N.A.M.R.I.

Report on test in accordance with

O.E.C.D. STANDARD CODE I for the Official Testing of Agricultural Tractor Performance

FULL CODE **O.E.C.D. Approval No. 1/1746**



Agricultural Tractor

LG LT530D(4WD)

Manufactured by : LG Cable & Machinery Ltd.
200, Dangjung-dong, Gunpo-si, Kyunggi-do, KOREA

NATIONAL AGRICULTURAL MECHANIZATION RESEARCH INSTITUTE
(NAMRI)
520-6 GONJIAM-RI, SILCHON-MYUN, KWANGJU-GUN, KYUNGGI-DO, KOREA

This is a report on a tractor test in accordance with the OECD STANDARD CODE for the Official Testing of Agricultural Tractor Performance(C(87)53(Final), Code 1) and amendments (C(90)79, C(92)52, C(93)52, C(93)133 and C(95)17).

It does not contain an evaluation of the tractor on practical work

Report No. : 97-M-5-4
Duration of test : April 1997 till November 1997
Date of approval : April 3, 1998

This report has been approved by the OECD Co-Ordinating Centre (CEMAGREF, France) as being in accordance with the OECD STANDARD CODE I.

In this report all performance characteristics are given corresponding to the International System of Units.
The reference to the former used Technical System of Units is given by the following relations:

Forces	1 kgf	=	9.80665 N
Powers	1 PS	=	0.7355 kW
Pressures	1 kgf/㎠	=	98.0665 kPa

All rights including the right of translation, reprint and photomechanical copying are reserved by The National Agricultural Mechanization Research Institute.

Printed in the Republic Of KOREA, April 1998 ; NAMRI

N.A.M.R.I.

Report on test in accordance with

O.E.C.D. STANDARD CODE I for the Official Testing of Agricultural Tractor Performance

FULL CODE

O.E.C.D. Approval No. 1/1746
Date of approval : April 3, 1998

Corrigendum to the OECD test report, approval No. 1/1746(page 9)



Agricultural Tractor

LG LT530D(4WD)

Manufactured by : LG Cable & Machinery Ltd.
200, Dangjung-dong, Gunpo-si, Kyunggi-do, KOREA

NATIONAL AGRICULTURAL MECHANIZATION RESEARCH INSTITUTE
(NAMRI)
520-6 GONJIAM-RI, SILCHON-MYUN, KWANGJU-GUN, KYUNGGI-DO, KOREA

PTO speed at rated engine speed : 588 rev/min
(2400rev/min)

Engine speed at standard power take-off speed : 2205 rev/min

Ratio of rotation speeds
(engine speed / p.t.o speed) : 4.083 : 1

Power restriction and maximum torque : None

Direction of rotation (viewed from behind tractor) : Clockwise

Power take-off proportional to ground speed : None

POWER LIFT

Make :	Hyundai Precision Co.
Model :	A1820033
Type :	Hydraulic three point hitch (Position, draft and mix control)
Type of hydraulic system :	Open center system
Type and number of cylinders :	1, single acting
Type of linkage lock for transport :	Hydraulic
Relief valve pressure setting :	15.6 ~ 16.4 MPa
Opening pressure of cylinder safety valve :	19.6 MPa
Lift pump type :	Gear pump
Transmission between pump and engine :	Driven by engine
Type and number of filters :	1, paper cartridge type
Site of oil reservoir :	Transmission housing
Type, number and location of tapping points :	SAE 3/8" hydraulic female coupler, 4 sets, rear of tractor
Maximum volume of oil available to external cylinders :	None

TABLE OF CONTENTS

	page
SPECIFICATIONS OF TRACTOR	4 to 13
TEST CONDITIONS	14 to 15
COMPULSORY TESTS RESULTS	
Main power take-off performance	16 to 19
Hydraulic power and lifting force	20
Drawbar performance	21
Turning area and turning circle	22
Location of center of gravity	22
Brake	22 to 23
Measurement of external noise level	23
REPAIRS AND ADJUSTMENTS DURING TESTS	23
REMARKS	23

Tractor manufacturer's name and address :	LG Cable & Machinery Ltd. 200, Dangjung-dong, Gunpo-si, Kyunggi-do, R.O.K.
Location of tractor assembly :	200, Dangjung-dong, Gunpo-si, Kyunggi-do, R.O.K.
Submitted for test by :	The manufacturer
Selected for test by :	The manufacturer with agreement by NAMRI
Place of running-in :	LG Cable & Machinery Ltd.
Duration of running-in :	Engine and tractor 120 hours
Location of test :	NAMRI

SPECIFICATIONS OF TRACTOR

TRACTOR

Make :	LG
Model :	LT530D
Type :	4 wheel drive
Serial No. :	LT53-G00198
1st Serial No. :	LT53-G00001

ENGINE

Make :	Mitsubishi Heavy Industries
Model :	S4S
Type :	4 stroke, water cooled, indirect injection diesel
Serial No. :	026865

Cylinders

Number/disposition :	4, Vertical, in-line
Bore / stroke :	94 mm/ 120 mm
Capacity :	3331 ㎤
Compression ratio :	22 : 1
Arrangement of valves :	Overhead
Cylinder liners :	None

Supercharging

None

Fuel system

Fuel feed system :	Gravity
Filters	
Make :	Mitsubishi Heavy Industries
Model :	32A40-00100

Type :	Replaceable paper element, cartridge type
Capacity of fuel tank :	55 dm³
Injection pump	
Make :	Mikuni Precision
Model :	J3943F070N
Type :	DPA
Serial No. :	0364EN
Manufacturer's production setting of injection pump	
Flow rate :	12.10±0.6 dm³/h at rated engine speed and full load
Timing :	20 degrees before T.D.C
Injectors	
Make :	Mikuni Precision
Model :	MM435-94101
Type :	Single hole
Injection pressure :	11.76 MPa

Governor

Make :	Mikuni Precision
Model :	32A61-00010
Type :	Mechanical
Governed range of engine speed :	From 750 to 2550 rev/min
Rated engine speed :	2400 rev/min

Air cleaner

Pre-cleaner	
Make :	Dae-Yang Industry Co.
Model :	A1190054
Type :	Cyclone type
Location of air intake :	Under the bonnet, in front of the radiator
Main cleaner	
Make :	Ssang-Ma Engineering.
Model :	A1190079
Type :	Oil bath
Maintenance indicator :	None

Lubrication system

Type of feed pump :	Forced-feed from rotor pump
Type of filter :	Full flow, replaceable canister
Number of filters :	1

Cooling system

Type of coolant :	Water or water and antifreeze solution
Type of pump :	Centrifugal
Specification of fan :	Axle driven puller
Number of fan blades :	7
Fan diameter :	380 mm
Coolant capacity :	7.5 dm³ (Radiator 3.0 dm³ + Engine 4.5 dm³)
Type of temperature control :	Wax type thermostat
Superpressure system :	88.3 kPa, radiator cap

Starting system

Make :	Mitsubishi Electronics
Model :	32A66-00101
Type :	Electrical, pre-engaged, solenoid operated
Starter motor power rating :	2.2 kW
Cold starting aid :	Electrothermal plug, 12V
Safety device :	Starting operable only when main clutch pedal fully depressed and PTO clutch disengaged

Electrical system

Voltage :	12 V
Generator	
Make :	Mitsubishi Electronics
Model :	3476805100
Type :	3 phase generator
Power :	0.54 kW
Battery	
Number :	1
Rating :	80Ah at 5 hours rating

Exhaust system

Make :	Se-Sin Engineering Co.
Model :	A1151098
Type :	Horizontal silencer
Location :	Under bonnet, left hand side

TRANSMISSION

Clutch (travel)

Make :	Seojin-Daikin Co. Ltd.

Model :	A1250066
Type :	Dry for transmission only
Number of plates :	1
Diameter of plates :	275 mm
Method of operation :	Mechanically actuated by pedal

Gear box

Make :	Own make
Model :	A1280093
Type :	Mechanical
Arrangement :	Synchromesh 4 speed gears with main lever, Constant mesh 2 speeds (H/L) gears with sub-lever, Additional constant mesh creep gear (CR), adding 8 forward and 8 reverse gears, Synchromesh type forward/reverse with shuttle lever
Number of gears :	16 forward, 16 reverse
Available options :	None

Rear axle and final drives

Make :	Own make
Model :	A1480042
Type :	Bevel gear type differential and spur gear type final drives
Differential lock	
Type :	Mechanical, dog clutch on differential gears
Method of engagement :	Mechanically actuated by pedal
Method of disengagement :	Self-disengagement by spring

Front axle and final drives

Make :	Youngjin-Precision Industries Co.
Model :	A1400109
Type :	Bevel gear type differential and bevel gear type final drives
Differential lock	
Type :	None
Method of engagement :	None
Method of disengagement :	None

Total ratios and travelling speeds

Gear No	Group or range	Number of engine revolutions for one revolution of the driving wheels		Nominal travelling speed(*) at rated engine speed of 2400 rev/min (km/h)	
		Forward	Reverse	Forward	Reverse
1	C-L-1	2182.13	2055.77	0.25	0.27
2	C-L-2	1518.01	1430.12	0.36	0.39
3	C-L-3	1123.33	1058.27	0.49	0.52
4	C-L-4	759.00	715.22	0.73	0.77
5	C-H-1	506.00	476.68	1.09	1.16
6	C-H-2	352.02	331.61	1.57	1.66
7	C-H-3	260.44	245.41	2.12	2.25
8	C-H-4	176.01	165.84	3.14	3.33
9	L-1	296.18	279.03	1.86	1.98
10	L-2	206.04	194.11	2.68	2.84
11	L-3	152.47	143.64	3.62	3.84
12	L-4	103.02	97.05	5.36	5.69
13	H-1	68.68	64.70	8.04	8.53
14	H-2	47.78	45.01	11.55	12.26
15	H-3	35.35	33.01	15.61	16.57
16	H-4	23.89	22.51	23.10	24.52
(*) Calculated with the dynamic radius index of 610 mm(ISO 4251/1-1992).					

Number of revolutions of front wheels for one revolution of rear-wheels : 1.39

Range selection : L = Low, H = High, C = Creep

POWER TAKE-OFF

Main power take-off

Type : Independent PTO

Method of engagement : By switch on instrument panel electro-hydraulically engaging wet multi-plate clutch

Number of shafts : 1

Method of changing power take-off shaft ends and speeds : Manually by hand lever

Power take-off proportional to engine speed

540 rev/min

Location : Rear of tractor

Diameter of power take-off shaft end : 35 mm

Number of splines : Six, in conformity with ISO 500/1991

Height above ground : 623 mm

Distance from the median plane of the tractor : 5 mm

Distance behind rear-wheel axis : 344 mm

PTO speed at rated engine speed : (2400rev/min)	588 rev/min
Engine speed at standard power take-off speed :	2400 rev/min
Ratio of rotation speeds (engine speed / p.t.o speed) :	4.083 : 1
Power restriction and maximum torque :	None
Direction of rotation (viewed from behind tractor) :	Clockwise
Power take-off proportional to ground speed :	None

POWER LIFT

Make :	Hyundai Precision Co.
Model :	A1820033
Type :	Hydraulic three point hitch (Position, draft and mix control)
Type of hydraulic system :	Open center system
Type and number of cylinders :	1, single acting
Type of linkage lock for transport :	Hydraulic
Relief valve pressure setting :	15.6 ~ 16.4 MPa
Opening pressure of cylinder safety valve :	19.6 MPa
Lift pump type :	Gear pump
Transmission between pump and engine :	Driven by engine
Type and number of filters :	1, paper cartridge type
Site of oil reservoir :	Transmission housing
Type, number and location of tapping points :	SAE 3/8" hydraulic female coupler, 4 sets, rear of tractor
Maximum volume of oil available to external cylinders :	None

Three-point linkage

Category : 1 to ISO730/1-1994

Category adapter : None

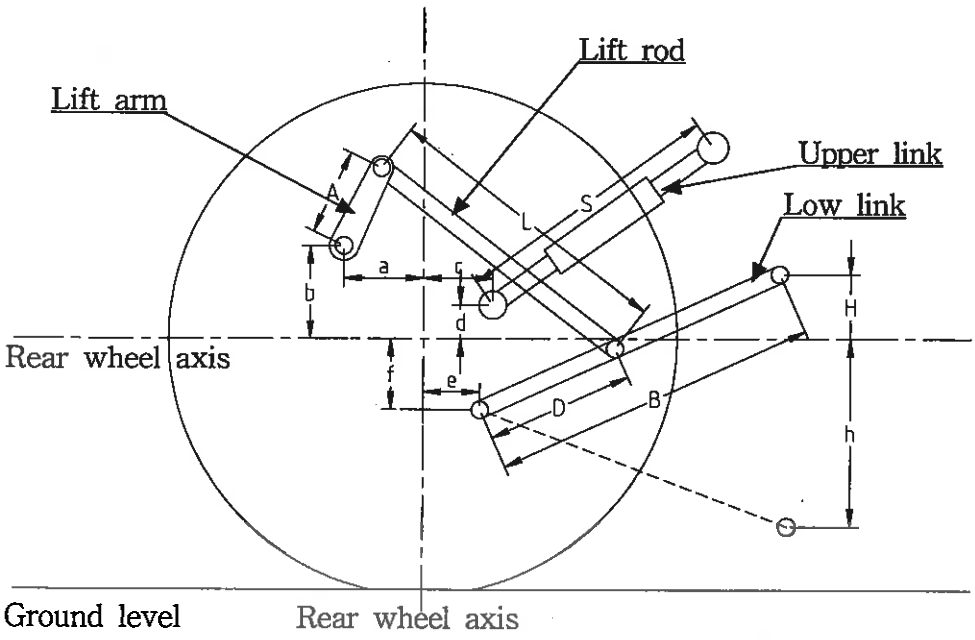


Figure 1.1 Linkage geometry

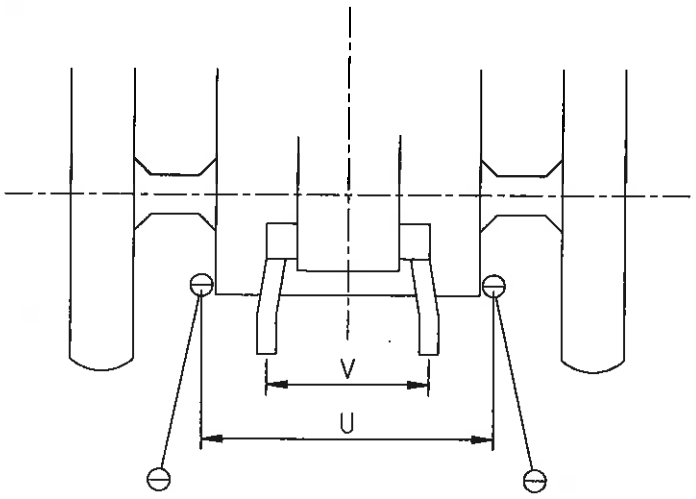


Figure 1.2 Linkage geometry

			Dimension or range (mm)	Settings used in test (mm)
Length of lift arms		(A)	250	250
Length of lower links		(B)	720	720
Distance of lift arm pivot point from rear-wheel axis	horizontally	(a)	127	127
	vertically	(b)	243	243
Horizontal distance between the 2 lower link points		(u)	355	355
Horizontal distance between the 2 lift arm end points		(v)	445	445
Length of upper link		(S)	from 482 to 720	555
Distance of upper link pivot point from rear wheel axis	horizontally	(c)	324	324
	vertically	(d)	258	258
Distance of lower link pivot point from rear wheel axis	horizontally	(e)	168	168
	vertically	(f)	157	157
Distance of lower link pivot point to lift rod pivot points on lower links		(D)	342	342
Length of lift rods		(L)	from 440 to 510	475
Height of lower hitch points relative to the rear-wheel axis				
- in low position		(h)	from 292 to 458	410
- in high position		(H)	from 229 to 347	230
Height above ground of lower hitch points when locked in transport position(*)			Any height within lift range(Hydraulic Transport Lock)	

(*)Assuming the dynamic radius index = 610mm (ISO 4251/1-1992)

Table 1.1 Dimensions of linkage geometry
(when connected to the standard frame)

SWINGING DRAWBAR : None

COMPULSORY TESTS RESULTS

1. MAIN POWER TAKE-OFF PERFORMANCE

Date and location of tests : 30th August, 1997, NAMRI, Korea

Type of dynamometer : FROUD AG250

Power kW	Speed		Fuel consumption			Specific energy kWh/ℓ
	Engine rev/min	P.T.O rev/min	Hourly kg/h	Hourly ℓ/h	Specific g/kWh	
1.1 MAXIMUM POWER - TWO-HOUR TEST						
35.55	2400	588	10.25	12.21	288	2.912
1.2 POWER AT RATED ENGINE SPEED						
35.55	2400	588	10.25	12.21	288	2.912
1.3 STANDARD POWER TAKE-OFF SPEED (540 rev/min)						
32.77	2205	540	9.40	11.20	287	2.927
1.4 PART LOADS 1.4.1 The torque corresponding to maximum power at rated engine speed						
35.55	2400	588	10.25	12.21	288	2.912
1.4.2 85% of torque obtained in 1.4.1						
31.36	2491	610	9.18	10.93	293	2.868
1.4.3 75% of torque defined in 1.4.2						
23.75	2515	616	7.70	9.17	324	2.590
1.4.4 50% of torque defined in 1.4.2						
15.93	2530	620	6.23	7.42	391	2.147
1.4.5 25% of torque defined in 1.4.2						
7.99	2540	622	4.60	5.48	575	1.459
1.4.6 Unloaded						
0	2555	626	3.22	3.84	-	-

Power kW	Speed		Fuel consumption			Specific energy kWh/ℓ
	Engine rev/min	P.T.O rev/min	Hourly kg/h	Hourly ℓ/h	Specific g/kWh	
1.5 PART LOADS AT STANDARD POWER TAKE-OFF SPEED(540 rev/min)						
1.5.1 The torque corresponding to maximum power available						
32.77	2205	540	9.40	11.20	287	2.927
1.5.2 85% of torque obtained in 1.5.1						
28.37	2246	550	8.35	9.95	294	2.853
1.5.3 75% of torque defined in 1.5.2						
21.55	2274	557	7.02	8.36	326	2.578
1.5.4 50% of torque defined in 1.5.2						
14.52	2299	563	5.60	6.67	386	2.177
1.5.5 25% of torque defined in 1.5.2						
7.35	2327	570	4.11	4.90	559	1.502
1.5.6 Unloaded						
0	2347	575	2.97	3.54	-	-

Other results

No load maximum engine speed : 2555 rev/min

Torque (equivalent crankshaft) at maxium power

-at rated engine speed : 141.46 Nm

-at standard power take-off speed : 141.94 Nm

Maximum torque engine speed(equivalent crankshaft) : 161.87 rev/rpm

(engine speed : 1500 rev/min)

Mean atmospheric conditions

Temperature : 25 ℃

Pressure : 102.0 kPa

Relative humidity : 35 %

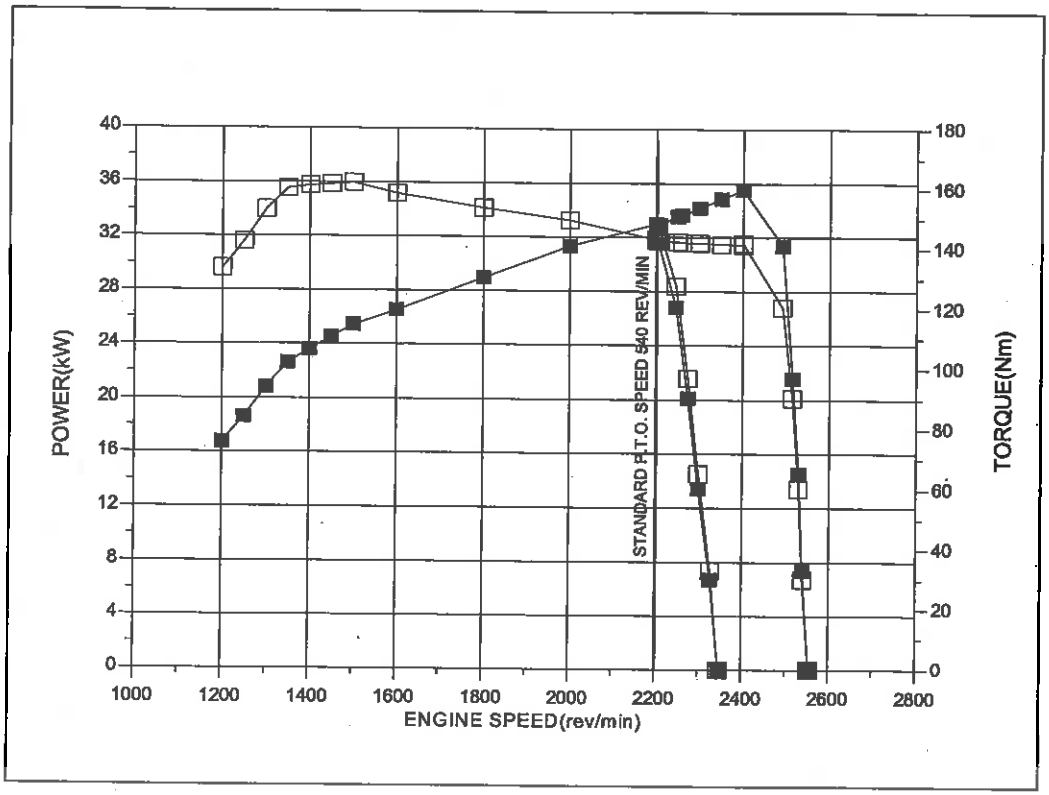
Maximum temperatures

Coolant : 90 ℃

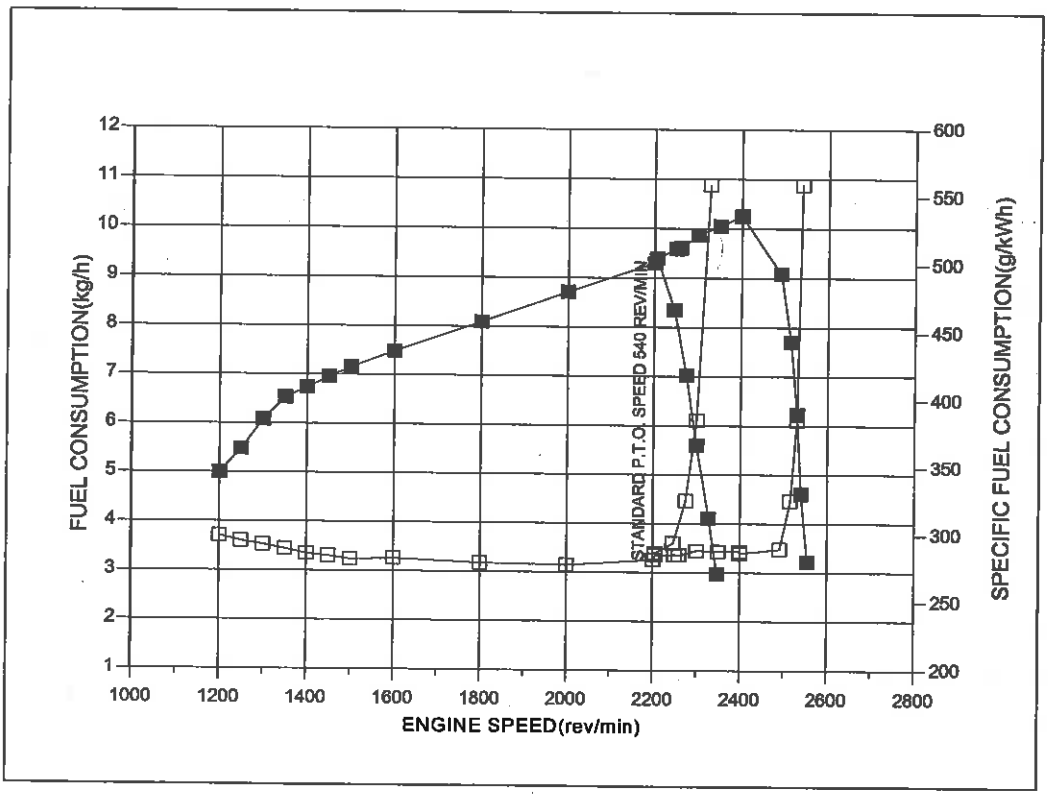
Engine oil : 110 ℃

Fuel : 35 ℃

Engine air intake : 33 ℃

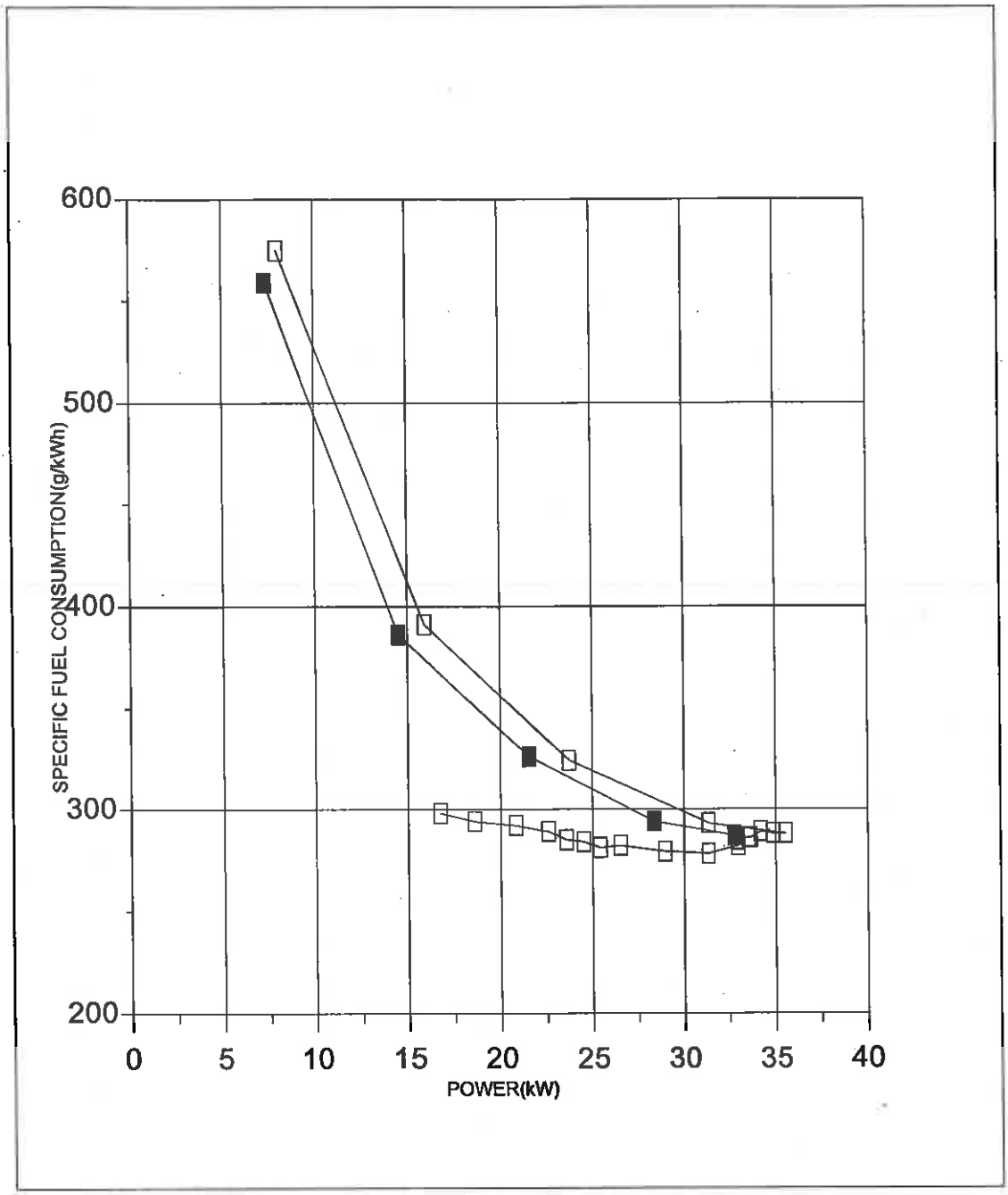


□ : TORQUE(Nm) ■ : POWER(kW)



□ : SPECIFIC FUEL CONSUMPTION(g/kWh) ■ : FUEL CONSUMPTION(kg/h)

POWER TAKE - OFF PERFORMANCE



□ : Governor set for maximum power at rated speed

■ : Governor set for maximum power at pto speed

POWER TAKE - OFF PERFORMANCE

2. HYDRAULIC POWER AND LIFTING FORCE

Date of tests : 17th October, 1997

2.1 HYDRAULIC POWER TEST

Sustained pressure with relief valve open : 16.38 MPa

Pump delivery rate at minimum pressure : 43.9 ℓ/min

	Flow rate	Pressure	Power
	ℓ/min	MPa	kW
Flow rate corresponding to a hydraulic pressure equivalent to 90% of the actual relief valve pressure setting and corresponding hydraulic power	26.4	14.74	6.49
Flow rate and hydraulic pressure corresponding to maximum hydraulic power	38.9	12.75	8.27

Tapping point used for test : Rear of tractor

Temperature of hydraulic fluid if different from 65±5℃ : -- ℃

2.2 POWER LIFT TEST

		At the hitch point	On the frame
Height of lower hitch point above ground in down position	mm	200	200
Vertical movement			
without lifting forces	mm	640	791
with lifting forces	mm	618	737
Maximum corrected force exerted through full range	kN	14.60	11.71
Corresponding pressure of hydraulic fluid	MPa	14.74	14.74
Moment about rear axle	kNm	12.96	17.54
Maximum tilt angle of mast over range of lift	degrees	-	9

Lifting heights relative to the horizontal lower links												
mm	-315	-300	-253	-200	-100	0	100	200	300	365	400	422
Lifting forces at hitch points, corrected to 14.74 MPa												
kN	-	-	14.60	14.70	14.99	15.98	16.70	17.12	17.52	16.70	-	-
Lifting forces at test frame, corrected to 14.74 MPa												
kN	13.04	13.10	-	13.46	13.80	14.00	13.84	13.52	13.18	-	12.49	11.71

3. DRAWBAR PERFORMANCE

Date of test : 22nd October, 1997

Type of track : Asphalt

	Height of drawbar above ground (mm)	Tyre inflation pressure	
		Front (kPa)	Rear (kPa)
Unballasted	410	196	117
Ballasted	410	196	117

Gear and range	Power	Drawbar pull	Speed	Engine speed	Slip of wheels	Specific fuel consum-ption	Specific energy	Temperatures			Atmospheric conditions		
								Fuel	Coolant	Engine oil	Tempe-rature	Relative humidity	Pressure
	kW	kN	km/h	rev/min	%	g/kWh	kWh/ℓ	°C	°C	°C	°C	%	kPa
3.1 MAXIMUM POWER IN TESTED GEARS (unballasted tractor)													
L-1	9.0	18.7	1.73	2508	15.0	953	0.88	34	87	109	21	64	99.1
L-2	12.8	18.5	2.49	2495	15.0	699	1.20	35	87	109	21	64	99.1
L-3	16.6	17.7	3.37	2475	15.0	575	1.46	34	86	108	22	65	99.2
L-4	24.3	17.5	4.98	2430	15.0	416	2.02	34	87	109	22	64	99.1
H-1	34.1	16.2	7.58	2402	8.5	307	2.73	35	86	109	21	65	99.2
H-2	33.6	10.8	11.20	2402	5.9	313	2.69	34	86	108	21	64	99.1
H-3	31.9	7.1	16.28	2598	5.7	324	2.59	33	88	109	21	64	99.2
3.2 MAXIMUM POWER IN TESTED GEARS (ballasted tractor)													
L-1	9.3	19.5	1.73	2501	15.0	923	0.91	35	87	109	21	64	99.1
L-2	13.1	18.9	2.49	2481	15.0	723	1.16	34	87	108	21	64	99.1
L-3	17.1	18.3	3.36	2470	15.0	560	1.50	34	87	109	20	65	99.2
L-4	24.6	17.8	4.96	2441	15.0	407	2.06	35	88	108	21	64	99.1
H-1	34.2	16.3	7.57	2401	8.2	296	2.84	35	88	109	21	65	99.1
H-2	33.4	10.9	11.00	2404	7.3	302	2.78	34	86	108	22	64	99.1
H-3	33.3	7.9	15.24	2398	4.3	307	2.73	35	87	109	21	64	99.2
3.3 FIVE-HOUR TESTS													
3.3.1 FIVE-HOUR TEST at 75% of pull at maximum power													
H-1	27.3	12.2	8.04	2435	3.5	369	2.28	35	89	109	21	65	99.1
3.3.2 FIVE-HOUR TEST at pull corresponding to 15% wheelslip with additional ballast : 40 kg													
L-4	25.0	17.8	5.05	2440	-	-	-	36	91	110	20	64	99.1

Oil consumption during ten hours duration of tests 3.3.1 and 3.3.2 : 7.5 g/h

4. TURNING AREA AND TURNING CIRCLE

Front wheel drive disengaged

	With brakes		Without brakes	
	Right-hand (m)	Left-hand (m)	Right-hand (m)	Left-hand (m)
Radius of turning area	3.29	3.28	3.79	3.78
Radius of turning circle	3.06	3.05	3.54	3.53

5. LOCATION OF CENTER OF GRAVITY

Height above ground : 782 mm

Distance forward from the vertical plane containing the axle of the rear-wheel : 818 mm

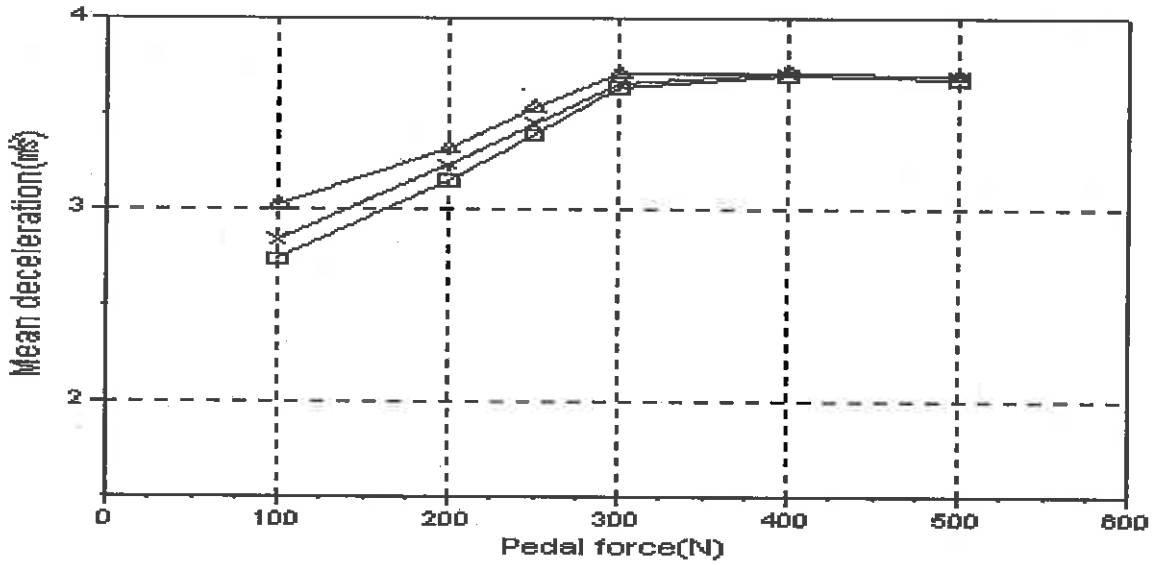
Distance from the median plane of the tractor to the left : 2 mm

6. BRAKING

Date of tests : 15th October, 1997

Type of track : Asphalt and concrete

	Speed before application of brakes (km/h)	Tractor mass (with driver)		
		Front (kg)	Rear (kg)	Total (kg)
Ballasted tractor	24.16	1119	1211	2330
Unballasted tractor	24.30	924	1256	2180



△ unballasted, □ ballasted, × fade

COLD SERVICE BRAKING DEVICE TEST AND FADE TEST

6.1 COLD SERVICE BRAKING DEVICE TEST

	Ballasted tractor	Unballasted tractor
Speed before application of brakes (km/h)	24.16	24.30

Maximum deviation of tractor from its original course : None

Abnormal vibration : None

Brake heating method : None

6.2 FADE TEST

Speed before application of brakes : 24.16 km/h

Maximum deviation of tractor from its original course : None

Abnormal vibration : None

Brake heating method : By means of towing the tractor for 1km at 19.32km/h with a towing force of 22.85 kN

6.3 PARKING BRAKE

	Ballasted tractor on 18% slope	
	Uphill (N)	Downhill (N)
Braking device control force	172	172

7. MEASUREMENT OF EXTERNAL NOISE LEVEL

Date of tests : 12th September, 1997

Type of track : Asphalt

Type of sound level meter : B&K model 2236

Gear	Travelling speed before acceleration (km/h)	Sound level (dB(A))
4 - H	18.89	89.7

8. REPAIRS AND ADJUSTMENTS DURING TESTS

None

9. REMARKS

None