,* *mm*	*(in)*
Headlights	1368	(53·9)	127 (5·0) dia		653	(25·7)
Side lights	1543	(60·7)	70 (2·8) × 70 (2·8)		348	(13·7)
Rear lights	1502	(59·1)	70 (2·8) × 70 (2·8)		340	(13·4)
Reflectors	1502	(59·1)	70 (2·8) × 57 (2·2)		411	(16·2)

Number of grease points

Whole tractor: 10

CONDITIONS DURING TEST

Masses

Tractor (without driver but with tanks full)

	Front, *kg*	*(lb)*	*Rear,* *kg*	*(lb)*	*Total,* *kg*	*(lb)*
Without ballast	900	(1984)	1639	(3613)	2539	(5598)
With ballast	900	(1984)	2902	(6398)	3802	(8382)

Ballast

	Number of weights	*Total mass,* *kg*	*(lb)*	*Water,* *kg*	*(lb)*
Rear wheels	18	582	(1283)	681	(1501)

Track setting during tests

Front: 1334 mm (52·5 in)

Rear: 1626 mm (64·0 in)

Overall dimensions

	Length	*Width*	*Height*
With ballast	3·645 m (143·5 in)	2·362 m (93·0 in)	2·477 m (97·5 in)
Without ballast	3·645 m (143·5 in)	2·070 m (81·5 in)	2·483 m (97·8 in)

Overall height measured to top of exhaust pipe

Seat Sifra, upholstered pan with torsion coupling suspension and rubber-plug damping, range of adjustment 43 mm (1·7 in) forwards and backwards

FUEL AND LUBRICANTS USED IN TESTS

Fuel: Diesel oil to Class A2 British Standard 2869: 1970, specific gravity 0·843 at 15·6°C (60°F), viscosity 2·36 cSt at 50°C (122°F), Cetane No. 54

Engine oil: Ford, ESEN/M2C 88/A

Transmission oil: Ford, ESEN/M2C 85/A for gearbox and 86/A for rear axle

COMPULSORY TESTS

1. Main power take-off performance

Date and location of tests: 8th October 1976, N.I.A.E., Silsoe, Bedford, U.K.

Type of dynamometer: Water brake, Heenan and Froude

Power,	*Speed, rev/min*		*Fuel consumption,*			
kW (*hp*)	*Engine*	*P.t.o.*	l/h (*UKgal/h*)	*kg/h* (*lb/h*)	*kg/kWh* (*lb/hph*)	*kWh/l* (*hph/UKgal*)
Maximum power—2 hour test						
46·4 (62·2)	2220	630	14·59 (3·21)	12·30 (27·12)	0·265 (0·436)	3·18 (19·39)
Standard p.t.o. speed (540 rev/min)						
42·5 (57·0)	1902	540	12·69 (2·79)	10·70 (23·59)	0·252 (0·414)	3·35 (20·42)
The speed recommended by the manufacturer for drawbar work						
44·9 (60·2)	2100	596	13·75 (3·02)	11·59 (25·55)	0·258 (0·424)	3·27 (19·94)
Part loads						
(1) 85% of the torque obtained at maximum power						
40·2 (53·9)	2260	642	13·42 (2·95)	11·31 (24·93)	0·281 (0·462)	3·00 (18·29)
(2) Unloaded						
—	2360	670	4·45 (0·98)	3·75 (8·27)	—	—
(3) Half the load defined in (1)						
20·6 (27·6)	2310	656	8·85 (1·95)	7·46 (16·45)	0·362 (0·595)	2·33 (14·20)
(4) Maximum power						
46·4 (62·2)	2220	630	14·59 (3·21)	12·30 (27·12)	0·265 (0·436)	3·18 (19·39)
(5) One quarter of the load defined in (1)						
10·4 (13·9)	2330	662	6·62 (1·46)	5·58 (12·30)	0·537 (0·883)	1·57 (9·57)
(6) Three-quarters of the load defined in (1)						
30·5 (40·9)	2292	651	10·97 (2·41)	9·25 (20·39)	0·303 (0·498)	2·78 (16·95)

No load maximum engine speed		2360 rev/min
Equivalent crankshaft torque at maximum power		199·7 Nm (147·3 lb ft)
Maximum equivalent crankshaft torque		230·2 Nm (169·8 lb ft) at 1100 rev/min engine speed
Mean atmospheric conditions	temperature	16°C (61°F)
	pressure	1017 m bar (30·03 in Hg)
	relative humidity	73%
Maximum temperature	coolant	87°C (189°F)
	engine oil	111°C (232°F)
	fuel	37°C (99°F)
	air intake	27°C (81°F)

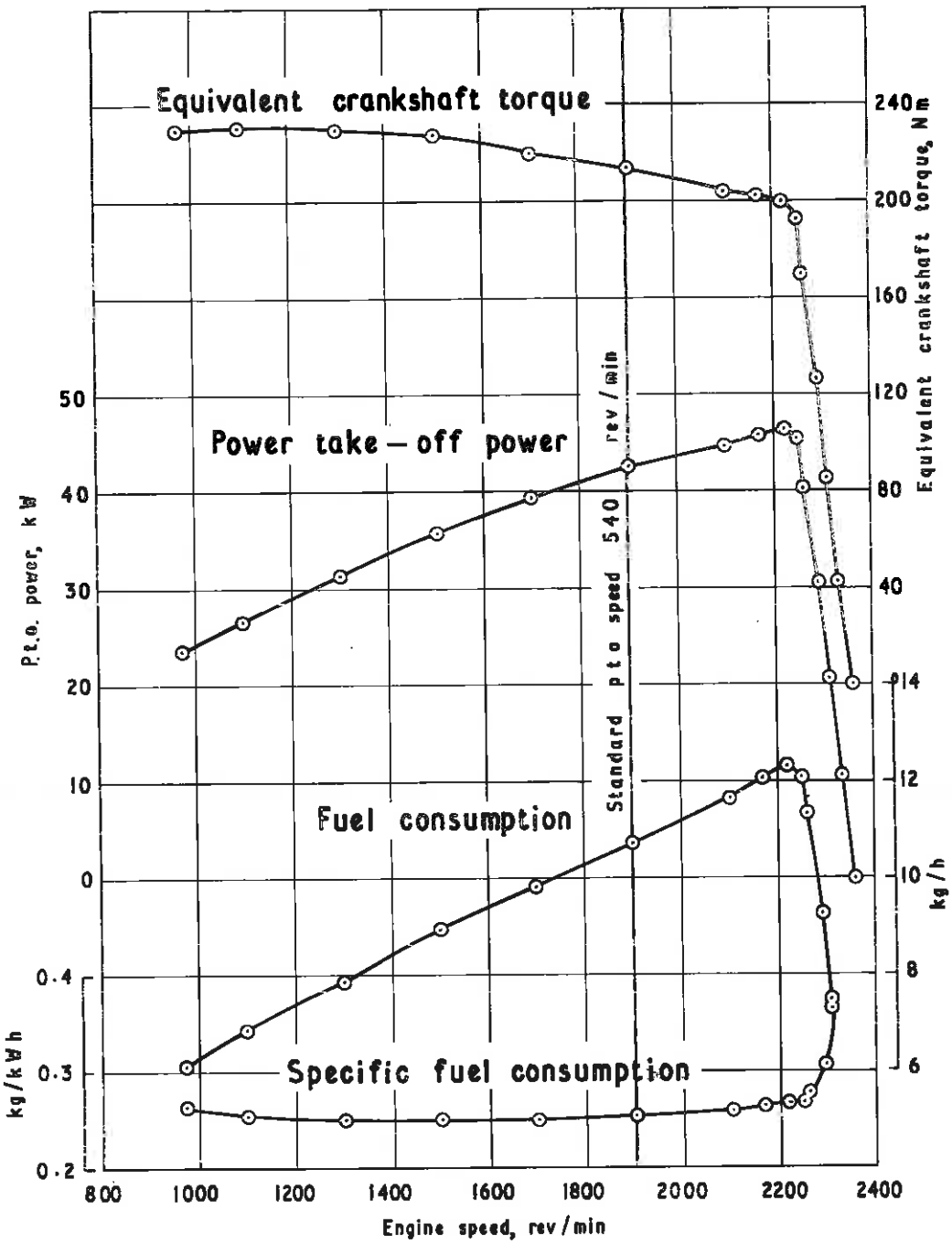


Fig. 1. Power take– off test

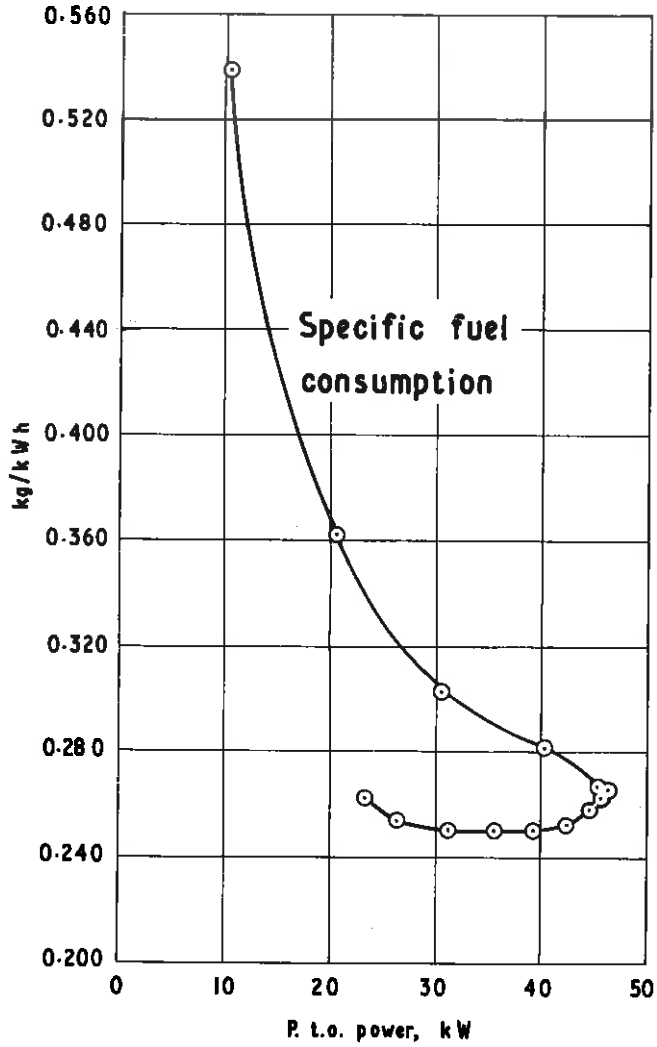


Fig. 2. Power take – off test

2. Drawbar performance

Date of tests: 18th November 1976–18th January 1977 Type of track: Concrete Height of drawbar above ground: 394 mm (15·5 in)

Gear	Power, kW (hp)	Drawbar pull, kN (lb)	Speed, km/h (mile/h)	Engine speed, rev/min	Wheel-slip, %	Specific fuel consumption, kg/kWh (lb/hph)	Specific fuel consumption, kWh/l (hph/UKgal)	Temperature, °C(°F) Coolant	Fuel	Oil	Atmospheric conditions Temperature, °C (°F)	Relative humidity, %	Pressure, mbar (in Hg)
(i) Maximum power (ballasted)													
L1	19·8* (26·6)	31·1 (6990)	2·29 (1·42)	2290	15·0	0·416 (0·684)	2·03 (12·4)	74 (165)	23 (73)	93 (199)	10 (50)	87	1029 (30·39)
L2	24·5* (32·9)	31·1 (6990)	2·84 (1·76)	2274	15·0	0·384 (0·631)	2·20 (13·4)	76 (169)	24 (75)	97 (207)	10 (50)	87	1029 (30·39)
L3	38·9 (52·2)	27·6 (6200)	5·07 (3·15)	2223	12·0	0·320 (0·526)	2·63 (16·0)	76 (169)	21 (70)	99 (210)	9 (48)	93	1036 (30·59)
L4	40·6 (54·4)	(20·2) (4540)	7·24 (4·50)	2220	7·7	0·304 (0·500)	2·77 (16.9)	76 (169)	23 (73)	101 (214)	9 (48)	93	1036 (30·59)
H1	41·7 (55·9)	17·0 (3820)	8·83 (5·49)	2220	6·0	0·296 (0·487)	2·85 (17·4)	76 (169)	26 (79)	97 (207)	9 (48)	93	1036 (30·59)
H2	41·2 (55·3)	13·3 (2990)	11·16 (6·93)	2222	4·5	0·300 (0·493)	2·81 (17·1)	76 (169)	27 (81)	94 (201)	9 (48)	93	1036 (30·59)
(ii) Five hour test at 75% of pull at maximum power													
L4	31·9 (42·8)	15·2 (3420)	7·56 (4·70)	2262	5·2	0·327 (0·538)	2·58 (15·7)	74 (165)	23 (73)	99 (210)	4 (39)	75	1024 (30·24)
(iii) Five hour test at pull corresponding to 15% wheelslip in test (i)†													
L2	—	31·1 (6990)	2·97 (1·85)	2263	—	—	—	75 (167)	25 (77)	97 (207)	6 (43)	81	1024 (30·24)
(iv) Maximum power (unballasted)													
L2	18·3* (24·5)	22·7 (5100)	2·90 (1·80)	2313	15·0	—	—	79 (169)	23 (73)	96 (205)	4 (39)	92	991 (29·26)
L3	31·5 (42·2)	22·2 (4990)	5·11 (3·18)	2265	14·1	—	—	74 (165)	23 (74)	100 (212)	4 (39)	92	991 (29·26)
L4	39·6 (53·1)	20·5 (4610)	6·96 (4·32)	2220	11·6	—	—	77 (171)	22 (72)	99 (210)	4 (39)	92	991 (29·26)
H1	41·8 (56·1)	17·3 (3890)	8·69 (5·40)	2220	8·1	—	—	77 (171)	21 (70)	98 (208)	4 (39)	92	991 (29·26)
H2	41·2 (55·3)	13·3 (2990)	11·16 (6·93)	2220	5·6	—	—	77 (171)	19 (66)	93 (199)	4 (39)	92	991 (29·26)

Total oil consumption during ten hours duration of tests (ii) and (iii) 13·1 g/h (0·029 lb/h)
*Maximum power available at 15% wheelslip
†Test (iii) was carried out with additional ballast and the results for power, slip and fuel consumption have no practical significance

3. Turning space and turning circle

Details of wheel equipment: As in specification, without ballast

Track of wheels: front—1334 mm (52·5 in)
rear—1626 mm (64·0 in)

	With brakes		*Without brakes*	
	Right-hand	*Left-hand*	*Right-hand*	*Left-hand*
Radius of turning space, m (in)	3·29 (130)	3·35 (132)	3·68 (145)	3·70 (146)
Radius of turning circle, m (in)	3·19 (126)	3·25 (128)	3·58 (141)	3·60 (142)

4. Location of centre of gravity

Height above ground, mm (in)	818 (32·2)
Distance forward from the vertical plane containing the axis of the rear wheels, mm (in)	770 (30·3)
Distance from the median plane of the tractor	0

5. Braking

Date of tests: 26th November and 2nd December 1976

Type of track: Concrete

Type of decelerometer: Moto Meter, recording type

Weight of ballasted tractor: 3802 kg (8382 lb)

Cold brakes

	Tractor without ballast		*Tractor ballasted*	
Travelling speed of tractor, km/h (mile/h)	25·0	(15·5)	25·0	(15·5)
Maximum deceleration, m/s² (ft/s²)	4·9	(16·1)	5·5	(18·0)
Stopping distance, m (ft)	6·0	(19·7)	5·5	(18·0)
Force on brake pedal, N (lb)	36·0	(81)	440	(99)
Force exerted on the brake pedal to achieve a deceleration of 2·5 m/s² (8·2 ft/s²), N (lb)	180	(40)	200	(45)

Brake fade characteristics (hot tests, ballasted tractor)

Maximum deceleration hot/maximum deceleration cold × 100: 100%

Stopping distance cold/stopping distance hot × 100: 100%

Force on pedal cold/force on pedal hot × 100: 100%

Efficacy of handbrake: Satisfactory facing up and down 16% slope

Pull on handbrake: 182 N (41 lb)

6. Measurement of ambient noise emitted by the tractor

Date of tests:	26th January 1977
Type of sound level meter:	Bruel and Kjaer 2204
Type of track:	Concrete
Results of test:	
Gear:	H 4
Travelling speed before acceleration:	21·9 km/h (13·6 mile/h)
Sound level:	89 dBA

7. Noise measurement at the driver's ear level

Date of tests:	26th January 1977
Type of sound level meter:	Bruel and Kjaer 2204
Type of track:	Concrete

Gear	*Travelling speed*, km/h (mile/h)*		*dBA*
L4	7·5	(4·7)	95
L3	5·0	(3·1)	96
H1	9·0	(5·6)	96

*The first gear tested corresponds to the travelling speed nearest to 7·25 km/h

8. Power lift and hydraulic pump performance

Date of tests:	24th and 25th January 1977
Hydraulic fluid	
Make and type:	Ford S.A.E. 80 Mild E.P.
Viscosity:	54 cSt at 50°C (122°F)
Type of linkage lock for transport:	Hydraulic
Opening pressure of the cylinder over pressure relief valve (manufacturer's figures):	19·6-20·3 MPa (2840-2940 lb/in²)
Pump characteristics	
(i) Opening pressure of relief valve:	14·5 MPa (2100 lb/in²)
Sustained pressure of the open relief valve:	18·3 MPa (2650 lb/in²)
(ii) Pump delivery rate at minimum pressure and rated engine speed:	36·6 l/min (8·1 gal/min)
(iii) Pump delivery rate at maximum hydraulic power:	38·4 l/min (8·4 gal/min)
Delivery pressure:	14·9 MPa (2160 lb/in²)
Power:	9·5 kW (12·7 hp)

Linkage geometry when connected to the standard frame, mm (in)

	Maximum mechanical advantage	Minimum mechanical advantage
Projected length in side view		
Lower links	864 (34·0)	864 (34·0)
Lift arms	229 (9·0)	229 (9·0)
Lift rods	734 (28·9)	734 (28·9)
Top link	681 (26·8)	691 (27·2)
Distance of lift rod connection point from pivot point of lower link	445 (17·5)	392 (15·4)
The following dimensions are given relative to the rear wheel centre line, situated 660 mm (26·0 in) above the ground level		
Lower link pivot point	102 (4·0) behind, 229 (9·0) below	102 (4·0) behind, 229 (9·0) below
Top link pivot point	286 (11·3) behind, 197 (7·8) above	286 (11·3) behind, 108 (4·3) above
Lift arm pivot point	102 (4·0) forward, 340 (13·4) above	102 (4·0) forward, 340 (13·4) above
Maximum and minimum height of lower link hitch points	222 (8·7) above, 369 (14·5) below	206 (8·1) above, 464 (18·3) below
Height of lower link hitch points when locked in transport position	Any height within lift range	Any height within lift range

Power lift performance

Lifting height in relation to a horizontal line through the lower link pivoting point		*mm* (*in*)	–279 (–11·0)	–229 (–9·0)	–200 (–7·9)	–152 (–6·0)	–127 (–5·0)	–100 (–3·9)	0	+100 (+3·9)	+200 (+7·9)	+300 (+11·8)	+400 (+15·7)	+432 (+17·0)	+500 (+19·7)	+533 (+21·0)	+610 (+24·0)
Lifting force with the pressure at maximum hydraulic horsepower (14·9 MPa (2160 lb/in²)), calculated from measurements made at maximum pressure (18·3 MPa (2650 lb/in²)), kN (lb)	At the hitch points	max. mech. advantage					*16·6 (3730)	17·2 (3870)	18·9 (4250)	19·9 (4470)	20·3 (4560)	20·5 (4610)	21·0 (4720)	21·2 (4770)			
		min. mech. advantage		*13·0 (2920)	13·7 (3080)			15·5 (3480)	16·6 (3730)	17·5 (3930)	18·0 (4050)	18·5 (4160)	19·0 (4270)				
	On the frame	max. mech. advantage				15·9 (3570)		16·6 (3730)	17·2 (3870)	17·1 (3840)	16·5 (3710)	15·8 (3550)	15·0 (3370)		14·1 (3170)	*13·7 (3080)	
		min. mech. advantage	11·9 (2680)		12·4 (2790)			12·7 (2860)	12·8 (2880)	12·9 (2900)	12·7 (2860)	12·5 (2810)	12·3 (2770)		11·7 (2630)		*10·8 (2430)

*Maximum force exerted throughout whole range

Force at which front of tractor is calculated to lift with maximum allowable front ballast is in excess of measured values

Repairs and adjustments during tests	None
Remarks	None

Officer in charge: D. W. Smith

Head of Tractor Department: M. J. Dwyer

Head of Tractor and Cultivation Division: J. Matthews

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