NIAE

OECD Approval No. 588a

Report No. 651

Test in accordance with the OECD standard code for the official testing of agricultural tractors

Report on test of Massey-Ferguson 248 Tractor.



Manufactured by Massey-Ferguson Manufacturing Company,
Banner Lane,
Coventry, Warwickshire.

Test No. R78/2/7013/O.E.C.D.

Date January, 1978.

THE BRITISH SOCIETY FOR RESEARCH IN AGRICULTURAL ENGINEERING

National Institute of Agricultural Engineering
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SPECIFICATION OF TRACTOR

Manufacturer:	Massey-Ferguson Manufacturing Company, Banner Lane, Coventry, Warwickshire
Submitted for test by:	The manufacturer
Selected for test by:	The manufacturer with the agreement of the testing station
Place of running-in:	Coventry
Duration of running-in:	50 hours

Tractor

Make:	Massey-Ferguson
Model:	M.F. 248
Type:	Four wheel, rear wheel driven, unit construction
Serial No.:	C475004

Engine

Make:	Perkins
Model:	AD3 152 DL
Type:	4-stroke, direct injection diesel
Serial No.:	AD3-152 UA 343385D
Cylinders:	3 cylinders, vertical, in-line, 91.4 mm (3.6 in) dia bore x 127 mm (5.0 in) stroke, capacity 2500 cm^3 ($153\ in^3$), compression ratio 18.5:1 (nominal), replaceable dry cylinder liners, overhead valves
Fuel system:	A.C. Delco mechanical fuel feed pump with hand-primer, C.A.V. paper element filter with sediment bowl on pressure side of feed pump; fuel tank capacity 47.7 l (10.5 U.K. gal); C.A.V. distributor type DPA 3230 F 350 injection pump, Serial No. R20346XT, manufacturer's production setting 9.55 - 9.94 l/h (16.8 - 17.5 pt/h) at 2250 rev/min engine speed and 63 °C (145 °F) cambox temperature: C.A.V.

Fuel system continued ...	type BDLL 150S6554 injector nozzles, injection pressure 18.75 MPa (185 atm), pump delivery starts 24° before T.D.C.
Governor:	C.A.V. mechanical, incorporated in fuel injection pump, governed range of engine speed 700 to 2470 rev/min, rated engine speed 2250 rev/min
Air cleaner:	A.C. oil bath, oil capacity 0.47 l (0.83 pt) situated forward of radiator, Lautrette type CR 5100-2 centrifugal pre-cleaner above bonnet
Lubrication system:	Forced feed from rotor type pump with metal strainer in sump; full flow replaceable element filter; total oil capacity 6.8 l (12.0 pt), recommended oil S.A.E. 20/30, viscosity 54 cSt at 50 °C (122 °F), change period 250 hours
Cooling system:	Water cooled, pressurised at 50 kPa (7 lb/in^2) thermosyphon assisted by centrifugal pump, 394 mm (15.5 in) dia 4-blade belt driven fan, thermostat for temperature control, cooling water capacity 10.2 l (18.0 pt)
Starting system:	Electrical, Lucas M45G solenoid engaged starter motor, operable only when high-low gear selector lever is in neutral position, C.A.V. Mk IIIC thermostart manifold flame type cold starting aid

Electrical system

Voltage:	12, negative earth
Generator:	Lucas alternator type 16 ACR
Battery:	Exide Supreme 253, lead-acid, 95 Ah at 20-hour rating

Transmission

Clutch:	Laycock, dual, dry, pedal-operated, 254 mm (10.0 in) dia plate for p.t.o. drive, and 305 mm (12.0 in) dia plate for gearbox drive
Gearbox:	Own make, sliding gear, 8 forward and 2 reverse speeds, comprising 4 forward and 1 reverse speed gearbox with high-low range epicyclic gear
Rear axle and final drives:	Own make, crown wheel and pinion and differential, pedal-operated differential lock

Oil capacities:

Common transmission and final drives 25.0 l (44.0 pt), recommended oil S.A.E. 20W/30, viscosity 54 cSt at 50 °C (122 °F), change period 500 hours

Gear		Number of engine revolutions for one revolution of driving wheel	Nominal travelling speed for 2250 rev/min rated engine speed,* km/h	(mile/h)
Forward				
Low	1	200.99	2.44	(1.52)
	2	137.04	3.57	(2.22)
	3	100.33	4.88	(3.03)
	4	74.75	6.55	(4.07)
High	1	50.25	9.74	(6.05)
	2	34.26	14.29	(8.88)
	3	25.08	19.51	(12.13)
	4	18.69	26.19	(16.28)
Reverse				
	1	147.58	3.32	(2.06)
	2	36.90	13.26	(8.24)

*Calculated with a tyre rolling radius of 577 mm (22.7 in)

Power take-off

At rear of tractor in vertical centre plane, height above ground 454 mm (17.9 in), 6-spline, 34.9 mm (1⅜ in) dia to I.S.O. Standard, engaged by hand lever and second plate of clutch, proportional engine speed giving 637 rev/min at 2250 rev/min rated engine speed, 540 rev/min (standard p.t.o. speed) at 1908 rev/min engine speed, direction of rotation clockwise viewed facing driving end

Belt pulley

Attachable to rear of tractor in two alternative horizontal positions, p.t.o. driven, 229 mm (9.0 in) dia x 165 mm (6.5 in) face width, 1161 rev/min giving 834 m/min (2736 ft/min) at 2250 rev/min rated engine speed, the standard belt speed of 945 m/min (3100 ft/min) could not be attained, direction of rotation related to position of unit

Power lift	Massey-Ferguson, hydraulic, 4 cylinder piston pump driven through second plate of clutch, oil supplied from transmission housing to ram cylinder and external tapping; Category 1 or 2 implement linkage, top link sensing, draught, position and pressure control, selective response on drop
Drawbar	Swinging drawbar, vertical height to centre of clevis 234 mm (9.2 in) and 386 mm (15.2 in), changed by inverting drawbar, distance behind rear axle centre 537 mm (21.1 in) and 651 mm (25.6 in), distance behind p.t.o. 241 mm (9.5 in) and 356 mm (14.0 in), lateral adjustment 451 mm (17.8 in) and 518 mm (20. 4 in), pivot position 130 mm (5.1 in) forward of rear wheel centre, drawbar pin hole 26 mm (1.0 in) dia
Steering	Worm and nut type with recirculating balls, double drag links and drop arms
Brakes	Girling, internal expanding with drums on differential half-shafts; independent or combined pedal-operated, hand lever with ratchet operating both brakes for parking
Wheels	
Steering wheels:	Two at front, Goodyear Triple Rib 6.00-16 cross-ply tyres, 6-ply rating, maximum permissible mass on each tyre 560 kg (1235 lb) at 324 kPa (47.0 lb/in^2), track width 1245 mm (49.0 in) by 102 mm (4.0 in) steps to 1857 mm (73.1 in), changed by extending axle
Driving wheels:	Two at rear, Goodyear Traction Sure Grip 12.4/11-28 cross-ply tyres, 6-ply rating, maximum permissible mass on each tyre 1275 kg (2810 lb) at 165 kPa (24.0 lb/in^2), track width 1330 mm (52.4 in by 102 mm (4.0 in) steps to 1942 (76.5 in), changed by reversing wheels and offset lug rims
Wheelbase:	1892 mm (74.5 in)
Seat	Sankey, pan type, with cushion and back rest, range of adjustment 102 mm (4.0 in) forwards and backwards

Lighting

Unrestricted beam angle of headlight in plan view 144°

	Height above ground of centre, mm (in)	Size, mm (in)	Distance from outside edge of tractor at 1330 mm (52.4 in) wheel track, to centre, mm (in)
Headlights	692 (27.2)	124 (4.9) dia	673 (26.5)
Side lights	1287 (50.7)	100 (3.9) x 32 (1.3)	118 (4.6)
Rear lights	1251 (49.3)	76 (3.0) x 40 (1.6)	200 (7.9)
Reflectors	1181 (46.5)	70 (2.8) x 32 (1.3)	163 (6.4)

Number of grease points

Whole tractor: 11

CONDITIONS DURING TEST

Masses

Tractor (without driver but with tanks full)

	Front, kg (lb)	Rear, kg (lb)	Total, kg (lb)
Without ballast	682 (1504)	934 (2059)	1616 (3563)
With ballast	1037 (2286)	2313 (5099)	3349 (7383)

Ballast

	Number of weights	Total weight, kg (lb)	Water, kg (lb)
Front wheels	Nil	Nil	Nil
Rear wheels	20	1098 (2421)	311 (686)
Additional	8	324 (714)	Front frame and weights

Track setting during tests

Front - 1245 mm (49.0 in)

Rear - 1330 mm (52.4 in)

Overall dimensions

	Length, m (in)	Width, m (in)	Height, m (in)
With ballast	3.54 (139.4)	2.45 (96.5)	2.11 (83.1)
Without ballast	3.10 (122.1)	1.64 (64.5)	2.13 (84.0)

Overall height measured to top of exhaust pipe

FUEL AND LUBRICANTS USED IN TESTS

Fuel:	Laboratory tests:	Diesel oil to Class A2 British Standard 2869: 1970, specific gravity 0.837 at 15.6 °C (60 °F), viscosity 2.34 cSt at 50 °C (122 °F), Cetane No. 52.7
	Track tests:	Diesel oil to Class A2 British Standard 2869: 1970, specific gravity 0.845 at 15.6 °C (60 °F), viscosity 2.49 cSt at 50 °C (122 °F), Cetane No. 53.8
Engine oil:		Agricastrol M.P. S.A.E. 20W/30, viscosity 54 cSt at 50 °C (122 °F)
Transmission oil:		Agricastrol M.P. S.A.E. 20W/30, viscosity 54 cSt at 50 °C (122 °F)

COMPULSORY TESTS

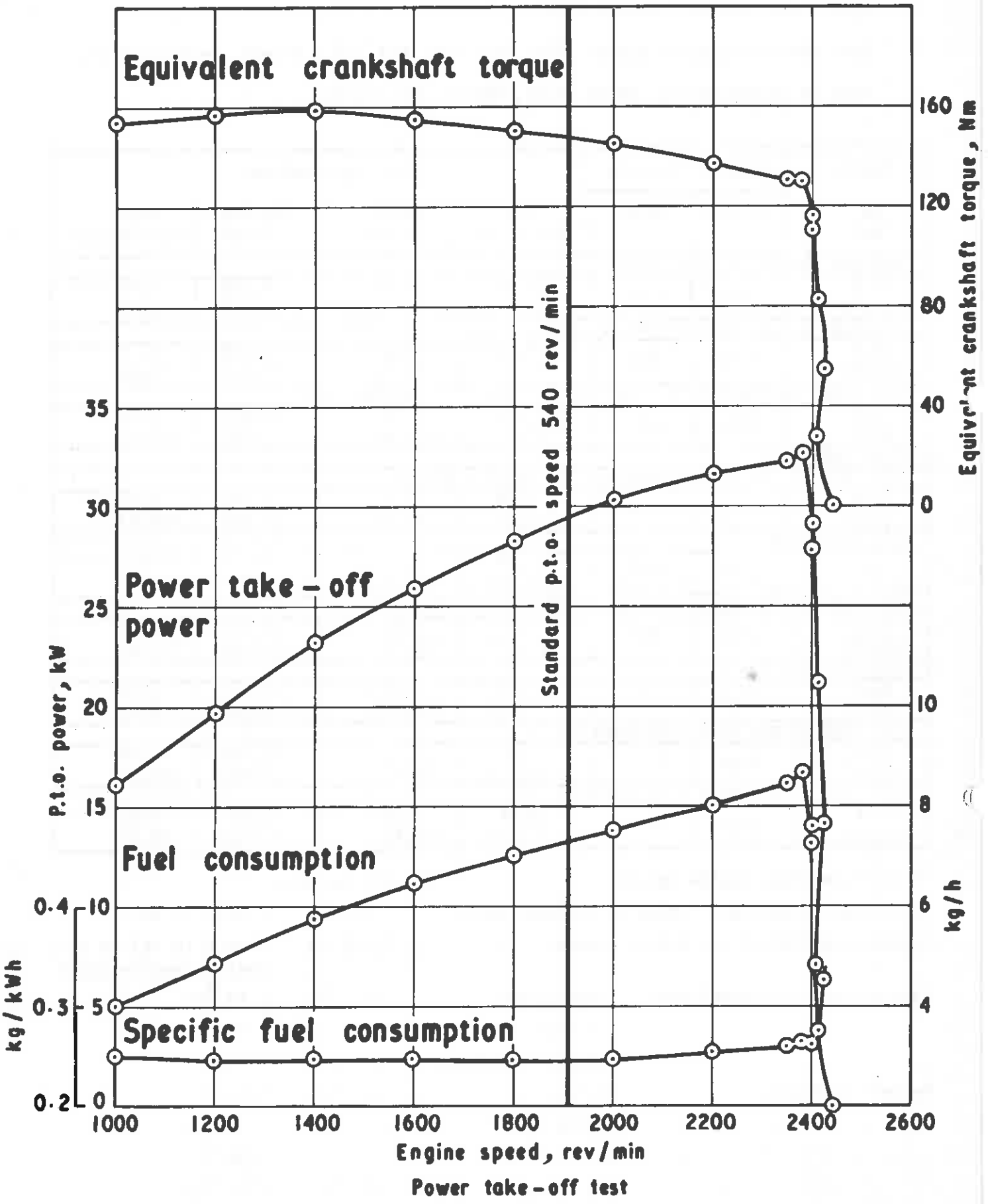
1. MAIN POWER TAKE-OFF PERFORMANCE

Date and location of tests: 26th May 1977, N.I.A.E., Silsoe, Bedford, U.K.

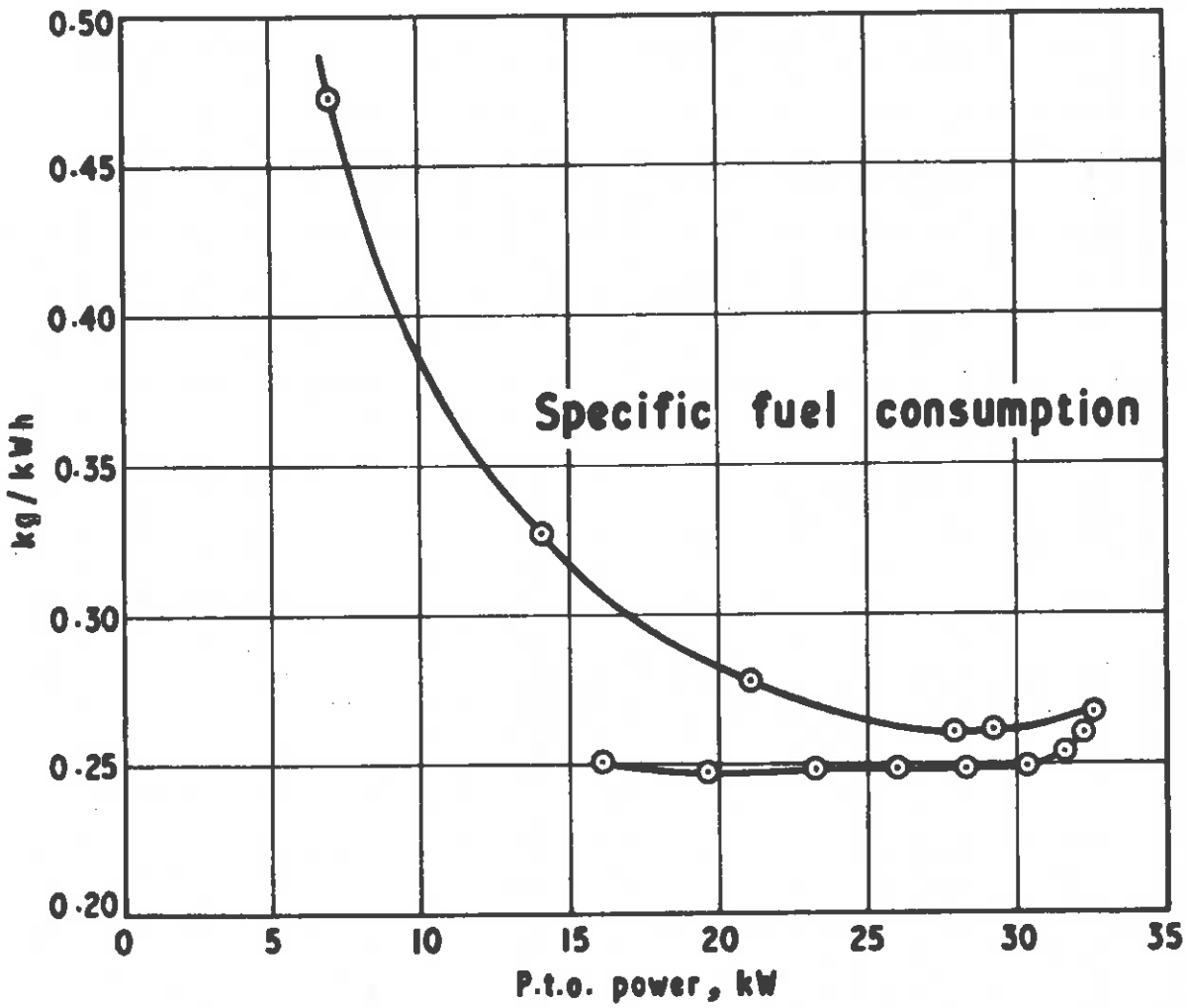
Type of dynamometer: Water brake, Heenan and Froude

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						
32.6 (43.7)	2380	674	10.37 (2.28)	8.67 (19.11)	0.266 (0.438)	3.14 (19.1)
Standard p.t.o. speed (540 rev/min)						
29.5 (39.6)	1908	540	8.74 (1.92)	7.32 (16.14)	0.248 (0.408)	3.38 (20.6)
The speed recommended by the manufacturer for drawbar work						
31.9 (42.8)	2250	637	9.79 (2.15)	8.20 (18.08)	0.257 (0.423)	3.26 (19.9)
Part loads						
(1) 85% of the torque obtained at maximum power						
27.9 (37.4)	2398	679	8.68 (1.91)	7.25 (15.98)	0.260 (0.428)	3.22 (19.6)
(2) Unloaded						
0	2441	691	2.79 (0.61)	2.33 (5.14)	-	-
(3) 50% of the torque defined in (1)						
14.1 (18.9)	2423	686	5.51 (1.21)	4.61 (10.16)	0.327 (0.538)	2.56 (15.6)
(4) Maximum power						
32.6 (43.7)	2380	674	10.37 (2.28)	8.67 (19.11)	0.266 (0.438)	3.14 (19.1)
(5) 25% of the torque defined in (1)						
7.0 (9.4)	2407	681	3.95 (0.87)	3.30 (7.28)	0.472 (0.776)	1.77 (10.8)
(6) 75% of the torque defined in (1)						
21.1 (28.3)	2414	683	6.98 (1.54)	5.84 (12.87)	0.277 (0.456)	3.02 (18.4)

No load, maximum engine speed		2441 rev/min	
Equivalent crankshaft torque at maximum power		130.8 Nm	(96.5 lb ft)
Maximum equivalent crankshaft torque		159.5 Nm	(117.6 lb ft) at 1380 rev/min engine speed
Mean atmospheric conditions	temperature	23 °C	(73 °F)
	pressure	1016 m bar	(30.00 in Hg)
	relative humidity	61 %	
Maximum temperature	coolant	87 °C	(189 °F)
	engine oil	112 °C	(233 °F)
	fuel	42 °C	(108 °F)
	air intake	28 °C	(82 °F)



Power take-off test



Power take - off test

2. DRAWBAR PERFORMANCE Date of tests: 1st August-29th September 1977 Type of track: Tarmacadam Height of drawbar above ground 343 mm (13.5 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	Engine oil	Atmospheric conditions Temperature, °C (°F)	Relative humidity, %	Pressure, millibar (in Hg)
(i) MAXIMUM POWER (ballasted)													
L1	14.0* (18.8)	22.75 (5114)	2.22 (1.38)	2424	15.0	0.399 (0.656)	2.12 (12.9)	78 (172)	28 (82)	102 (216)	18 (64)	50	1005 (29.69)
L2	20.4* (27.4)	22.75 (5114)	3.23 (2.01)	2418	15.0	0.372 (0.612)	2.27 (13.8)	82 (180)	26 (79)	94 (201)	18 (64)	52	1005 (29.69)
L3	25.7 (34.5)	20.69 (4651)	4.47 (2.78)	2378	11.8	0.349 (0.574)	2.42 (14.8)	85 (185)	35 (95)	102 (216)	25 (77)	48	1008 (29.76)
L4	27.2 (36.5)	15.43 (3469)	6.35 (3.95)	2380	7.2	0.314 (0.516)	2.69 (16.4)	85 (185)	34 (93)	100 (212)	24 (75)	54	1008 (29.76)
H1	29.2 (39.2)	10.93 (2457)	9.62 (5.98)	2388	4.5	0.300 (0.493)	2.82 (17.2)	89 (192)	34 (93)	109 (228)	22 (72)	52	1008 (29.76)
H2	29.2 (39.2)	7.35 (1652)	14.30 (8.89)	2377	2.8	0.299 (0.492)	2.83 (17.3)	85 (185)	36 (97)	105 (221)	24 (75)	55	1008 (29.76)
(ii) FIVE HOUR TEST AT 75% OF PULL AT MAXIMUM POWER													
L4	21.0 (28.2)	11.57 (2601)	6.53 (4.06)	2414	5.1	0.319 (0.524)	2.65 (16.2)	82 (180)	25 (77)	107 (225)	13 (55)	63	1017 (30.04)
(iii)+ FIVE HOUR TEST AT PULL CORRESPONDING TO 15% WHEELSLIP IN TEST (i)													
L2	-	22.75 (5114)	3.37 (2.09)	-	-	-	-	83 (181)	25 (77)	108 (226)	14 (57)	62	1013 (29.92)
(iv) MAXIMUM POWER (unballasted)													
L2	11.6* (15.6)	12.95 (2889)	3.22 (2.00)	2434	15.0	-	-	82 (180)	25 (77)	90 (194)	18 (64)	56	1011 (29.84)
L3	15.7* (21.1)	12.95 (2889)	4.36 (2.71)	2419	15.0	-	-	80 (176)	23 (73)	88 (190)	17 (63)	60	1011 (29.84)
L4	21.1* (28.3)	12.95 (2889)	5.87 (3.65)	2403	15.0	-	-	80 (176)	24 (75)	94 (201)	19 (66)	52	1011 (29.84)
H1	28.5 (38.2)	10.92 (2455)	9.40 (5.84)	2363	7.9	-	-	83 (181)	24 (75)	95 (203)	17 (63)	50	1012 (29.88)
H2	29.3 (39.3)	7.39 (1661)	14.27 (8.87)	2364	3.8	-	-	85 (185)	25 (77)	99 (210)	15 (59)	58	1012 (29.88)
H3	28.0 (37.5)	5.10 (1147)	19.76 (12.28)	2381	2.6	-	-	85 (185)	27 (81)	99 (210)	16 (61)	59	1009 (29.80)

Total oil consumption during ten hours duration of tests (ii) and (iii) 9.1 g/h (0.020 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 - 1245 mm (49.0 in)
rear - 1330 mm (52.4 in)

	With brakes		Without brakes	
	Right-hand	Left-hand	Right-hand	Left-hand
Radius of turning space, m (in)	2.97 (117)	3.03 (119)	3.23 (127)	3.26 (128)
Radius of turning circle, m (in)	2.88 (113)	2.94 (116)	3.14 (124)	3.17 (125)

4. LOCATION OF CENTRE OF GRAVITY

Height above ground, mm (in)	704 (27.7)
Distance forward from the vertical plane containing the axis of the rear wheels, mm (in)	777 (30.6)
Distance from the median plane of the tractor	0

5. BRAKING

Date of tests: 14th and 21st September 1977
Type of track: Tarmacadam
Type of decelerometer: Moto Meter, recording type
Weight of ballasted tractor: 3350 kg (7385 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/s^2 (ft/s^2)	4.1 (13.6)	4.6 (15.0)
Stopping distance, m (ft)	6.1 (20.0)	5.5 (18.0)
Force on brake pedal, N (lb)	374 (84)	547 (123)
Force exerted on the brake pedal to achieve a deceleration of 2.5 m/s^2 (8.2 ft/s^2), N (lb)	240 (54)	338 (76)

Brake fade characteristics (hot tests, ballasted tractor)

Maximum deceleration hot/maximum deceleration cold x 100: 100%
Stopping distance cold/stopping distance hot x 100: 92%
Force on pedal cold/force on pedal hot x 100: 93%
Efficacy of handbrake: Satisfactory facing up and down 16% slope
Pull on handbrake: 280 N (63 lb)

6. MEASUREMENT OF AMBIENT NOISE

Date of tests:	11th October 1977
Type of sound level meter:	Bruel and Kjaer 2206
Type of track:	Tarmacadam
Results of tests:	
Gear:	H4
Travelling speed before acceleration:	21.0 km/h (13.1 mile/h)
Sound level:	90 dBA

7. NOISE MEASUREMENT AT THE DRIVER'S EAR LEVEL

Date of tests:	11th October 1977
Type of sound level meter:	Bruel and Kjaer 2206
Type of track:	Tarmacadam

Gear	Travelling speed, km/h	(mile/h)	dBA
L4	6.4	(4.0)	101
H1	9.7	(6.0)	102

8. POWER LIFT AND HYDRAULIC PUMP PERFORMANCE

Date of tests: 7th and 9th November 1977

Hydraulic fluid

Make and type:	Agricastrol M.P. S.A.E. 20W/30
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): 18.3-19.3 MPa (2650-2800 lb/in^2)

Pump characteristics

i)	Opening pressure of relief valve:	17.7 MPa	(2570 lb/in^2)
	Sustained pressure of the open relief valve:	18.9 MPa	(2740 lb/in^2)
ii)	Pump delivery rate at minimum pressure and rated engine speed:	18.37 l/min	(4.04 gal/min)
iii)	Pump delivery rate at maximum hydraulic power:	17.82 l/min	(3.92 gal/min)
	Delivery pressure:	17.7 MPa	(2570 lb/in^2)
	Power:	5.2 kW	(7.0 hp)

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

Projected length in side view		
Lower links	873	(34.4)
Lift arms	267	(10.5)
Lift rods	572	(22.5)
Top link	698	(27.5)
Distance of lift rod connection point from pivot point of lower link	448	(17.6)
The following dimensions are given relative to the rear wheel centre line, situated 577 mm (22.7 in) above the ground level		
Lower link pivot point	44 (1.7) forward,	114 (4.5) below
Top link pivot point	134 (5.3) behind,	273 (10.7) above
Lift arm pivot point	196 (7.7) forward,	233 (9.2) above
Maximum and minimum height of lower link hitch points	279 (11.0) above,	437 (17.2) below
Height of lower link hitch points when locked in transport position	Any height within lift range	

Power lift performance

Lifting height in relation to a horizontal line through the lower link pivoting point	mm (in)	-360 (-14.2)	-320 (-12.6)	-240 (-9.5)	-160 (-6.3)	-80 (-3.2)	0	+80 (+3.2)	+160 (+6.3)	+240 (+9.5)	+320 (+12.6)	+380 (+15.0)	+400 (+15.7)	+440 (+17.3)
Lifting force with the pressure at maximum hydraulic power (17.7 MPa(2570 lb/in^2)) calculated from measurements made at maximum pressure (18.9 MPa(2740 lb/in^2)), kN (lb)	At the hitch points		*12.7 (2850)	13.6 (3060)	14.4 (3240)	15.1 (3390)	15.6 (3510)	15.9 (3570)	16.2 (3640)	16.4 (3690)	16.6 (3730)	16.7 (3750)		
	On the frame	12.3 (2760)	12.5 (2810)	12.8 (2880)	13.1 (2950)	13.3 (2990)	13.3 (2990)	13.4 (3010)	13.2 (2970)	13.0 (2920)	12.7 (2860)		12.4 (2790)	12.2* (2740)

* 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.

OPTIONAL TESTS

9. PERFORMANCE AT ENGINE CRANKSHAFT

Date and location of tests: 31st May 1977, N.I.A.E., Silsoe, Bedford, U.K.

Type of dynamometer: Water brake, Heenan and Froude

Power, kW (hp)	Engine speed, rev/min	Fuel consumption, l/h (UKgal/h)	kg/h (lb/h)	kg/kWh (lb/hph)	kWh/l (hph/UKgal)
Maximum power - 2 hour test					
34.7 (46.5)	2380	10.33 (2.27)	8.64 (19.05)	0.249 (0.409)	3.36 (20.5)
The speed recommended by the manufacturer for drawbar work					
33.6 (45.1)	2250	9.84 (2.16)	8.23 (18.14)	0.245 (0.403)	3.41 (20.8)
Part loads					
(1) 85% of the torque obtained at maximum power					
30.0 (40.2)	2415	9.18 (2.02)	7.68 (16.93)	0.256 (0.421)	3.27 (19.9)
(2) Unloaded					
0	2438	2.90 (0.64)	2.43 (5.36)	-	-
(3) 50% of the torque defined in (1)					
15.1 (20.2)	2437	5.67 (1.25)	4.74 (10.45)	0.314 (0.516)	2.66 (16.2)
(4) Maximum power					
34.7 (46.5)	2380	10.33 (2.27)	8.64 (19.05)	0.249 (0.409)	3.36 (20.5)
(5) 25% of the torque defined in (1)					
7.5 (10.1)	2422	4.19 (0.92)	3.50 (7.72)	0.467 (0.768)	1.79 (10.9)
(6) 75% of the torque defined in (1)					
22.6 (30.3)	2429	7.27 (1.60)	6.08 (13.40)	0.269 (0.442)	3.11 (19.0)

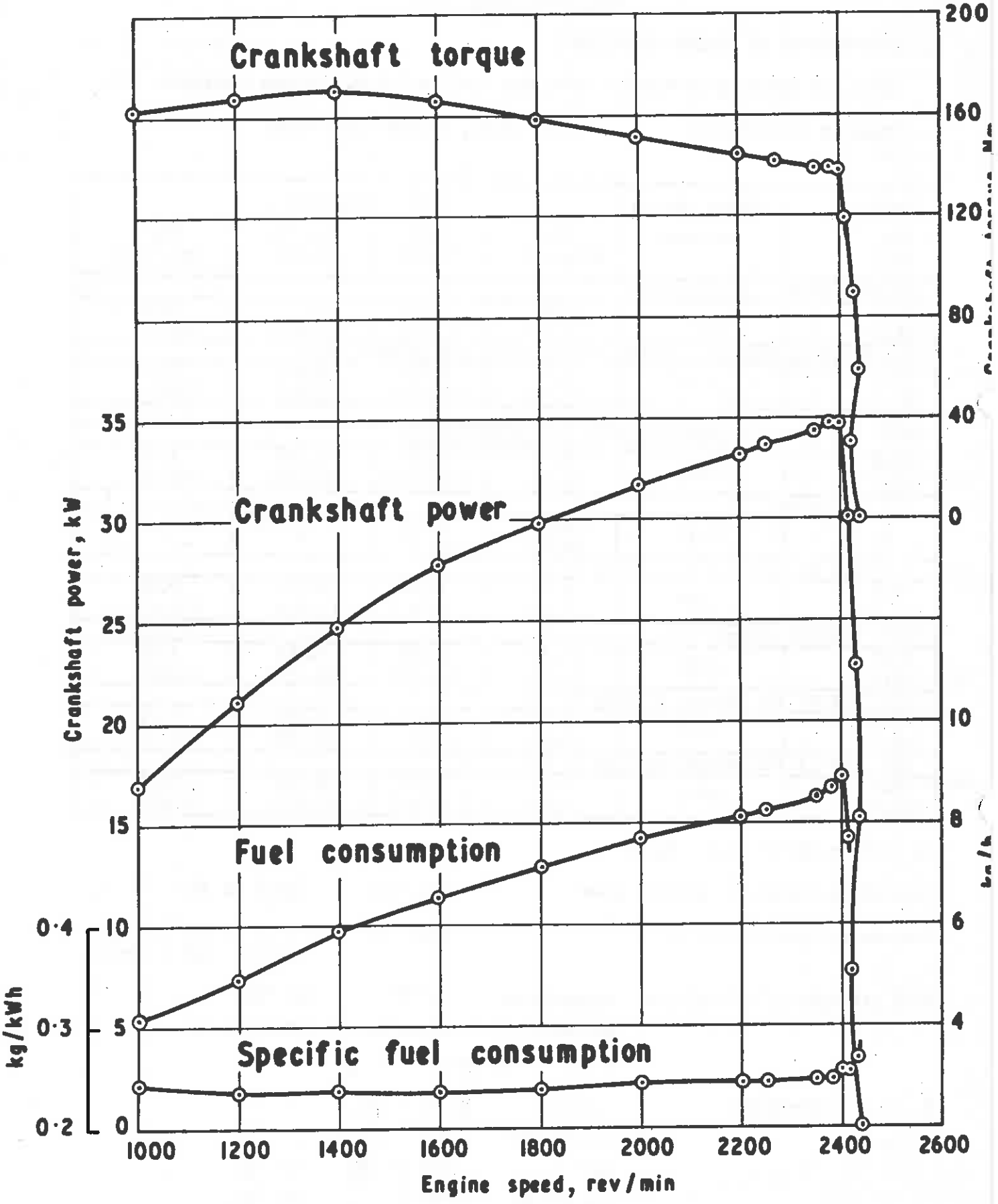
No load, maximum engine speed 2438 rev/min

Crankshaft torque at maximum power 139.4 Nm (102.8 lb ft)

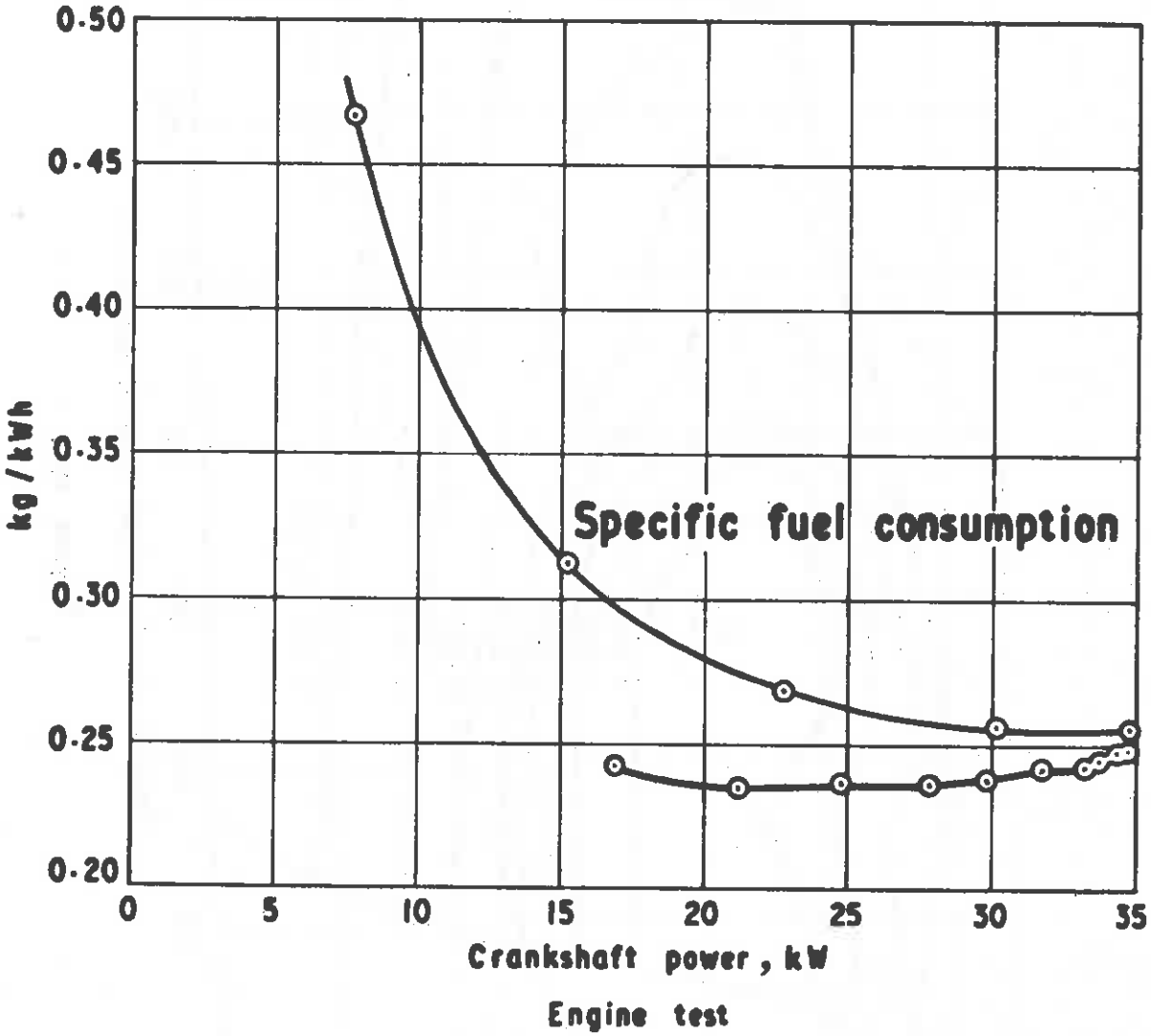
Maximum crankshaft torque 169.4 Nm (124.9 lb ft) at 1380 rev/min engine speed

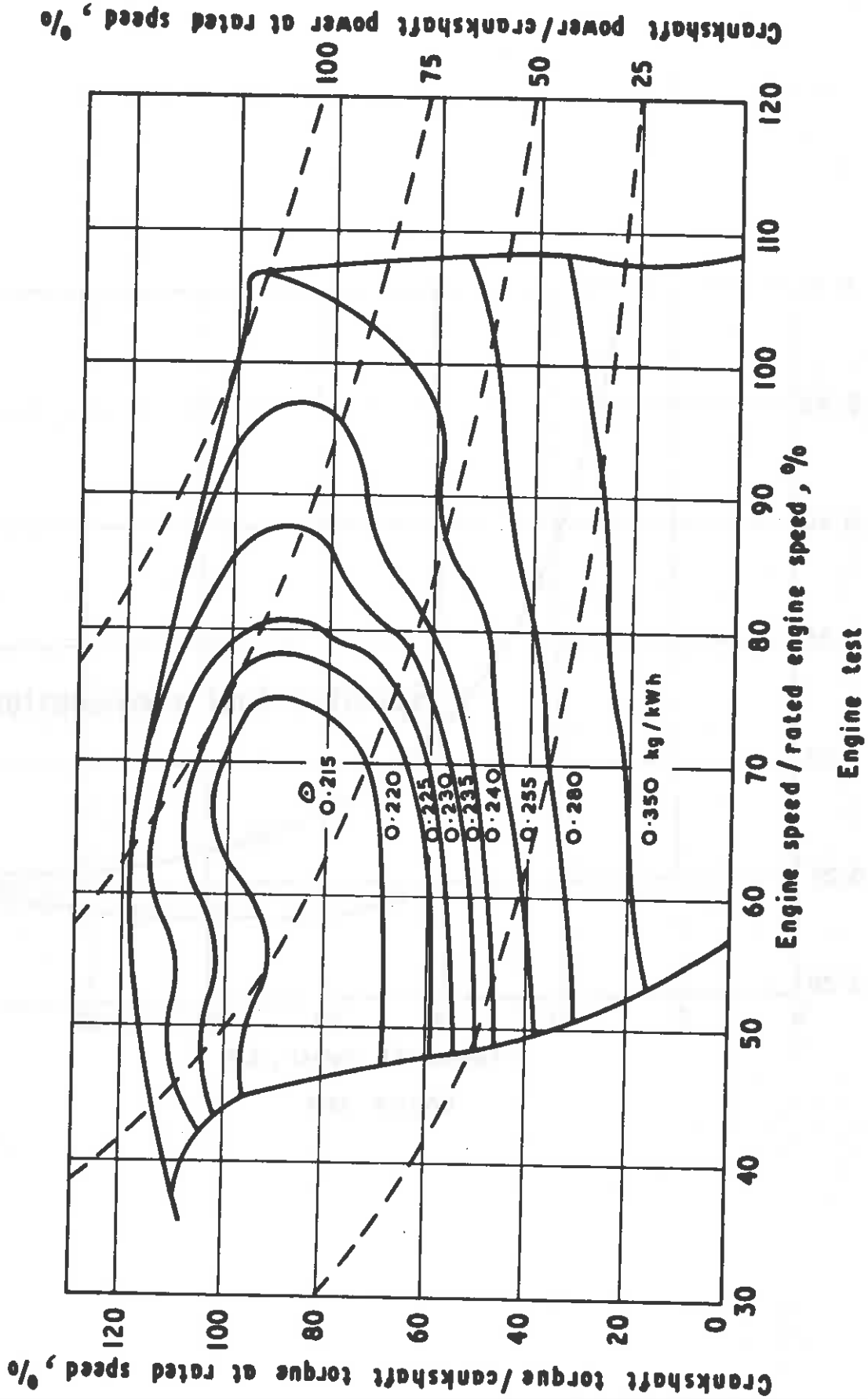
Mean atmospheric conditions
- temperature 16 °C (61 °F)
- pressure 1024 m bar (30.24 in Hg)
- relative humidity 54%

Maximum temperature
- coolant 85 °C (185 °F)
- engine oil 104 °C (220 °F)
- fuel 33 °C (92 °F)
- air intake 19 °C (66 °F)


Crankshaft torque
Crankshaft power
Fuel consumption
Specific fuel consumption
Crankshaft power, kW
kg/kWh
Engine speed, rev/min
1000
1200
1400
1600
1800
2000
2200
2400
2600
200
160
120
80
40
0
10
8
6
4
35
30
25
20
15
10
5
0
0·4
0·3
0·2

Engine test


0.50
0.45
0.40
0.35
0.30
0.25
0.20
kg / kWh
Specific fuel consumption
0
5
10
15
20
25
30
35
Crankshaft power , kW
Engine test


Crankshaft power/crankshaft power at rated speed, %
100
75
50
25
120
110
100
90
80
70
60
50
40
30
Engine speed/rated engine speed, %
Engine test
0·215
0·220
0·225
0·230
0·235
0·240
0·255
0·280
0·350 kg/kWh
Crankshaft torque/crankshaft torque at rated speed, %
120
100
80
60
40
20
0

10. PERFORMANCE AT THE BELT PULLEY

Date and location of tests: 16th June 1977, N.I.A.E., Silsoe, Bedford, U.K.

Type of dynamometer: Water brake, Heenan and Froude

Power, kW (hp)	Speed, rev/min		Fuel consumption,			
	Engine	Belt pulley	l/h (UKgal/h)	kg/h (lb/h)	kg/kWh (lb/hph)	kWh/l (hph/UKgal)
Maximum power - 2 hour test						
31.6 (42.4)	2364	1220	10.20 (2.24)	8.53 (18.81)	0.270 (0.444)	3.10 (18.9)
Standard belt speed of 945 m/min (3100 ft/min)						
Not attainable						
The speed recommended by the manufacturer for drawbar work						
31.0 (41.6)	2250	1161	9.63 (2.12)	8.06 (17.77)	0.260 (0.427)	3.22 (19.6)
Part loads						
(1) 85% of the torque obtained at maximum power						
27.0 (36.2)	2372	1224	8.62 (1.90)	7.21 (15.90)	0.267 (0.439)	3.13 (19.1)
(2) Unloaded						
0	2430	1254	2.89 (0.64)	2.42 (5.34)	-	-
(3) 50% of the torque defined in (1)						
13.7 (18.4)	2404	1241	5.39 (1.19)	4.51 (9.94)	0.329 (0.541)	2.54 (15.5)
(4) Maximum power						
31.6 (42.4)	2364	1220	10.20 (2.24)	8.53 (18.81)	0.270 (0.444)	3.10 (18.9)
(5) 25% of the torque defined in (1)						
6.9 (9.3)	2412	1245	3.98 (0.88)	3.33 (7.34)	0.482 (0.792)	1.74 (10.6)
(6) 75% of the torque defined in (1)						
20.4 (27.4)	2392	1235	6.93 (1.52)	5.79 (12.76)	0.284 (0.467)	2.95 (18.0)

No load, maximum engine speed 2430 rev/min

Equivalent crankshaft torque at maximum power 127.7 Nm (94.2 lb ft)

Maximum equivalent crankshaft torque 154.0 Nm (113.6 lb ft at 1380 rev/min engine speed

Mean atmospheric conditions temperature 18 °C (64 °F)

pressure 1018 m bar (30.06 in Hg)

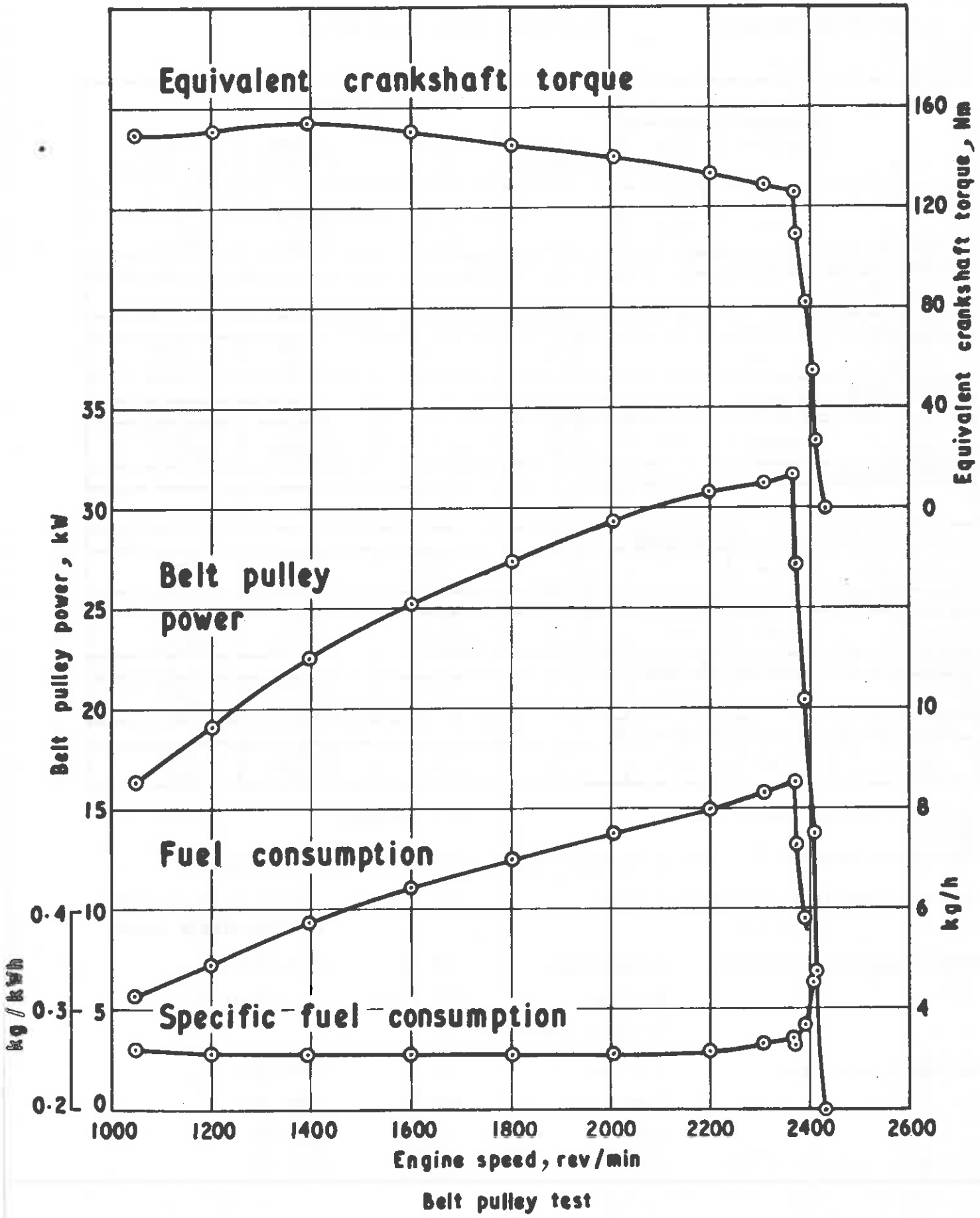
relative humidity 65 %

Maximum temperature coolant 87 °C (189 °F)

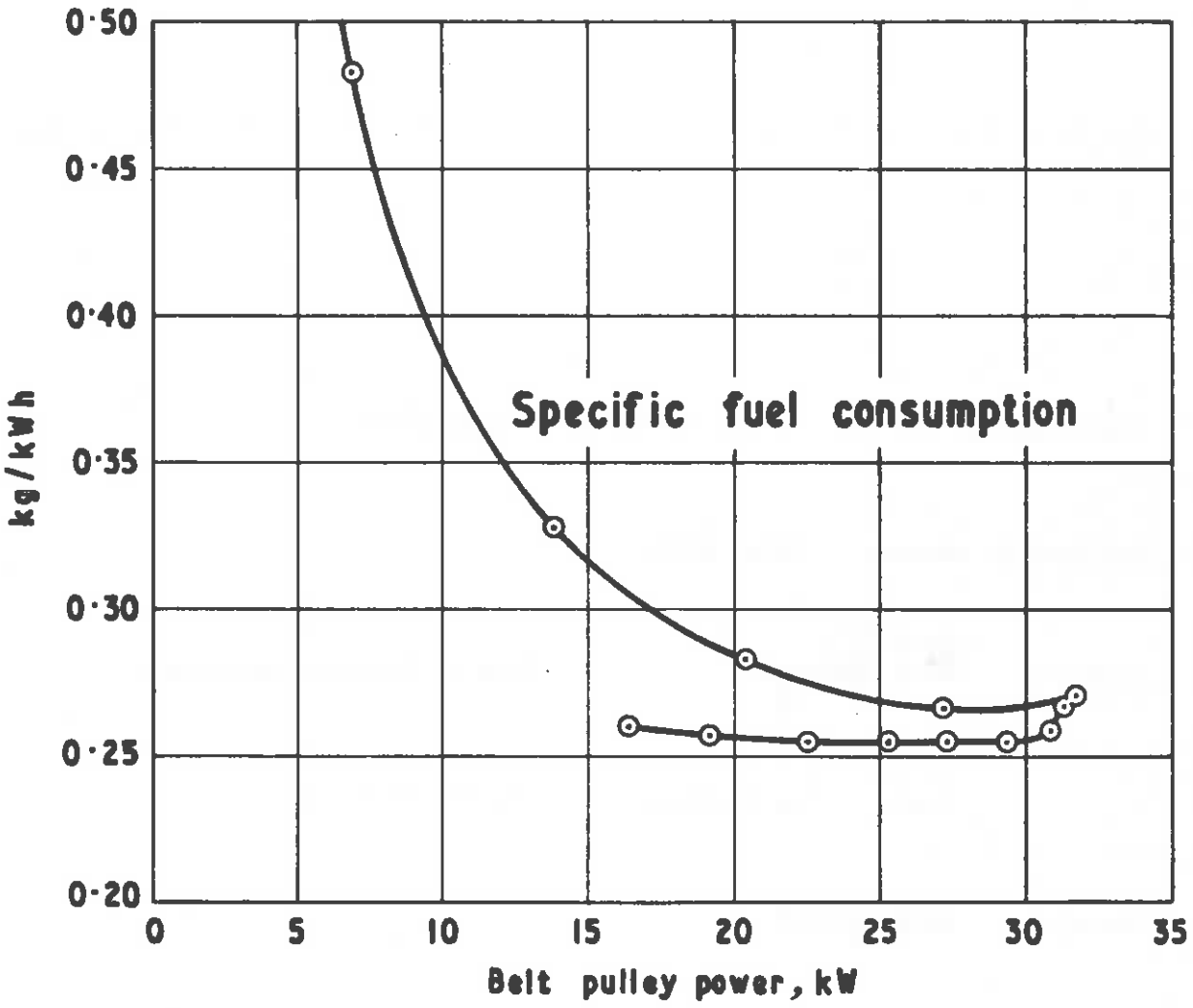
engine oil 103 °C (217 °F)

fuel 39 °C (102 °F)

air intake 23 °C (73 °F)



Belt pulley test



Belt pulley test

REPAIRS AND ADJUSTMENTS DURING TESTS

A rear sump cork seal was replaced during the drawbar tests.

REMARKS

None

Test carried out by: F. Thistlethwaite, T.W. Brown

Officer in charge: D.W. Smith

Signed: [signature] Head of Tractor Department

[signature] for the Director

Date: 11/1/78