O. E. C. D. Approval No. : 851

Report on test in accordance with

O. E. C. D. Test Code for Agricultural Tractors

KUBOTA L 235 4WD

Manufactured by: KUBOTA, Ltd.
TSUKUBA Plant
Ibaraki, JAPAN



Test No.: 82001/O. E. C. D.
Date of Test: April, 1982

This report has been approved by the O. E. C. D. Coordinating Center (C. E. M. A. G. R. E. F., France) as being in accordance with the O. E. C. D. Tractor Test Code.
Date of Approval: 10th December, 1982

INSTITUTE OF AGRICULTURAL MACHINERY

OMIYA SAITAMA JAPAN

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Remarks

Manufacturer :	KUBOTA, Ltd. TSUKUBA Plant Ibaraki, Japan
Submitted for test by :	The manufacturer
Selected by :	The manufacturer with the agreement of I. A. M.
Place of running-in :	KUBOTA, Ltd. TSUKUBA PIant
Duration of running-in :	77 hours

SPECIFICATION OF TRACTOR

Tractor

Make :	KUBOTA, Ltd.
Model :	L235 4WD
Type :	Wheeled tractor, four wheel driven, unit construction
Serial No. :	L235DT-10776

Engine

Make :	KUBOTA, Ltd.
Model :	D1102-A
Type :	4-stroke diesel engine with indirect injection, water cooled
Serial No. :	D1102-A-2483
Cylinders :	3-cylinders, vertical in line, bore 76 mm stroke 82 mm, capacity 1115 cm^3, compression ratio 21 : 1, dry replaceable cylinder liners
Valves :	Overhead
Fuel system :	Fuel feed by gravity NIPPON DENSO make in-line type injection pump ND-PFR3M55/1ND061, manufacturer's production setting 20-23 mm^3/stroke at rated engine speed and full load, injection timing 22-24° before TDC; NIPPON DENSO make throttle type fuel injection nozzles ND-DN12SD12, injection pressure 137^{+10}_{0} bar; TAIYO GIKEN make replaceable paper element filter with sediment bowl between fuel tank and injection pump, element changing period 400 hours; capacity of fuel tank 28 ℓ
Governor :	Own make mechanical acting variable speed type incorporated with injection pump, governed range of engine speed 820 to 2800 rev/min, rated engine speed 2600 rev/min
Air cleaner :	NIPPON DONALDSON make dry paper element type situated in front of radiator under bonnet
Lubrication system :	Forced feed from gear type pump; strainer in sump;

replaceable cartridge type paper element full flow filter, cartridge changing period 150 hours; oil capacity 6.1 ℓ, oil changing period 75 hours, recomended oil quality API service CC or CD, recomended oil viscosities
below 0°C SAE 10W or 10W-30
0°C to 25°C SAE 20 or 10W-30
above 25°C SAE 30 or 10W-30

Cooling system : Water cooling with centrifugal pump; 320 mm dia. 7 blade belt driven fan; pressurized at 0.88 bar; water capacity 6.6 ℓ; thermostat of wax type for temperature control

Starting system : Electrical; NIPPON DENSO make solenoid engaged type starter motor ND028000-3611, 12 V, 1 kW, operable only with clutch pedal operated; electrical glow plug for cold starting

Exhaust silencer : Own make multi-chamber absorption-expansion type silencer, 85 mm dia. 530 mm long, total length 1180 mm, vertical on the left side of tractor, lateral discharge
Optional: posterior discharge (not fitted in tests)

Electrical equipment : 12 V, negative earth; NIPPON DENSO make three-phase alternator ND021000-8660, 420 W 35 A; 1 lead acid battery 65 Ah at 20 hours rating

Transmission

Clutch : DAIKIN SEISAKUSHO make dry single disk, 215 mm dia.; pedal operated for gearbox and p. t. o. drive
Optional: dual disc clutch (not fitted)

Gear box : Own make, mechanically acting; reversing gear (FORWARD-REVERSE) combined with 4 speed change gear and reduction gear (HIGH-LOW); lst and 4th gear constant mesh, 2nd and 3rd gear sliding mesh; reduction gear sliding mesh; totally 8 forward speeds and 7 reverse speeds*

* Because of action of stopper combined reduction gear (HIGH-LOW) lever, when the lever position is "HIGH", combination of gear "REVERSE-4" cannot be engaged.

Real axle and final drives : Own make bevel gear drive with crown wheel and pinion; bevel gear type differential with spur gear final drives; pedal operated self disengaging differential lock

Front axle and final drives : Own make bevel gear drive with crown wheel and pinion; 3 bevel pinion gears and 1 crown wheel final drives in portals

Oil capacity : Gear box, rear axle, differential and final drives in common with hydraulic system 24 ℓ

recomended oil :	quality	API GL-4
	viscosity	SAE 75 W
change period :	300 hours	

front axle differential case			2.3 ℓ
front axle gear case		each	0.15 ℓ
recomended oil :	quality	API GL-4	
	viscosity	SAE 80 or 90	
change period :	300 hours		

Total ratios and speeds (tyres 9.5-24)

Gear		Number of engine revolutions for one revolution of driving wheels	*Nominal travelling speed for rated speed of engine km/h
Sub	Main		
Foward			
low	1	366.95	1.35
low	2	239.20	2.07
low	3	140.85	3.51
low	4	105.33	4.70
high	1	88.34	5.60
high	2	57.59	8.60
high	3	33.91	14.60
high	4	25.36	19.52
Reverse			
low	1	407.19	1.22
low	2	265.43	1.87
low	3	156.30	3.17
low	4	116.88	4.24
high	1	98.03	5.05
high	2	63.90	7.75
high	3	37.63	13.15

* Calculated with a tyre rolling radius of 505 mm

Power take-off

Main p.t.o. :

At rear of tractor in median plane, height above ground 520 mm, distance behind rear axle center 173.5 mm, p.t.o. shaft giving 6 spline 35 mm dia. to ISO 500/SAE J1170; not independent; dependent of main clutch, driven by pedal operating single clutch; rotation clockwise viewed from driving end
proportional engine speed
2 speeds are preselectable by hand lever

High ratio : 887 rev/min at rated engine speed
540 rev/min (standard p.t.o. speed) at 1584 rev/min engine speed

Low ratio : 578 rev/min at rated engine speed
540 rev/min (standard p.t.o. speed) at 2430 rev/min engine speed

Power lift

Own make hydraulic power lift, position control
Optional : position control and draft control
(not fitted in tests)

Hydraulic system :

Open center system; single acting ram, bore 80 mm stroke 90 mm; own make gear pump driven by engine, delivery 23.6 ℓ/min at rated engine speed; maximum pressure 142 bar; 2 oil tappings fitted*1,
hydraulically acting linkage lock for transport; metal net hydraulic filter situated delivery line between gear box and gear pump, filter cleaning period 300 hours; hydraulic oil capacity 24 ℓ in common with gear box, oil changing period 300 hours

*1 When using tappings, hydraulic oil should be added for external hydraulic circuit.

Implement linkage :

Three point linkage, category I to ISO 730/SAE J715f*2; lift rods length adjustable 388, 413 and 438 mm; lifting range above ground with lift rods length of 413 mm from 240 mm to 820 mm

*2 Side sway at hitch point each side of center position with lower links horizontal is not conformed ISO and SAE standard

Holed drawbar :

Optional fitted in tests; fitted on the clevis of lower links; length between the ball joints 683 mm, thickness 25 mm, width 75 mm, center hole and 3 holes on either side with 80 mm distance each, all holes 29 mm dia.
distance of holes' center line with lower links in horizontal position
to rear axle center 717.5 mm
to p.t.o. shaft end 544 mm

height above ground 483 mm with lower links horizontal, measured at the surface of the bar
range of movement above ground adjustable by power lift

Pull attachment

Hitch : Own make clevis type; height above ground 390 mm, distance from rear axle 204.5 mm, position relative to p.t.o. 31 mm rearward, diameter of clevis hole 25 mm, maximum permissible load vertically 550 kg

Swinging drawbar : Optional, not fitted in tests; own make swinging drawbar, height above ground 330 mm and 435 mm, distance from rear axle 479.5 mm and 529.5 mm, position relative to p.t.o. 306 mm and 356 mm rearward, lateral adjustment about 18° to either side, distance of pivot point rearward from rear axle 95 mm, pin hole diameter 26 mm

Steering : NIPPON SEIKO make ball and screw type with single drag link on the left side of tractor;
Optional : power-assisted steering (not fitted in tests)

Brakes

Service brake : Own make; mechanically acting on 2 wet disc on differential shaft; disc diameter 210 mm; independent or combined pedal operated

Parking brake : In common with service brake; operated by foot pedals with ratchet

Wheels

Steering wheels : Two pneumatics at front 6-14 4 ply rating, diagonal type tyre casing; maximum permissible load on each tyre 300 kg at 1.96 bar inflation pressure; track width 1000 mm only; rims 5JA x 14WDC

Driving wheels : Two pneumatics at rear 9.5-24 4 ply rating, diagonal type tyre casing; maximum permissible load on each tyre 675 kg at 0.98 bar inflation pressure; track width 1015 mm and 1135 mm, changing by turning wheels; rims W7 x 24

Wheel base : 1650 mm

Seat : NANBA PRESS INDUSTRY make, upholstered seat with back rest, supported with hinge and spring; range of adjustment 60 mm horizontally, not adjustable vertically

Number of grease points : 7

Dimensions

Total length : Without ballast
2860 mm with three point linkage
With ballast
3065 mm with three point linkage

Total width : Without ballast
1255 mm at 1015 mm rear wheels track width
1375 mm at 1135 mm rear wheels track width

With ballast
1685 mm at 1015 mm rear wheels track width
1735 mm at 1135 mm rear wheels track width

Total height : Without ballast
1960 mm (to top of exhaust silencer)
1350 mm (to top of steering wheel)
With ballast
1950 mm (to top of exhaust silencer)
1340 mm (to top of steering wheel)

Ground clearance : 259 mm below front differential case

Technical permissible total weights and axle loads

for all available wheel equipment

Tyre size		Permissible axle load		Permissible total weight
front	rear	front kg	rear kg	kg
6-14 4PR	9.5-24 4PR	600	1300	1900
25 x 8.50 -14 4PR	13.6-16 4PR	1050	1300	1900

Lighting equipment

Electrical, 12V
as per EC directives

	Dimensions mm	Height above ground of center mm	*Distance from outside edge of tractor to center mm
Head lights	120 dia.	990	478
Side lights	120 x 40	1160	138
Rear lights	120 x 40	1160	138
Flashers	120 x 70	1220	138
Reflectors	60 dia.	845	138

* with track width of 1015 mm

TEST CONDITIONS

Weights (without driver, but with tanks full)

Without ballast :	front	461 kg
	rear	492 kg
	total	953 kg
Front ballast :	4 weights 25 kg each (at front frame)	100 kg
Rear ballast :	12 weights 27.5 kg each (at rear wheel)	330 kg
	water	160 kg
With ballast	front	591 kg
	rear	952 kg
	total	1543 kg

Track setting during tests

1000 mm at front
1015 mm at rear

Fuel and lubricants used in tests

Fuel :	Diesel oil, specific gravity 0.8385 at 15°C, viscosity 3.806 cSt at 30°C, cetane index 58 to No. 2 JIS
Engine oil :	GENERAL SEKIYU, ENGINE OIL, API service CC, SAE 10W-30, viscosity 66.21 cSt at 40°C
Transmission oil :	MARUZEN OIL, UDT OIL, API service GL-4, SAE 75W, viscosity 56.72 cSt at 40°C
Front axle gear oil :	ESSO STANDARD SEKIYU, JWS 2098C, API service GL-3, SAE 85W, viscosity 100.90 cSt at 40°C

COMPULSOLY TESTS

(1) MAIN POWER TAKE-OFF PERFORMANCE (low ratio)

Date of test : 13th April, 1982
Type of dynamometer : DC electrical, MEIDENSHA EB-DHI

Power	Speed		Fuel consumption			Specific
	Engine	p. t. o.	hourly		specific	energy
kW	rev/min	rev/min	ℓ/h	kg/h	g/kWh	kWh/ℓ
MAXIMUM POWER						
At 2 hour test						
14.1	2600	578	5.10	4.28	303	2.77
At the speed recommended for drawbar work						
14.1	2600	578	5.10	4.28	303	2.77
PART LOADS, The governor hand lever in the position corresponding to the maximum power at full load						
(i) 85 per cent of the torque obtained at maximum power						
12.1	2628	584	4.38	3.67	303	2.77
(ii) unloaded						
—	2739	609	1.44	1.21	—	—
(iii) half the torque defined in (i)						
6.2	2684	596	2.78	2.33	378	2.22
(iv) the torque corresponding to maximum power						
14.1	2600	578	5.10	4.28	303	2.77
(v) one-quater of the torque defined in (i)						
3.1	2702	601	2.08	1.74	555	1.51
(vi) three-quaters of the torque defined in (i)						
9.2	2663	592	3.56	2.98	323	2.60

Power	Speed		Fuel consumption			Specific
	Engine rev/min	p. t. o. rev/min	hourly		specific g/kWh	energy kWh/ℓ
kW			ℓ/h	kg/h		
PART LOADS, The governor hand lever in the position corresponding to the standard p. t. o. speed at full load						
(i) 85 per cent of the torque obtained at maximum power						
12.0	2499	556	4.28	3.59	300	2.80
(ii) unloaded						
—	2588	575	1.30	1.09	—	—
(iii) half the torque defined in (i)						
6.1	2551	568	2.67	2.24	365	2.30
(iv) the torque corresponding to maximum power						
13.7	2430	540	4.73	3.96	289	2.90
(v) one-quater of the torque defined in (i)						
3.0	2573	570	1.95	1.64	539	1.55
(vi) three-quaters of the torque defined in (i)						
9.1	2525	562	3.44	2.88	318	2.63

Standard specific fuel consumption : 303/378/300/365 g/kWh

No load maximum engine speed : 2739 rev/min

Equivalent crankshaft torque at maximum power : 51.9 Nm

Maximum equivalent crankshaft torque : 64.2 Nm at 1300 rev/min of the engine

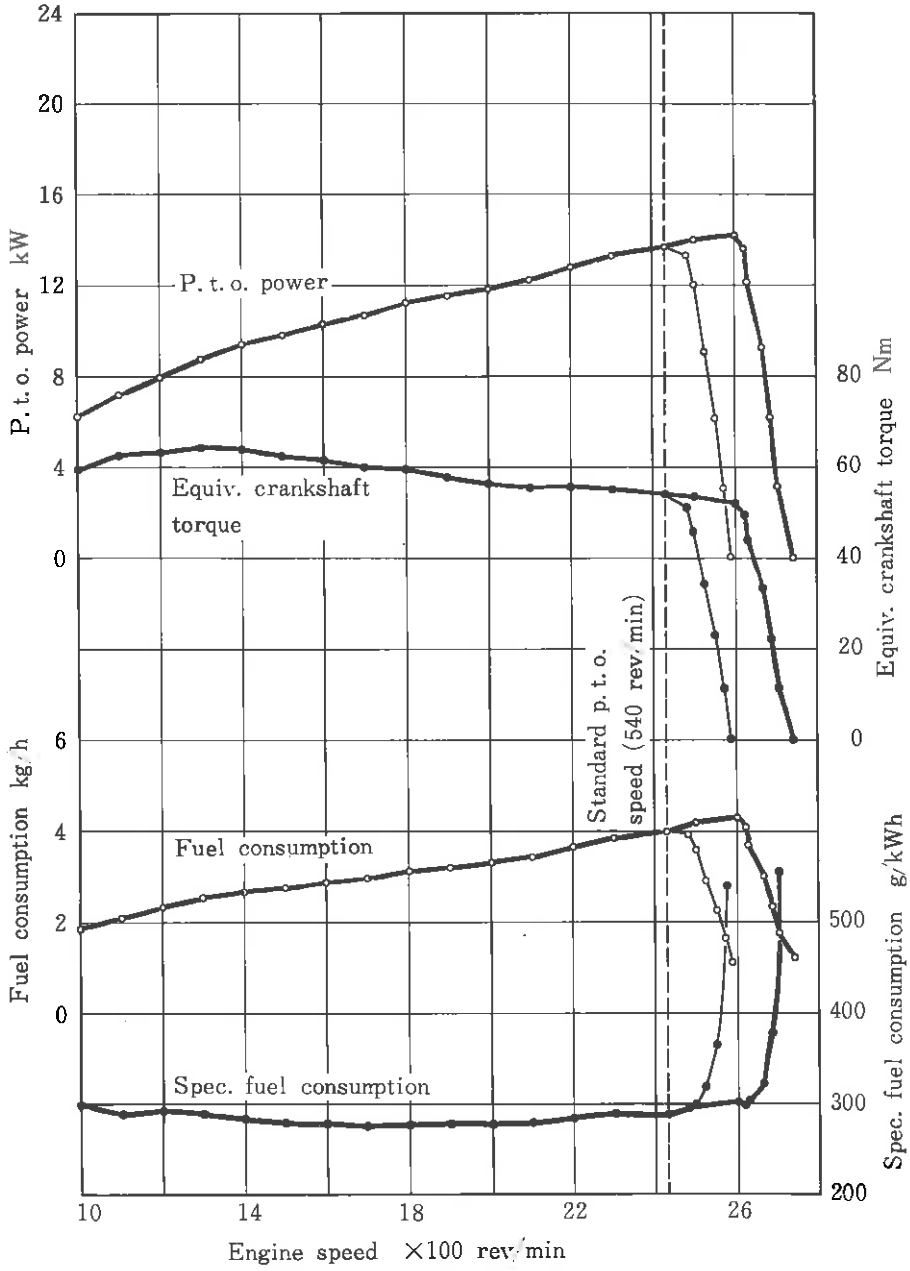
Mean atmospheric conditions :

temperature	23 °C
pressure	1026 mbar
relative humidity	43 %

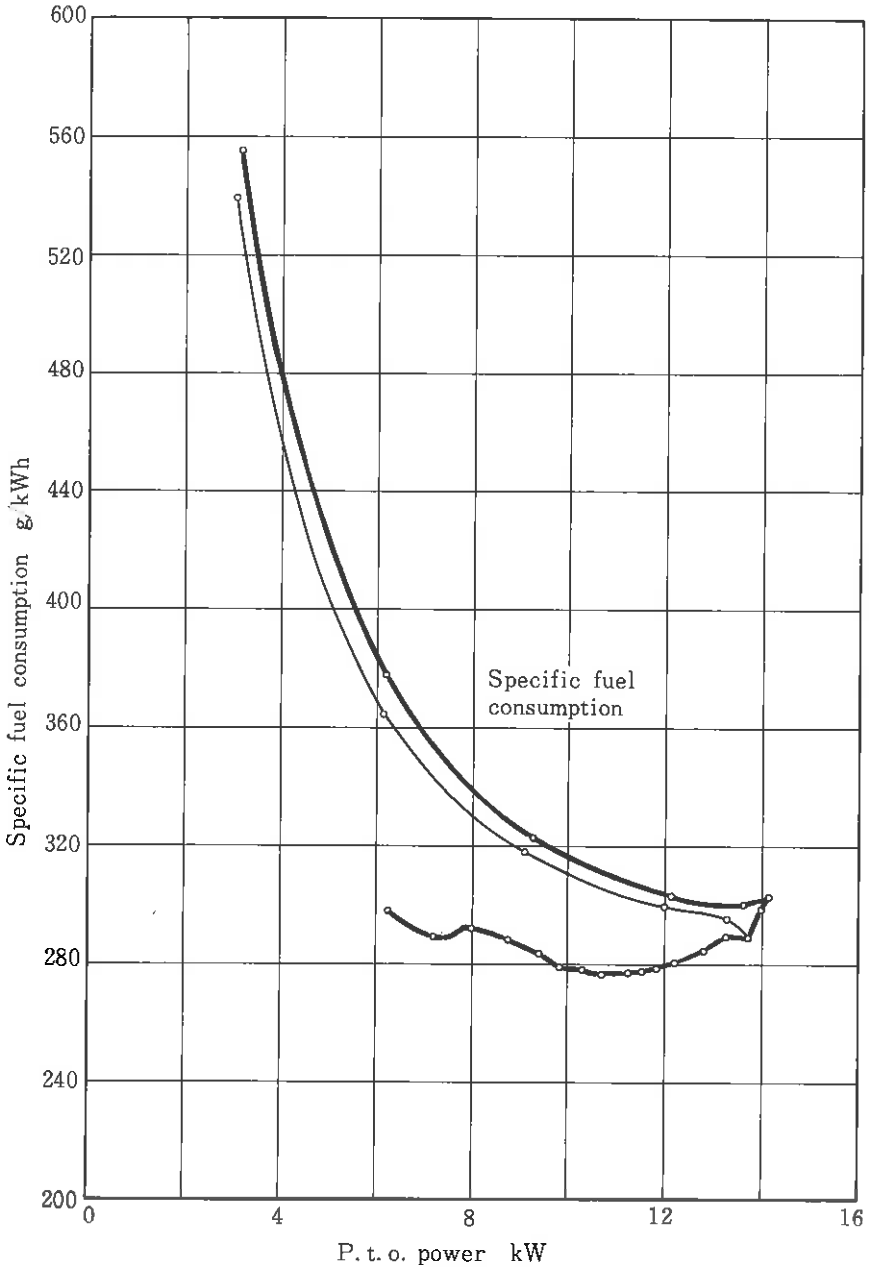
Maximum temperatures :

coolant	90 °C
engine oil	102 °C
fuel	31 °C
engine air intake	30 °C

P. T. O. PERFORMANCE



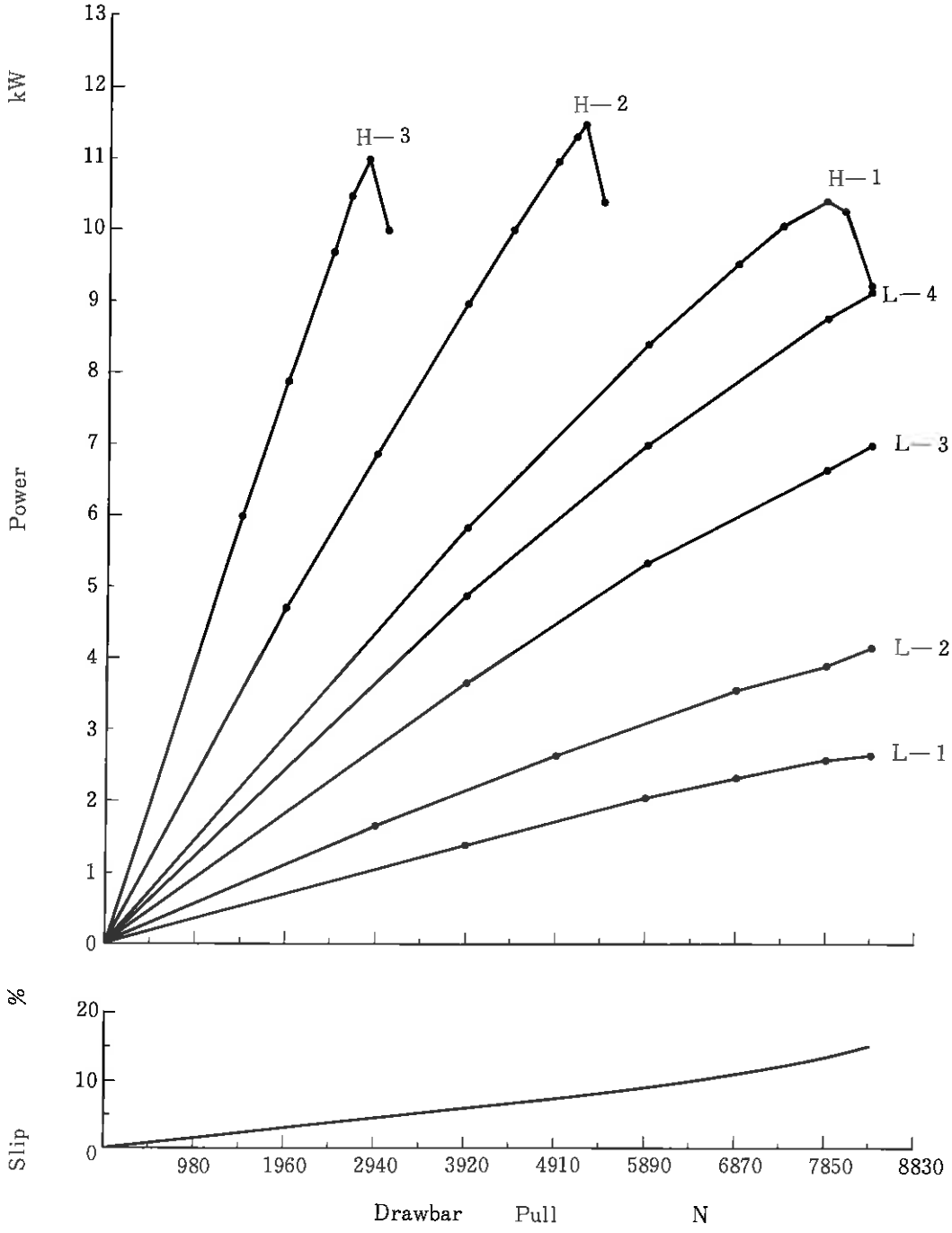
P. T. O. PERFORMANCE



(2) DRAWBAR PERFORMANCE

Date of test : 16th to 21st April, 1982
Tyre size : 6-14 at front, 9.5-24 at rear
Type of track : Concrete
Tread bar height at the beginning of drawbar test in per cent of the value
Height of drawber above ground : 399 mm when new : 83 at front, 80 at rear
Tyre inflation pressure : 0.98 bar at rear, 1.96 bar at front

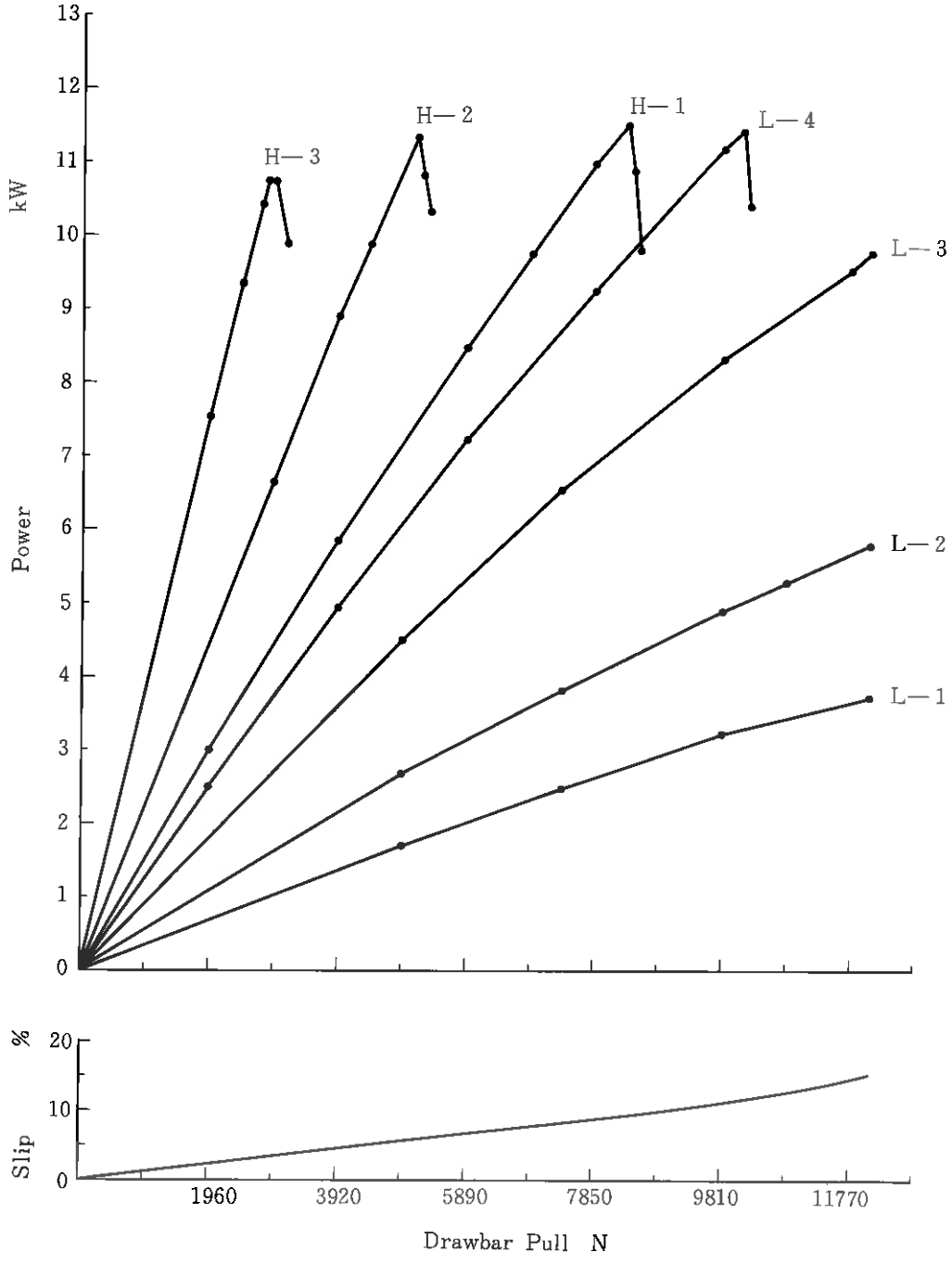
Gear No.	Speed km/h	Power kW	Drawber pull N	Engine speed rev/min	Slip of wheels %	Specific fuel consumption kg/kWh	Specific energy kWh/ℓ	Temperatures			Atmospheric conditions		
								Fuel °C	Coolant °C	Engine oil °C	Temperature °C	Relative humidity %	Pressure mbar
(I) MAXIMUM POWER (without ballast)													
L-1	1.15	2.66	8330	2691	15.1	0.706	1.19	29	72	89	22	23	1010
L-2	1.80	4.17	8330	2685	15.2	0.524	1.60	27	73	91	21	26	1011
L-3	3.02	6.99	8330	2648	15.0	0.424	1.98	28	77	94	21	26	1011
L-4	3.96	9.16	8330	2606	15.1	0.404	2.08	24	76	91	21	26	1011
H-1	4.79	10.43	7840	2598	14.0	0.396	2.12	23	83	93	19	35	1012
H-2	7.96	11.48	5194	2604	7.2	0.366	2.29	20	82	90	19	35	1012
H-3	13.93	11.00	2842	2604	4.5	0.385	2.18	17	81	86	19	35	1012


kW
Power
13
12
11
10
9
8
7
6
5
4
3
2
1
0
H— 3
H— 2
H— 1
L— 4
L— 3
L— 2
L— 1
%
Slip
20
10
0
980
1960
2940
3920
4910
5890
6870
7850
8830
Drawbar Pull N

Height of drawbar above ground: 378 mm
Tyre inflation pressure: 0.98 bar at rear, 1.96 bar at front

Gear No.	Speed km/h	Power kW	Drawber pull N	Engine speed rev/min	Slip of wheels %	Specific fuel consumption kg/kWh	Specific energy kWh/ℓ	Temperatures			Atmospheric conditions		
								Fuel °C	Coolant °C	Engine oil °C	Temperature °C	Relative humidity %	Pressure mbar
(II) MAXIMUM POWER (with ballast)													
L-1	1.12	3.75	12054	2683	15.2	0.578	1.45	35	79	90	20	23	1018
L-2	1.73	5.79	12054	2650	15.2	0.456	1.84	35	79	92	19	23	1018
L-3	2.92	9.78	12054	2616	15.1	0.370	2.27	34	78	93	19	23	1018
L-4	4.07	11.41	10094	2598	10.2	0.370	2.27	29	96	95	17	25	1019
H-1	4.97	11.50	8330	2599	7.9	0.370	2.27	26	86	89	17	28	1019
H-2	7.99	11.31	5096	2607	4.6	0.408	2.06	25	78	83	16	29	1020
H-3	13.61	10.74	2842	2607	4.4	0.423	1.98	19	73	87	16	29	1020
(III) FIVE HOUR TEST at 75% of pull at maximum power													
H-2	8.17	8.68	3822	2643	3.5	0.379	2.12	28	78	92	21	38	1017
(IV) FIVE HOUR TEST at pull corresponding to 15% wheelslip in test (II)													
*L-3	2.92	—	12054	—	—	—	—	28	77	94	17	64	1018

*Those figures not quoted are irrelevant due to the additional ballast.
Total oil consumption during ten hours duration of tests (III) and (IV) 13.1 g/h


13
12
11
10
9
8
7
6
5
4
3
2
1
0
kW
Power
H— 3
H— 2
H— 1
L— 4
L— 3
L— 2
L— 1
%
20
10
0
Slip
1960
3920
5890
7850
9810
11770
Drawbar Pull N

(3) TURNING SPACE AND TURNING CIRCLE

Wheel equipment	front :	6—14 4PR
	rear :	9.5—24 4PR
Track of wheels	front :	1000 mm
	rear :	1015 mm

Front axle drive disengaged

	with brakes		without brakes	
	left-hand m	right-hand m	left-hand m	right-hand m
Radius of turning space	2.90	2.80	3.27	3.18
Radius of turning circle	2.72	2.62	3.09	3.00

Front axle drive engaged

	with brakes		without brakes	
	left-hand m	right-hand m	left-hand m	right-hand m
Radius of turning space	2.65	2.59	3.57	3.50
Radius of turning circle	2.47	2.41	3.39	3.32

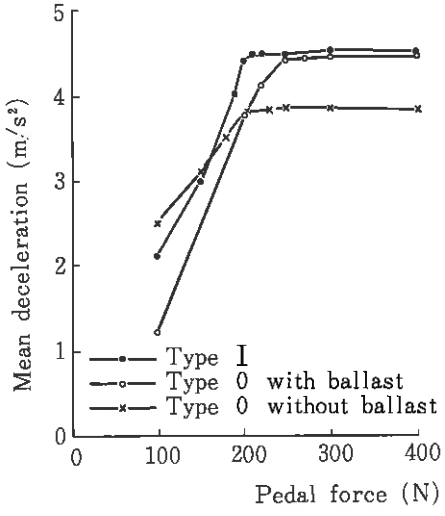
(4) LOCATION OF CENTER OF GRAVITY

Height above ground :	632 mm
Distance forward from the vertical plane, containing the axis of the rear wheels :	753 mm
Distance from the median plane :	0 mm

(5) BRAKING

Date of test :	13th April, 1982		
Tractor masses during test with driver :	front	rear	total
	kg	kg	kg
without ballast	467	585	1052
with ballast	596	1316	1912

A) Service brake



Speed before application of brakes, without ballast 20.2 km/h
with ballast 19.5 km/h

The brakes were heated by towing of the tractor for 1 km.

B) Parking brake

	Ballasted tractor on 18%-slope		Unballasted tractor on 12%-slope with trailer of 1052 kg	
	up	down	up	down
Braking device control force N	245	206	196	157

(6) MEASUREMENT OF EXTERNAL NOISE LEVEL

Date of test : 13th April, 1982
Type of track : Concrete
Type of sound level meter : RION NA 61

Results of test
Gear : High 4
Travelling speed before acceleration : 15.2 km/h
Sound lovel : 78 dB (A)

(7) NOISE MEASUREMENT AT THE DRIVER'S EAR LEVEL

Date of test : 16th April, 1982
Type of sound level meter : RION NA 61
Type of track : Concrete
Results of test

Gear	Drawbar pull at which the tractor develops the max. sound level kN	Measured travelling speed km/h	Sound level dB(A)
H-2*)	4.9	8.06	91.5
H-2*)	Light load	8.75	87
H-4	Light load	18.90	90

*)The H-2 gear corresponds to the nominal travelling speed nearest to 7.5 km/h

(8) POWER LIFT AND HYDRAULIC PUMP PERFORMANCE

Date of test : 9th April, 1982

Power Lift

	Height of lower hitch point above ground in down position mm	Vertical movement mm	Maximum force exerted through full range kN	Corresponding pressure of hydraulic fluid MPa	Moment about rear axle kNm	Maximum tilt angle of mast over range of lift degrees
At hitch points	240	580	5.14	10.2	—	—
On the frame	240	921	3.68	10.2	4.89	16

Temperature of hydraulic fluid at start of test 62 °C

Hydraulic pump performance

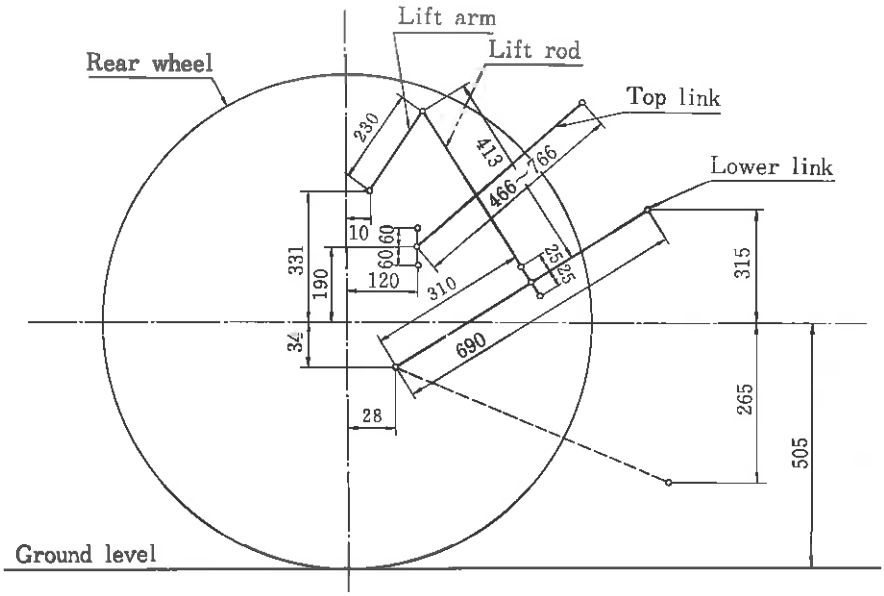
Opening pressure of the relief valve	10.2 MPa
Sustained pressure with relief valve open	14.0 MPa
Pump delivery rate at minimum pressure, the governor control lever being set for maximum power	26.6 ℓ/min
Hydraulic power at 90 per cent of relief valve setting	2.3 kW
Corresponding delivery rate	10.7 ℓ/min
Pressure	12.6 MPa
Temperature of hydraulic fluid	65 °C
Tapping point used for test :	under the seat

Linkage geometry when connected to the standard frame
Projected length in side view :

Lower links	690 mm
Lift arms	230 mm
Lift rods	413 mm
Top link	632 mm
Distance of lift rod connection point from pivot point of lower link	310 mm

The following dimensions are given relative to the rear wheel centre line, situated 505 mm above the ground level :

Lower link pivot point	34 mm below,	28 mm behind
Top link pivot point	190 mm above,	120 mm behind
Lift arm pivot point	331 mm above,	10 mm behind
Maximum and minimum height of lower link hitch points	315 mm above,	265 mm below
Height of lower link hitch points when locked in transport position	Any position within power range	



all dimensions in mm

REPAIRS AND ADJUSTMENTS DURING TESTS:	None
REMARKS:	None

Officer in charge:	K. NISHIZAKI
Head of Testing Division:	T. KANATSU
Date:	28th May, 1982