Agricultural Research Centre of Finland

AGRICULTURAL ENGINEERING RESEARCH
MTT/Vakola

TEST BULLETIN: O.E.C.D. No. 2/1792 CODE 2

Report on Test in Accordance with O.E.C.D. Code 2
for the Official Testing of Agricultural Tractors



VALMET 1180S-4 (4WD)

Manufactured by: Valtra do Brasil S.A
Mogi das Cruzes, SP-Brasil

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This bulletin is based on engineering tests in accordance with the OECD Code 2 for the Official Testing of Agricultural Tractors Performance. It does not contain an evaluation of the performance of the tractor on practical farm work.

This report has been approved by the OECD Co-ordinating Centre (CEMAGREF France) as being in accordance with the OECD Code 2 for the Official Testing of Agricultural Tractors.

TABLE OF CONTENTS

1.	SPECIFICATION OF THE TRACTOR	2
1.1	IDENTIFICATION	2
1.2	ENGINE	2
1.3	TRANSMISSION	4
1.4	POWER TAKE-OFF	6
1.5	POWER LIFT	6
1.6	THREE POINT LINKAGE	7
1.7	SWINGING DRAWBAR	9
1.10	STEERING	10
1.11	BRAKES	10
1.12	WHEELS	10
1.12	STRUCTURE	10
1.14	SEAT	11
1.15	LIGHTNING	11
2	TEST CONDITIONS	11
3	COMPULSORY TEST RESULTS	13
3.1	MAIN POWER TAKE-OFF	13
3.2	HYDRAULIC POWER AND LIFTING FORCE	14
3.3	DRAWBAR POWER AND FUEL CONSUMPTION	15

Tractor manufacturer`s name and address	Valtra do Brasil S.A Mogi das Cruzes SP-Brazil
Location of tractor assembly	Mogi das Cruzes, SP-Brazil
Submitted for test by	The manufacturer
Selected for test by	The manufacturer
Place of running-in	Jyväskylä, Finland
Duration of running-in	60 h
Location of test	MTT/Vakola, Finland

1 SPECIFICATIONS OF TRACTOR

1.1 IDENTIFICATION

Make/Model/Type	Valmet/1180S-4/Four wheel drive, unit construction
Number of driving wheels	4
Serial number	1180 BA 30637
First serial number	1180 40 30101

1.2 ENGINE

Make/Model/Type	Valmet/620 D/water cooled, direct injection diesel engine, naturally aspirated
Serial number	G2144

1.2.1 CYLINDERS

Number	6
Disposition	Vertical, in line
Bore/Stroke	108 mm/120 mm
Capacity	6600 cm^3
Compression ratio	16,5:1
Arrangement of valves	Overhead
Cylinder liners	Wet, with middle support

1.2.2 SUPERCHARGING

Make/Model	None

1.2.3 FUEL SYSTEM

Fuel feed system	Rotative pump
Fuel filters	Lucas/Cav 2FS V5845 B 150
Capacity of fuel tank	180 dm^3
Injection pump	Lucas/Cav DP100 V8861 A 090W
Serial number of injection pump	09317 CPB

Manufacturer's production setting of injection pump	58 mm^3/stroke at rated engine speed and full load x)
Flow rating at rated engine speed and full load	24,0 dm^3/h
Timing	21° before TDC
Injectors	Lucas/Cav LRB 67050001
Injection pressure	25 + 0.8 MPa

1.2.4 GOVERNOR

Make/Model/Type	Lucas/Cav
Governed range of engine speed	From 750 to 2500 rev/min
Rated engine speed	2300 rev/min

1.2.5 AIR CLEANER

Pre-cleaner	
Make/Model/Type	Mann/cyclon type
Location of air intake	Above engine hood
Main cleaner	
Make/Model/Type	Mann/dry cleaner with safety element
Location of air intake	Above engine hood
Maintenance indicator	Mechanical

1.2.6 LUBRICATION SYSTEM

Type of pump	Gear type pump
Type of filters	One full flow oil filter with replaceable paper element
Number	1

1.2.7 COOLING SYSTEM

Type of coolant	Water
Type of pump	Centrifugal
Number of fan blades	6
Fan diameter	483 mm
Coolant capacity	26 dm^3
Type of temperature control	Thermostat with temperature indicater
Superpressure system	50 kPa

1.2.8 STARTING SYSTEM

Make/Model/Type	Wapsa/electrical solenoid starting motor
Starter motor power rating	3,0 kW
Cold starting aid	No
Safety device	Only operable when clutch pedal is pressed

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x) The given figure is based on fuel pump bench test according to ISO 4010, for actual fuel consumption see the test results, main power take-off test

1.2.9 ELECTRICAL SYSTEM

Voltage	12 V
Generator	
Make/Model/Type	Bosch K1 R 14V 21/75A
Power	1260 W
Battery	
Number	1
Rating	135 Ah at 20 hours

1.2.10 EXHAUST SYSTEM

Make/Model/Type	Valmet/Ebersprächer/muffler expansion chamber type
Location	Vertical on the right hand side on the bonnet, debouch 2790 mm above ground

1.3 TRANSMISSION

1.3.1 CLUTCH (TRAVEL ALONE)

Make/Model/Type	Luk/330/dry
Number of plates	1
Diameter of plates	330 mm
Method of operation	Mechanical, pedal operated

1.3.2 GEAR BOX

Make/Model/Type	Valmet/380/constant mesh synchronized
Arrangement	Synchronized gears 1-4 with 2 non-synchronized groups, L and H. 2-speeds shift-on-the-go

Description	Forward	Reverse
Number of gears	4	4
Number of ranges/groups	2/2	1/2
Total of arrangements	16	8

Available options: None

1.3.3 REAR AXLE AND FINAL DRIVES

Make/Model/Type	Valmet/crown wheel and pinion differential, planetary final drives
Differential lock	
Type	Dog clutch
Method of engagement	Mechanical, pedal
Method of disengagement	Mechanical, pedal

1.3.4 FRONT AXLE AND FINAL DRIVES

Make/Model/Type	ZF APL 350
Differential lock	
Type	Limit slip
Method of engagement	Automatic
Method of disengagement	Automatic

1.3.5 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 2300 rev/min km/h
1	L/Lo	190.545	3.50
2	L/Lo	136.325	4.90
3	L/Lo	96.047	6.95
4	L/Lo	76.683	8.71
1	L/Hi	151.703	4.40
2	L/Hi	108.536	6.15
3	L/Hi	76.468	8.73
4	L/Hi	61.051	10.94
1	H/Lo	56.548	11.83
2	H/Lo	40.393	16.53
3	H/Lo	28.458	23.46
4	H/Lo	22.721	29.38
1	H/Hi	44.949	14.85
2	H/Hi	32.159	20.76
3	H/Hi	22.657	29.47
4	H/Hi	18.089	36.91
1	R/Lo	119.558	5.58
2	R/Lo	85.537	7.81
3	R/Lo	60.265	11.08
4	R/Lo	48.115	13.88
1	R/Hi	95.186	7.01
2	R/Hi	68.101	9.80
3	R/Hi	47.980	13.92
4	R/Hi	38.307	17.43

(*) Calculated with a tyre dynamic radius index of 770 mm (ISO 4251/1-1992)

Number of revolutions of front wheel for one revolution of rear wheels 1.346

1.4 POWER TAKE-OFF

1.4.1 MAIN POWER TAKE-OFF

Type	Independent
Method of engagement	Hand lever operated electrohydraulical wet multiplate clutch together with a collar shifter
Number of shafts	2
Method of changing power take-off shaft ends and speeds	no changeable shafts, speed change with lever

1.4.1.1 POWER TAKE-OFF PROPORTIONAL TO ENGINE SPEED

Power take-off at 540 rev/min

Location	At the rear of the tractor
Diameter of power take-off shaft end	34,8 mm
Number of splines	6, in conformity with ISO 500:1991
Height above ground	650 mm
Distance from the median plane of the tractor	0 mm
Distance behind rear-wheel axis	470 mm
PTO speed at rated engine speed (2300 rev/min)	656 rev/min
Engine speed at standard PTO speed 540 rev/min	1893 rev/min
Ratio of rotation speeds (engine speed/PTO speed)	3,51
Power restriction and maximum torque	None, but advice to use 1000 r/min PTO for powers over 50 kW
Direction of rotation (viewed from behind tractor)	Clockwise

Power take-off at 1000 rev/min

Location	At the rear of the tractor
Diameter of power take-off shaft end	34,8 mm
Number of splines	21, in conformity with ISO 500:1991
Height above ground	766 mm
Distance from the median plane of the tractor	0 mm
Distance behind rear-wheel axis	470 mm
PTO speed at rated engine speed (2300 rev/min)	1128 rev/min
Engine speed at standard PTO speed 1000 rev/min	2040 rev/min

Ratio of rotation speeds (engine speed/PTO speed)	2,04
Direction of rotation	Clockwise

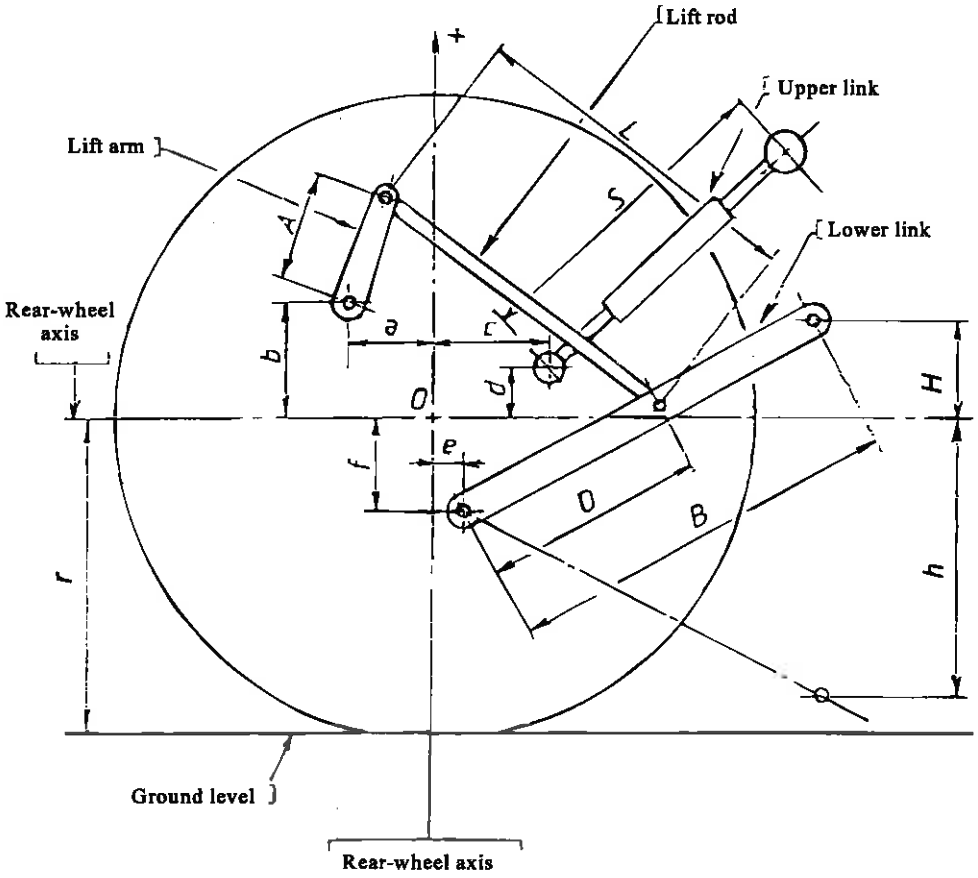
1.5 POWER LIFT

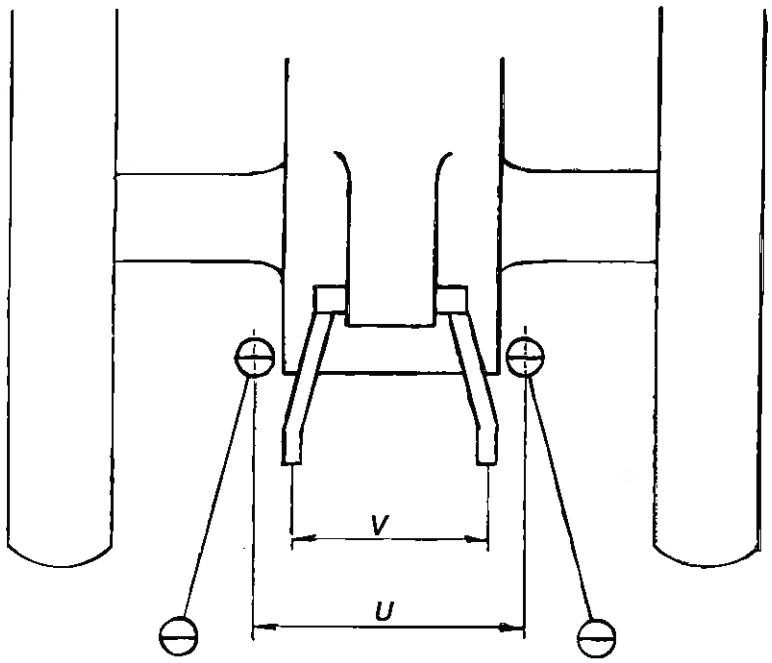
Make/Model/Type	
Type of hydraulic system	Open centre
Type and number of cylinders	Two single acting
Type of linkage lock for transport	Without lock
Relief valve pressure setting	18 + 1 MPa
Opening pressure of cylinder safety valve	20 + 1 MPa
Lift pump type	Gear pump
Transmission between pump and engine	Gears
Type and number of filters	Suction strainer and pressure filter
Site of oil reservoir	In the gearbox
Type, number and location of tapping points	Push-pull, 4 at the rear of the tractor
Maximum volume of oil available to external cylinders	10 dm^3, 20 dm^3 with extra filling

1.6 THREE POINT LINKAGE

Category	2, in conformity with ISO 730-1:1994
Category adapter	None

X) The proportional to ground speed power take off is not connected to pto speeds 540 or 1000, but is independent from those, lever in a third position


Lift rod
Upper link
Lift arm
Lower link
Rear-wheel axis
A
S
L
a
c
b
d
O
H
e
f
D
B
r
h
Ground level
Rear-wheel axis


V
U

		Dimension or range mm	Settings used in test mm
Length of lift arms	(A)	310	310
Length of lower links	(B)	835	835
Distance of lift arm pivot : horizontally	(a)	-108	-108
point from rear-wheel axis : vertically	(b)	278	278
Horizontal distance between the 2 lower link point	(u)	524	524
Horizontal distance between the 2 lift arm end points	(v)	589	589
Length of upper link	(S)	from 510 to 690	540
Distance of upper link pivot point from rear wheel axis			
: horizontally	(c)	555, 533, 520	520
: vertically	(d)	190, 235, 280	280
Distance of lower link pivot point from rear wheel axis			
: horizontally	(e)	219	219
: vertically	(f)	208	208
Distance of lower link pivot points to lift rod pivot points on lower links	(D)	381, 451	381
Length of lift rods	(L)	from 530 to 825	615
Height of lower hitch points relative to the rear-wheel axis			
: in low position	(h)	from 280 to 725	570
: in high position	(H)	from -355 to 270	130
Height above ground of lower hitch points when locked in transport position (*)		45 - 1040	

(*) Assuming r = 770 mm tyre dynamic radius index of ISO 4251/1-1992.

Table 1.1 Dimensions of linkage geometry

1.7 SWINGING DRAWBAR

Type	Fork
Hoke diameter	32.5 mm
Height above ground	410 mm
Distance of hitch point from rear-wheel axis, horizontally	830, 875 mm
Distance of hitch point from power take-off shaft end:	
- vertically	240 mm
- horizontally	360, 405 mm
Maximum vertical permissible load	25 kN completely depressed

1.8 TRAILER HITCH None

1.9 HOLED DRAWBAR None

1.10 STEERING

Make/Model/Type	Danfoss/Orbitrol OSPC160/hydrostatic
Method of operation	Hydraulic circuit
Cylinders	Single central cylinder acting on both steering arms
Working pressure	10 MPa

1.11 BRAKES

1.11.1 Service brake

Make/Model/Type	Valmet/oil immersed disc brakes (4+4 discs)
Method of operation	Two pedals hydraulically actuated independent or combined operation

1.11.2 PARKING BRAKE

Type	Mechanical, coupled to both service brakes
Method of operation	Hand lever with ratchnet

1.12 WHEELS

Number	
- front	Two driving and steering wheels
- rear	Two driving wheels
Wheelbase	2570 mm

Track width adjustment:

	Minimum mm	Maximum mm	Adjustment method
Front	1530	2040	Offset lug rims and reversing wheel centres
Rear	1510	2140	

1.13 STRUCTURE

Make/Model/Type	Mansilla/1180, Cab
Manufacturer's name and address	Valtra do Brasil S.A Mogi das Cruzes, SP-Brazil
Protective device	Roll Over Protective Structure
OECD approval number	None

1.14 SEATS

1.14.1 DRIVER'S SEAT

Make/Model/Type	KLEPP/1050L
Seat and Steering wheel reversible	No
Type of suspension	Mechanical spiral spring
Type of damping	Hydraulic damper
Range of adjustment	
- longitudinal	170 mm
- vertical	45 mm
Safety belt	No

1.15 LIGHTING

	Height above ground of centre mm	Size mm	Distance from outside edge of lights to median plane of tractor mm
Headlights	1180	100 x 160	280
Sidelights	1610	60 x 170	580
Rearlights	1620	60 x 170	750
Reflector	1515 795	40 x 180 ⌀80	755 510

2 TEST CONDITIONS

2.1 OVERALL DIMENSIONS

	Length mm	Width		Height at top of	
		Minimum mm	Maximum mm	Protective structure mm	Exhaust silencer mm
Unballasted	4755	2015	2645	2745	2790

2.2 GROUND CLEARANCE (UNBALLASTED TRACTOR)

380 mm

Clearance limiting part: Swinging drawbar

2.3 TRACTOR MASS

Mass (with cab and tanks full)

	Unballasted	
	Without driver kg	With driver kg
Front	2050	2060
Rear	2365	2430
Total	4415	4490

2.4 TRACK SPECIFICATION

No tracks

2.5 TYRES AND TRACK WIDTH SPECIFICATIONS

	Front	Rear
Tyres:		
- dimensions	14.9-24 R-1	18.4-34 R-1
- load index	6	10
- type	diagonal	diagonal
- maximum load (tyre manufacturer's)	1510 kg	2990 kg
- maximum load (tractor manufacturer's)	1394.5 kg	1803.5 kg
- inflation pressure (tyre manufacturer's)	140 kPa	180 kPa
- dynamic radius index	590 mm	770 mm
Chosen track width	1600 mm	1610 mm

2.6 FUEL

Type — Dieseloil, in conformity with national standards

Density at 15 °C — PTO test 831 g/dm^3

Drawbar power test — 835 g/dm^3

2.7 OILS AND LUBRICATION

2.7.1 CAPACITY AND CHANGE INTERVAL

	Capacity dm^3	Oil change h	Filter change h
Engine	19	250	250
Gear box *)	66	1000	500
Front axle	5.5	1000	-
Final drive (front axle)	2 x 0.75	1000	-

*) Includes rear axle, final drive (rear), hydraulic system and steering

2.7.2 SPECIFICATIONS

	Recommended	Used during test
Engine oil		
- Type	15w/40	As recommended
- Viscosity	10W/30 +30-20°C 5W/20 -10..-30°C	
- Classification	API CE	
Transmission oils		
- Type		As recommended
- Viscosity	SAE 90	
- Classification	API - GL 4(STOU)	
Front axle		
- Type		As recommended
- Viscosity	90,80W/90	
- Classification	API GL-5 (EP)	

2.7.3 Grease — (NLGI-2)

Number of lubrication points — 9

3 COMPULSORY TEST RESULTS

3.1 MAIN POWER TAKE-OFF

- Date and location of tests 14th October 1997 MTT/Vakola
- Type of dynamometer Schenk W 400

Power	Speed		Fuel consumption			Specific energy
	Engine	P.T.O.	Hourly		Specific	
kW	rev/min		kg/h	l/h	g/kWh	kWh/l
1.1 MAXIMUM POWER - TWO-HOUR TEST						
79.2	2250	1103	20.03	24.11	253	3.29
1.2 POWER AT RATED ENGINE SPEED						
79.1	2300	1127	20.31	24.45	257	3.23
1.3 STANDARD POWER TAKE-OFF SPEED (1000 REV/MIN)						
75.2	2040	1000	18.54	22.32	247	3.37
1.4 PART LOADS 1.4.1 The torque corresponding to maximum power at rated engine speed						
79.1	2300	1127	20.31	24.45	257	3.23
1.4.2 85 % of torque obtained in 1.4.1						
69.4	2373	1163	18.62	22.42	268	3.10
1.4.3 75 % of torque defined in 1.4.2						
52.9	2411	1182	15.59	18.77	295	2.82
1.4.4 50 % of torque defined in 1.4.2						
35.8	2446	1199	12.82	15.45	358	2.32
1.4.5 25 % of torque defined in 1.4.2						
18.0	2475	1213	9.78	11.78	542	1.53
1.4.6 Unloaded						
0	2507	1229	6.91	8.34	-	-
1.5 PART LOADS AT STANDARD POWER TAKE-OFF SPEED (1000 REV/MIN) 1.5.1 The torque corresponding to maximum power						
75.2	2040	1000	18.54	22.32	247	3.37
1.5.2 85 % of torque obtained in 1.5.1						
65.7	2099	1029	16.54	19.91	252	3.30
1.5.3 75 % of torque defined in 1.5.2						
50.4	2144	1051	13.85	16.68	275	3.02
1.5.4 50 % of torque defined in 1.5.2						
34.2	2183	1070	10.94	13.18	320	2.59
1.5.5 25 % of torque defined in 1.5.2						
17.4	2215	1086	8.21	9.90	472	1.76
1.5.6 Unloaded						
0	2256	1106	5.66	6.84	-	-

- No load maximum engine speed 2507 rev/min
- Torque[1)] at rated engine speed 328.4 Nm
- Torque[1)] at maximum power 336.3 Nm
- Maximum torque[1)] 417.2 Nm
  at engine speed 1102 rev/min
- Mean atmospheric conditions
  - Temperature 23 °C
  - Pressure 99.8 kPa
  - Relative humidity 43 %
- Maximum temperatures
  - Coolant 80 °C
  - Engine oil 98 °C
  - Fuel 39 °C
  - Engine air intake 30 °C

[1)] Equivalent crankshaft torque

3.2 HYDRAULIC POWER AND LIFTING FORCE

Date of tests 3rd July and 8th July 1998

3.2.1 HYDRAULIC POWER TEST

Sustained pressure with relief valve open 18.3 MPa

Pump delivery rate at minimum pressure 53.1 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	50.6	16.5	13.9
Flow rate and hydraulic pressure corresponding to maximum hydraulic power	50.5	17.0	14.3

Tapping point used for test External tapping

3.2.2 POWER LIFT TEST

	At the hitch point	On the frame
Height of lower hitch points above ground in down position	200 mm	200 mm
Vertical movement without lifting forces with lifting forces	 700 mm 600 mm	 870 mm 750 mm
Maximum corrected force exerted through full range	40.4 kN	25.0 kN
Corresponding pressure of hydraulic fluid	16.6 MPa	16.6 MPa
Moment about rear-wheel axis	42.6 kNm	41.6 kNm
Maximum tilt angle of mast from vertical		16 degrees

Lifting heights relative to the horizontal plane including the lower link pivot points									
mm	-342	-300	-200	-100	0	100	200	300	408
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	-	40.4	40.4	40.7	40.6	40.7	40.7	40.6	-
Corresponding pressure 16.6 MPa									
At the frame kN	39.8	37.5	36.0	34.5	33.0	30.8	29.9	27.6	25.0
Corresponding pressure 16.6 MPa									

3.3 DRAWBAR POWER AND FUEL CONSUMPTION

Date of tests 9th July 1998

Type of track Tarmacadam

		Tyre inflation presssure	
	Height of drawbar above ground	Front	Rear
Unballasted	430 mm	120 kPa	120 kPa

FUEL CONSUMPTION

Gear and range	Power	Draw-bar pull	Speed	Engine speed	Slip of wheels	Specific fuel cons-umption	Specific energy	Temperature			Atmospheric conditions		
								Fuel	Coo-lant	Eng ine oil	Tempera-ture	Relative humidi-ty	Pressure
	kW	kN	km/h	rev/min	%	g/kWh	kWh/l	°C	°C	°C	°C	%	kPa
3.3.1. MAXIMUM POWER IN TESTED GEARS (unballasted tractor)													
1 L/Lo	34.6	37.3	3.34	2424	14.9	428	1.95	39	82	89	28	59	98.7
1 L/Hi	43.5	37.7	4.15	2398	14.9	377	2.22	40	82	87	25	59	98.7
2 L/Lo	47.6	37.3	4.59	2383	14.8	367	2.27	38	82	85	26	59	98.7
2 L/Hi	58.8	37.6	5.63	2332	15.0	335	2.49	38	82	86	30	59	98.7
3 L/Lo	61.4	35.4	6.24	2256	13.8	332	2.51	39	84	83	27	59	98.7
3 L/Hi	62.9	28.0	8.09	2247	10.5	324	2.58	41	82	85	27	59	98.7
4 L/Lo	63.6	28.2	8.12	2247	10.4	320	2.61	40	82	84	26	59	98.7
4 L/Hi	64.3	22.2	10.43	2255	8.4	317	2.64	41	82	84	27	59	98.7
1 H/Lo	65.0	20.7	11.30	2229	7.0	314	2.66	41	82	83	28	59	98.7
1 H/Hi	63.6	15.8	14.50	2246	5.9	320	2.61	41	82	82	27	59	98.7
2 H/Lo	63.2	14.1	16.14	2234	5.4	322	2.59	45	83	84	27	59	98.7
2 H/Hi	62.7	10.9	20.70	2255	4.3	328	2.55	44	83	86	26	59	98.7

3.3.2 FUEL CONSUMPTION

Gear and range	Power	Drawbar pull	Speed	Engine speed	Slip of wheels	Specific fuel consumption	Specific energy	Temperature			Atmospheric conditions		
								Fuel	Coolant	Engine oil	Temperature	Relative humidity	Pressure
	kW	kN	km/h	rev/min	%	g/kWh	kWh/l	°C	°C	°C	°C	%	kPa
3.3.2.1 In selected gear, at maximum power at rated speed													
1 H/Lo	65.0	20.7	11.30	2229	7.0	314	2.66	41	82	85	28	59	98.7
3.3.2.1.1 75 % of pull at maximum power at rated speed													
1 H/Lo	52.9	15.5	12.29	2383	5.4	340	2.46	42	81	86	26	59	98.7
3.3.2.1.2 50 % of pull at maximum power at rated speed													
1 H/Lo	36.8	10.5	12.60	2411	4.2	405	2.06	43	81	86	25	59	98.7
3.3.2.1.3 Next higher gear at reduced engine speed, same pull and travelling speeds as in 3.3.2.1.1													
1 H/Hi	53.1	15.4	12.42	1920	5.7	301	2.78	42	82	83	24	59	98.7
3.3.2.1.4 Next higher gear at reduced engine speed, same pull and travelling speeds as in 3.3.2.1.2													
1 H/Hi	36.0	10.2	12.70	1934	4.3	335	2.49	39	82	84	22	59	98.7

Gear and range	Power	Drawbar pull	Speed	Engine speed	Slip of wheels	Specific consumption	Specific energy	Temperature			Atmospheric conditions		
								Fuel	Coolant	Engine oil	Temperature	Relative humidity	Pressure
	kW	kN	km/h	rev/min	%	g/kWh	kWh/l	°C	°C	°C	°C	%	kPa
3.3.2.2 In selected gear nearest to 7.5 km/h													
3 L/Lo	61.4	35.4	6.24	2256	13.8	332	2.51	39	82	86	27	59	98.7
3.3.2.2.1 75 % of pull at maximum power at rated speed													
3 L/Lo	51.1	26.5	6.94	2383	9.3	342	2.44	38	82	84	22	59	98.7
3.3.2.2.2 50 % of pull at maximum power at rated speed													
3 L/Lo	35.6	17.7	7.24	2419	6.8	402	2.08	38	80	87	22	59	98.7
3.3.2.2.3 Next higher gear at reduced engine speed, same pull and travelling speeds as in 3.3.2.2.1													
4 L/Lo	50.7	26.3	6.94	1907	9.5	304	2.75	39	79	85	22	59	98.7
3.3.2.2.4 Next higher gear at reduced engine speed, same pull and travelling speeds as in 3.3.2.2.2													
4 L/Lo	35.1	17.7	7.14	1894	6.3	332	2.52	40	82	85	23	59	98.7

4	**OPTIONAL TEST RESULTS**	None
5	**REPAIRS**	None
6	**REMARKS**	None
7	**Annexes**	Power curve, fuel consumption curve and specific fuel consumptin curve.

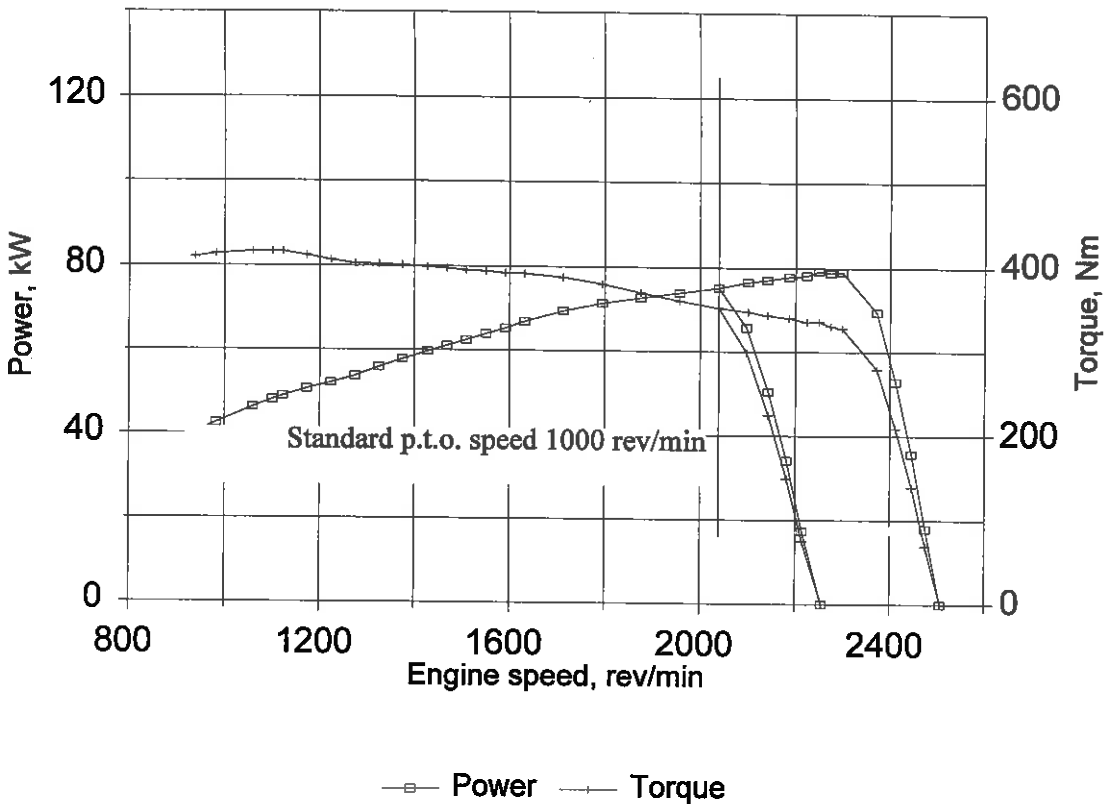
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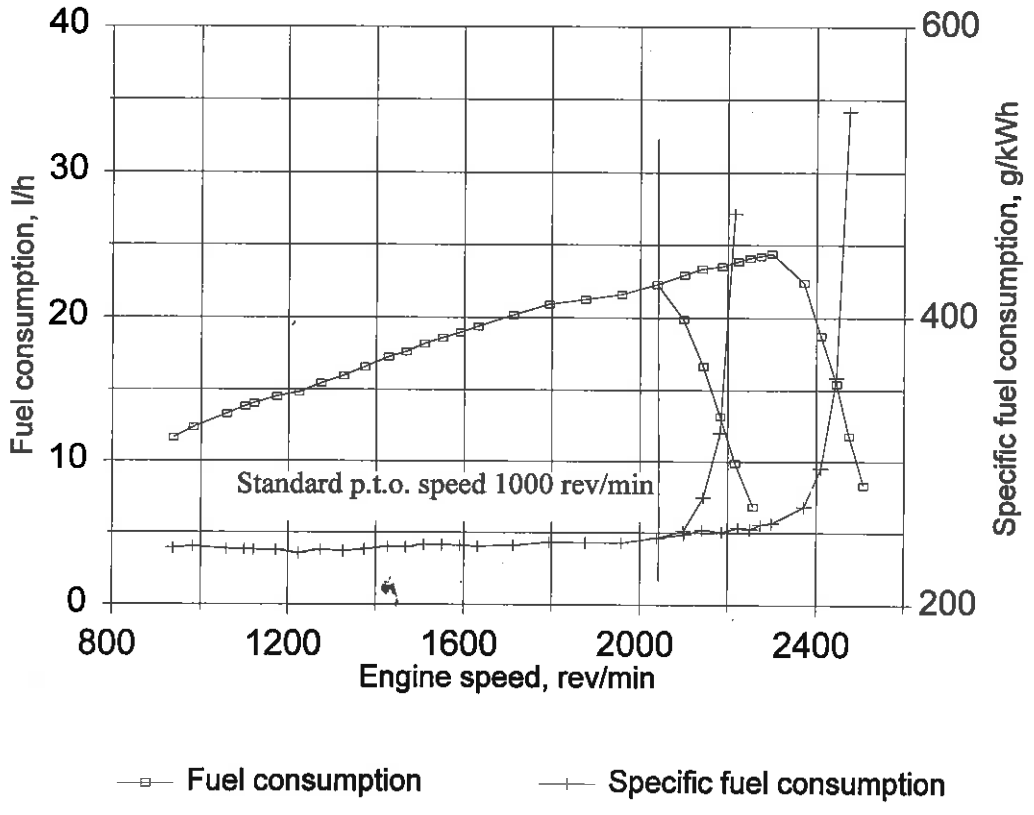
Vihti, 10th July 1998

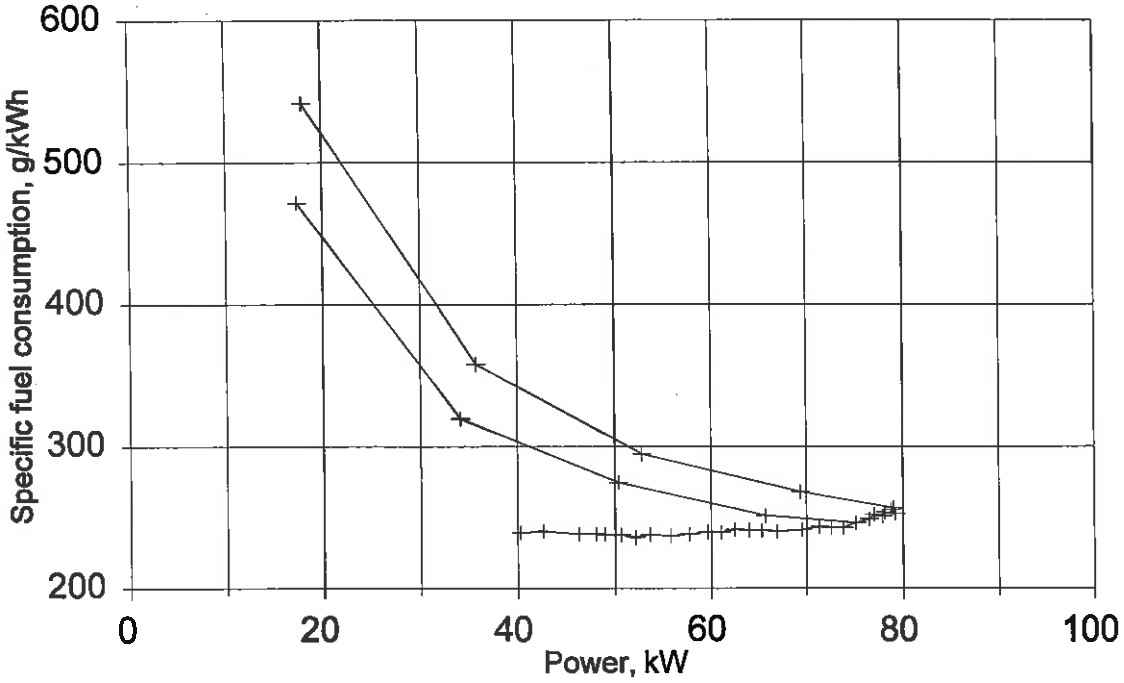
Head of inspector office — Lauri Tuunanen

Test engineer — Ari Lemminkäinen

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120
80
40
0
600
400
200
0
Power, kW
Torque, Nm
Standard p.t.o. speed 1000 rev/min
800
1200
1600
2000
2400
Engine speed, rev/min
Power
Torque


40
30
20
10
0
600
400
200
Fuel consumption, l/h
Specific fuel consumption, g/kWh
Standard p.t.o. speed 1000 rev/min
800
1200
1600
2000
2400
Engine speed, rev/min
Fuel consumption
Specific fuel consumption


600
500
400
300
200
Specific fuel consumption, g/kWh
0
20
40
60
80
100
Power, kW

Vihdin Painorasteri Oy 1999