VAKOLA

PPA 1
SF-03400 VIHTI
FINLAND
+358 0 224 6211

VALTION MAATALOUSTEKNOLOGIAN TUTKIMUSLAITOS

STATE RESEARCH INSTITUTE OF ENGINEERING IN AGRICULTURE AND FORESTRY

TEST BULLETIN: O.E.C.D. No. 1332 RESTRICTED CODE

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



VALMET 8100 (4WD)

Manufactured by: Valmet Tractors Inc.
SF-44200 Suolahti, Finland

Date of approval: 24th September 1991.Serial No. 1332 RESTRICTED CODE

This bulletin is based on engineering tests in accordance with the OECD Restricted Standard Code for the Official Testing of Agricultural Tractors Performance. It does not contain on 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 Restricted Standard Code for the Official Testing of Agricultural Tractors.

TABLE OF CONTENTS

I SPECIFICATION OF THE TRACTOR 2
TRACTOR 2
ENGINE 2
TRANSMISSION 4
POWER TAKE-OFF 6
POWER LIFT 7
TRAILER HITCH 9
STEERING 9
BRAKES 10
WHEELS 10
PROTECTIVE STRUCTURE 10
DRIVER'S SEAT 10
MISCELLANEOUS 11
LIGHTNING 11
II TEST CONDITIONS 11
III TEST RESULTS 13
1. MAIN POWER TAKE-OFF 13
2. HYDRAULIC POWER AND LIFTING FORCE 14
3. DRAWBAR POWER AND FUEL CONSUMPTION 15
IV OPTIONAL TEST RESULTS 18
4. BRAKING 18

Tractor manufacturer's name and address	Valmet Tractors Inc. SF-44200 Suolahti, Finland
Location of tractor assembly	Suolahti, Finland
Submitted for test by	The manufacturer
Selected for test by	The manufacturer
Place of running-in	Valmet Corporation, Tourula
Duration of running-in	80 h
Location of test	VAKOLA, Finland

I SPECIFICATIONS OF TRACTOR

TRACTOR

Make/Model/Type	Valmet/8100/Four wheel drive unit construction
Number of driving wheels	4
Serial number	651859
First serial number	651859

ENGINE

Make/Model/Type	Valmet/620 D/water cooled, direct injection diesel engine, naturally aspirated
Serial number	95712

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
Supercharging	None
Fuel system	
Fuel feed system	Mechanical piston type feed pump
Fuel filters	Bosch (paper)
Capacity of fuel tank	165 dm^3
Injection pump	Bosch PES 6A, in line
Serial number of injection pump	06330957

Manufacturer's production setting of injection pump	74 mm^3/stroke, at rated engine speed and full load x)
Flow rating at rated engine speed and full load	26.6 dm^3/h
Timing	24° before TDC
Injectors	Stanadyne NBS 770620, multihole
Injection pressure	23 MPa
Governor	
Make/Model/Type	Bosch RSV/centrifugal
Governed range of engine speed	from 750 to 2450 rev/min
Rated engine speed	2225 rev/min
Air cleaner	
Pre-cleaner	
Make/Model/Type	Valmet/cyclon type
Location of air intake	Above engine hood
Main cleaner	
Make/Model/Type	Valmet/dry cleaner with safety element
Location of air intake	Above engine hood
Maintenance indicator	Electrical
Lubrication system	
Type of pump	Gear pump
Type of filters	One full flow oil filter with replaceable paper element
Number	1
Cooling system	
Type of coolant	Anti-freeze
Type of pump	Centrifugal
Number of fan blades	6
Fan diameter	508 mm
Coolant capacity	24 dm^3
Type of temperature control	Thermostat
Superpressure system	50 kPa
Starting system	
Make/Model/Type	Lucas/M127/electrical solenoid starting motor
Starter motor power rating	3 kW
Cold starting aid	Thermostart, automatic fuel exess and injection delay
Safety device	Only operable when clutch pedal is pressed

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.

Electrical system	
Voltage	12 V
Gnerator	
Make/Model/Type	Magnetti Marelli/A127-65
Power	870 W
Battery	
Number	1
Rating	158 Ah at 20 hours
Exhaust system	
Make/Model/Type	Valmet/Eberspächer/muffler, expansion chamber type
Location	Vertical on the right hand side, debouch 2895 mm above ground

TRANSMISSION

Clutch (travel alone)	
Make/Model/Type	Fichtel & Sachs 330 WGSZX/ dry
Number of plates	1
Diameter of plates	330 mm
Method of operation	Mechanical pedal operated
Gear box	
Make/Model/Type	Valmet/GL 420/constant mesh fully synchronized with shuttle gear
Arrangement	Synchromesh gear box with 4 speeds, syncromesh group gear with 2 ranges (M and H), LL with dog clutch and directional shift and quick-shift gear
Number of gears	24 forward, 24 reverse
Available options	40 km/h transmission
Rear axle and final drives	
Make/Model/Type	Valmet/crown wheel and pinion differential, planetary final drives
Differential lock	
Type	Multidisc
Method of engagement	Electrohydraulically by a press button
Method of disengagement	Electrohydraulically by a press button
Front axle and final drives	
Make/Model/Type	Sige/CS17 SD 01 crown wheel and pinion differential

Differential lock

Type	Limit slip
Method of engagement	Automatic
Method of disengagement	Automatic

Total ratios and travelling speeds

Gear	Group	Quickshift	Number of engine revolutions for one revolution of the driving wheels		Nominal travelling speed[1] at rated engine speed of 2225 rev/min, km/h	
			forward	reverse	forward	reverse
1	LL	L	1105.758	1079.005	0.6	0.6
1	LL	H	880.358	859.054	0.8	0.8
2	LL	L	775.597	756.833	0.9	0.9
2	LL	H	617.495	602.555	1.1	1.1
3	LL	L	551.940	538.587	1.2	1.3
3	LL	H	439.429	428.798	1.6	1.6
4	LL	L	390.410	380.965	1.8	1.8
4	LL	H	310.826	303.306	2.2	2.3
1	M	L	261.458	255.13	2.6	2.7
1	M	H	208.161	203.124	3.3	3.4
2	M	L	183.391	178.95	3.8	3.8
2	M	H	146.007	142.475	4.7	4.8
3	M	L	130.507	127.35	5.3	5.4
3	M	H	103.904	101.390	6.6	6.8
4	M	L	92.313	90.08	7.5	7.6
4	M	H	73.495	71.717	9.4	9.6
1	H	L	83.795	81.77	8.2	8.4
1	H	H	66.714	65.100	10.3	10.6
2	H	L	58.776	57.35	11.7	12.0
2	H	H	46.794	45.662	14.7	15.1
3	H	L	41.827	40.81	16.4	16.8
3	H	H	33.300	32.495	20.6	21.2
4	H	L	29.586	28.87	23.2	23.8
4	H	H	23.555	22.985	29.2	29.9

1) Calculated with a tyre dynamic radius index of 820 mm (ISO 4251/1-1984)

Number of revolutions of front wheels for one revolution of rear wheels	1.3151

POWER TAKE-OFF

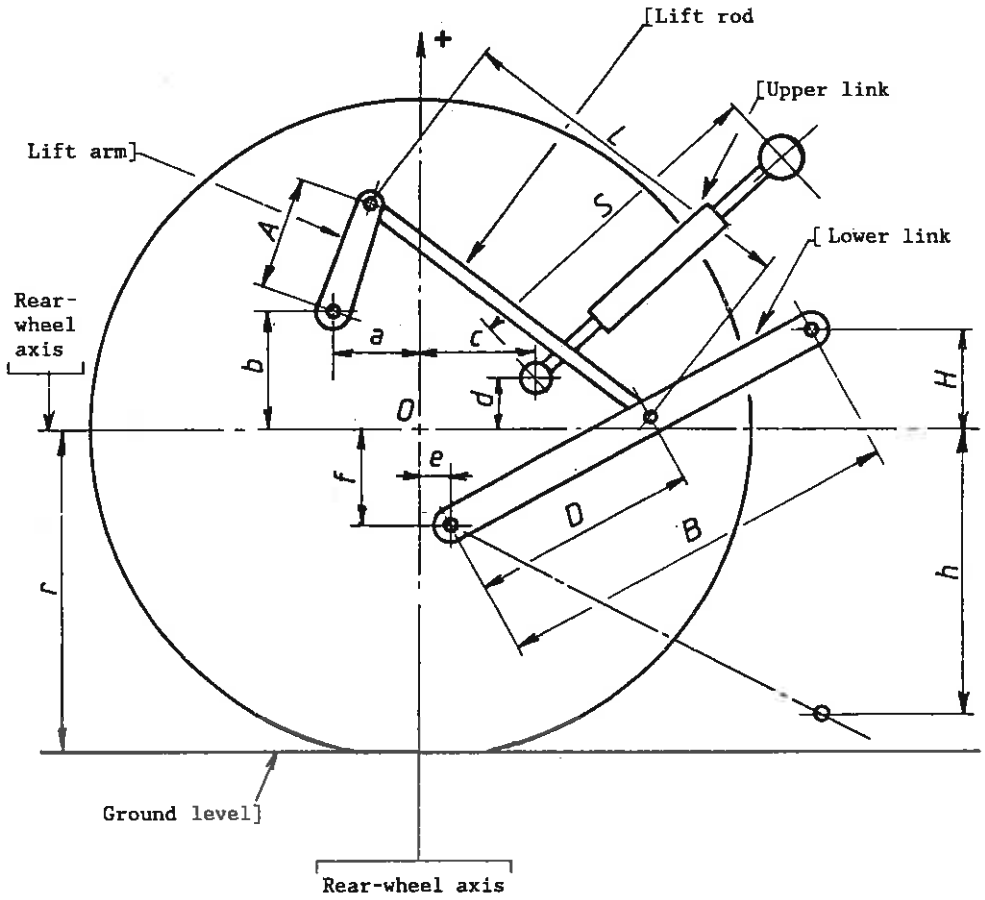
Main power take-off	
Type	Independent
Method of engagement	Hand lever operated electrohydraulical wet multiplate clutch together with a collar shifter
Number of shafts	1
Method of changing power take-off shaft ends	Changeable shaft and speed changing happens with a collar shifter
Power take-off proportional to engine speed	
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 500/1979
Height above ground	780 mm
Distance from the median plane of the tractor	0 mm
Distance behind rear-wheel axis	428 mm
PTO speed at rated engine speed (2225 rev/min)	641 rev/min
Engine speed at standard PTO speed 540 rev/min	1874 rev/min
Ratio of rotation speeds (engine speed/PTO speed)	3,471
Power restriction and maximum torque	None
Direction of rotation (viewed from behind tractor)	Clockwise
1000 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 500/1979, additional: 21, in conformity with ISO 500/1979
Height above ground	780 mm
Distance from the median plane of the tractor	0 mm
Distance behind rear-wheel axis	428 mm
PTO speed at rated engine speed (2225 rev/min)	1070 rev/min

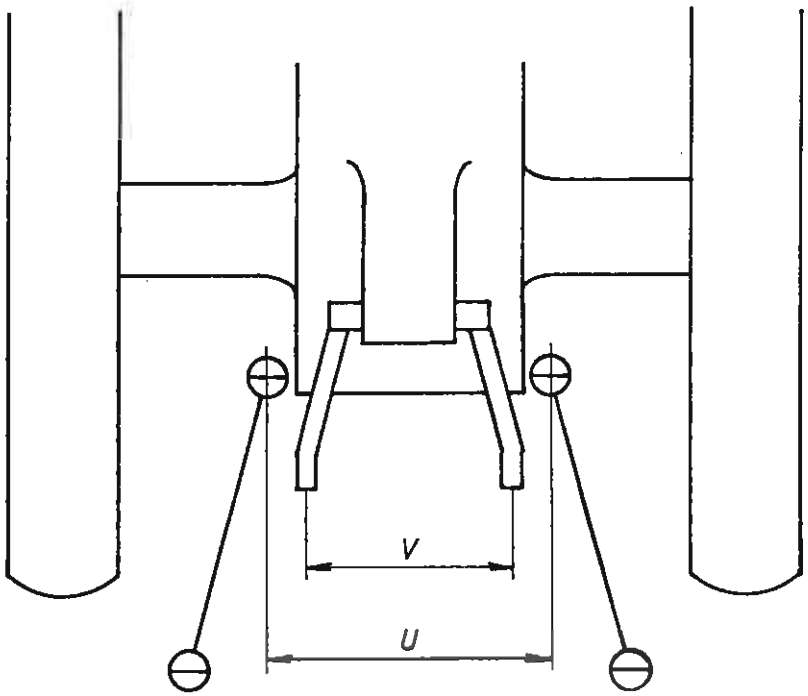
Engine speed at standard PTO speed 1000 rev/min	2080 rev/min
Ratio of rotation speeds (engine speed/PTO speed)	2,080
Direction of rotation	Clockwise
Power take-off proportional to ground speed	
PTO shaft	Optional together with 540 and 1000
Travelling distance for one revolution of power take-off shaft	125,8 mm x)
Number of power take-off shaft revolutions for one revolution of (rear) driving wheels	40,96 x)
Direction of rotation with forward gear engaged	Clockwise

POWER LIFT

Make/Model/Type	Valmet/60 kN
Type of hydraulic system	Open centre
Type and number of cylinders	Two single acting
Type of linkage lock for transport	Electric
Relief valve pressure setting	18 + 0,8 MPa
Opening pressure of cylinder safety valve	20 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	15 dm^3, 30 dm^3 with extra filling
Three point linkage	
Category	2, in conformity with ISO 730/1-1977
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
+
L
S
A
a
b
c
d
O
e
f
D
B
H
h
r
Ground level]
Rear-wheel axis


V
U

		Dimension or range mm	Settings used in test mm
Length of lift arms	(A)	350	350
Length of lower links	(B)	920	920
Distance of lift arm pivot point from rear-wheel axis : horizontally	(a)	-112	-112
: vertically	(b)	287	287
Horizontal distance between the 2 lower link point	(u)	610	610
Horizontal distance between the 2 lift arm end points	(v)	600	600
Length of upper link	(S)	570 - 790	670
Distance of upper link pivot point from rear wheel axis : horizontally	(c)	422, 432, 442	432
: vertically	(d)	155, 230, 305	230
Distance of lower link pivot point from rear wheel axis : horizontally	(e)	192	192
: vertically	(f)	260	260
Distance of lower link pivot points to lift rod pivot points on lower links	(D)	342, 384, 440	440
Length of lift rods	(L)	555 - 680	660
Height of lower hitch points relative to the rear-wheel axis : in low position	(h)	385-750	620
: in high position	(H)	62-385	100
Height above ground of lower hitch points when locked in transport position (*)		70-1205	

(*) Assuming r = 820 mm tyre dynamic radius index of ISO 4251/1-1984.

Table 1.1 Dimensions of linkage geometry

TRAILER HITCH

Type	Hitch-hook
Hook diameter	47 mm
Height above ground	565 mm
Distance of hitch point from rear-wheel axis, horizontally	470 mm
Distance of hitch point from power take-off shaft end:	
- vertically	215 mm
- horizontally	42 mm behind
Maximum vertical permissible load	53 kN

STEERING

Make/Model/Type	Danfoss/Orbitrol OSBC 125 LS/hydrostatic

Method of operation	Independent hydraulic circuit for steering
Cylinders	Single central cylinder acting on both steering arms
Working pressure	14 + 1 MPa

BRAKES

Service brake

Make/Model/Type	Valmet/oil immersed disc brakes
Method of operation	Two pedals hydraulically actuated independent or combined operation
Trailer braking take-off	Additional (not on tested tractor)

Parking brake

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

WHEELS

Number	
- front	Two driving and steering wheels
- rear	Two driving wheels
Wheelbase	2558 mm

Track width adjustment:

	Minimum mm	Maximum mm	Adjustment method
Front	1520	1972	Offset lug rims and reversing wheel centres
Rear	1505	2120	Offset lug rims and reversing wheel centres

PROTECTIVE STRUCTURE

Make/Model/Type	T 888/2
Manufacturer's name and address	Valmet Tractors Inc. 44200 Suolahti, Finland
Protective device	Protective cab, not tiltable
OECD approval number	CSS 0164/5

DRIVER'S SEAT

Make/Mode/Type	Grammer DS 85H/90 A
Type of suspension	Mechanical spiral spring

Type of damping	Hydraulic damper
Range of adjustment	
- longitudinal	200 mm
- vertical	60 mm

MISCELLANEOUS

Additional seat	
- location	To the left of the driver
- number of places	1

LIGHTNING

	Height above ground of centre mm	Size mm	Distance from outside edge of lights to median plane of tractor mm
Headlights	1170	100 x 160	178
Sidelights	1810	60 x 80	645
Rearlights	1780	60 x 80	755
Reflector	1575	40 x 180	793

II. TEST CONDITIONS

Overall dimensions

Length mm	Width		Height at top of	
	Minimum mm	Maximum mm	Protective structure mm	Exhaust silencer mm
4745	2200	2640	2760	2895

Ground clearance	475 mm
Clearance limiting part	Hitch-hook

Tractor mass
(with cab and tanks full)

	Unballasted		Ballasted	
	Without driver kg	With driver kg	Without driver kg	With driver kg
Front	2000	2010	2910	2920
Rear	2600	2665	3660	3725
Total	4600	4675	6570	6645

Ballast

	Weights		
	Number	Total mass kg	Water kg
Front	12	470	220
Rear	8	580	700

Tyres and track width specifications

	Front	Rear
Tyres:		
- dimensions	14.9 R 28	18.4 R 38
- load index	128	146
- type	Radial	Radial
- maximum load (tyre manufacturer's)	18 kN	30 kN
- maximum load (tractor manufacturer's)	- kN	- kN
- inflation pressure (tyre manufacturer's)	160 kPa	160 kPa
- dynamic radius index	640 mm	820 mm
Chosen track width	1780 mm	1720 mm

Oils and lubrication (Capacity and change interval)

	Capacity dm^3	Oil change h	Filter change h
Engine	16	200	200
Gear box(*)	43	800	400
Front axle	8	800	-
Final drive (front axle)	2 x 1	800	-

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

	Recommended	Used during test
Engine oil		Neste Delta Tractor Super
- Type	10W/30 +30-20°C	
- Viscosity	5W/20 -10..-30°C	10 W 30
- Classification	API CD	API GL 5
Transmission oils		Neste Delta Tractor Super
- Type	10W/30, 5W/30	
- Viscosity	5W/20 -10..-30°C	10 W 30
- Classification	API - GL 4(STOU)	API GL 5
Front axle		Texaco Hypoid
- Type		
- Viscosity	80W/90	80 W/90
- Classification	API GL-5 (EP)	EP

Grease — Universal grease

Number of lubrication points — 29

Fuel

Type	Dieseloil, in conformity with national standards
Density at 15 °C	PTO test 841 g/dm³ Drawbar power test 835 g/dm³
REPAIRS	None
REMARKS	None

III. TEST RESULTS

COMPULSORY TEST RESULTS

1. MAIN POWER TAKE-OFF

- Date and location of tests	Vihti 23.8.1990
- 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						
81.0	2225	1070	19.5	23.2	240	3.50
1.2 POWER AT RATED ENGINE SPEED						
81.0	2225	1070	19.5	23.2	240	3.50
1.3 STANDARD POWER TAKE-OFF SPEED (1000 rev/min)						
81.0	2079	1000	19.3	22.9	238	3.54
1.4 PART LOADS 1.4.1 The torque corresponding to maximum power at rated engine						
81.0	2225	1070	19.5	23.2	240	3.50
1.4.2 85% of torque obtained in 1.4.1						
69.7	2252	1083	17.0	20.2	244	3.45
1.4.3 75% of torque defined in 1.4.2						
53.1	2281	1097	13.7	16.3	258	3.26
1.4.4 50% of torque defined in 1 4.2						
35.7	2306	1109	10.6	12.7	298	2.82
1.4.5 25% of torque defined in 1.4.2						
18.0	2326	1119	7.7	9.1	425	1.97
1.4.6 Unloaded						
0	2360	1135	4.9	5.8	-	-

Power	Speed		Fuel consumption			Specific energy
	Engine	P.T.O.	Hourly		Specific	
kW	rev/min		kg/h	l/h	g/kWh	kWh/l
1.5 PART LOADS AT STANDARD POWER TAKE-OFF SPEED (1000 REV/MIN) 1.5.1 The torque corresponding to maximum power						
81.0	2079	1000	19.3	22.9	238	3.54
1.5.2 85% of torque obtained in 1.5.1						
69.7	2102	1011	16.4	19.6	236	3.56
1.5.3 75% of torque defined in 1.5.2						
52.9	2127	1023	13.1	15.6	248	3.40
1.5.4 50% of torque defined in 1.5.2						
35.6	2150	1034	10.0	11.9	282	2.98
1.5.5 25% of torque defined in 1.5.2						
18.1	2175	1046	7.1	8.5	396	2.12
1.5.6 Unloaded						
0	2210	1063	4.4	5.2	-	-

- No load maximum engine speed 2360 rev/min
- Torque[1] at maximum power 348 Nm
- Maximum torque[1] 421 Nm
  at engine speed 1220 rev/min
- Mean atmospheric conditions
  - Temperature 20°C
  - Pressure 100.2 kPa
  - Relative humidity 59 %
- Maximum temperatures
  - Coolant 83°C
  - Engine oil 114°C
  - Fuel 45°C
  - Engine air intake 29°C

[1] Equivalent crankshaft torque

2. HYDRAULIC POWER AND LIFTING FORCE

2.1 Hydraulic power test

Date of tests 25 and 27.2.1991

Sustained pressure with relief valve open 20.5 MPa

Pump delivery rate at minimum pressure 67.4 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	63.0	18.5	19.4
Flow rate and hydraulic pressure corresponding to maximum hydraulic power	62.7	19.0	19.9

Tapping point used for test external tapping

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	685 mm	645 mm
Maximum corrected force exerted through full range	56,4 kN	39,1 kN
Corresponding pressure of hydraulic fluid	17,7 MPa	17,7 MPa
Moment about rear-wheel axis	62,7 kNm	67,3 kNm
Maximum tilt angle of mast from vertical	-	14 degrees

Lifting heights relative to the horizontal plane including the lower link pivot points										
mm	-350	-310	-250	-200	-100	0	100	200	300	335
Lifting forces (the values measured are corrected to correspond to a hydraulic pressure equivalent to 90% of the actual relief valve pressure setting)										
At the hitch points kN	58.0		57.8	57.7	57.3	56.4	57.0	57.1	57.3	57.3
Corresponding pressure: 17.7 MPa										
At the frame kN		53.3	52.9	52.0	50.3	48.6	46.1	44.0	41.1	39.1
Corresponding pressure: 17.7 MPa										

3. DRAWBAR POWER AND FUEL CONSUMPTION

Date of tests 4.9.1990
Type of track Tarmacadam

		Tyre inflation presssure	
	Height of drawbar above ground	Front	Rear
Unballasted	535 mm	100 kPa	100 kPa

Gear and range	Power	Drawbar pull	Speed	Engine speed	Slip of wheels or track	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
3.1 MAXIMUM POWER IN TESTED GEARS													
M1H	33.3	39.7	3.0	2307	14.8	379	2.20	38	79	93	13	41	101.4
M2L	38.0	40.1	3.4	2301	15.0	357	2.34	38	79	94	12	41	101.4
M2H	47.4	40.1	4.3	2272	14.7	334	2.50	38	79	93	12	41	101.4
M3L	52.7	39.9	4.8	2269	14.6	325	2.57	39	80	93	14	41	101.4
M3H	61.1	36.7	6.0	2226	12.6	318	2.63	42	80	91	13	41	101.4
M4L	64.1	34.0	6.8	2217	11.6	308	2.71	41	82	92	14	41	101.4
H1L	66.0	31.2	7.6	2209	9.9	299	2.79	42	80	90	14	41	101.4
M4H	65.7	26.5	8.9	2231	8.0	300	2.78	44	81	92	14	41	101.4
H1H	65.9	24.2	9.8	2198	7.3	299	2.79	45	81	92	14	41	101.4
H2L	67.1	21.5	11.3	2203	5.9	293	2.85	44	80	92	14	41	101.4
H2H	65.9	16.3	14.5	2221	3.8	298	2.80	45	80	91	14	41	101.4
H3L	62.6	13.7	16.4	2232	4.0	311	2.69	45	79	91	14	41	101.4

3.2 FUEL CONSUMPTION

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
3.2.1 In selected gear at maximum power													
H2L	67.1	21.5	11.3	2203	5.9	293	2.85	44	80	92	14	41	101.4
3.2.1.1 75 % of pull at maximum power at rated speed													
H2L	53.1	16.1	11.9	2281	4.3	306	2.73	42	80	91	14	41	101.4
3.2.1.2 50 % of pull at maximum power at rated speed													
H2L	35.8	10.7	12.1	2288	2.8	357	2.34	43	79	91	14	41	101.4
3.2.1.3 Next higher gear at reduced engine speed, same pull and travelling speeds as in 3.2.1.1													
H2H	53.7	16.1	12.0	1838	3.8	279	3.00	41	80	91	15	41	101.4
3.2.1.4 Next higher gear at reduced engine speed, same pull and travelling speeds as in 3.2.1.2													
H2H	35.8	10.7	12.1	1822	2.4	315	2.65	40	79	92	14	41	101.4

IV. OPTIONAL TEST

In the braking tests the tractor was equipped with a 40 km/h transmission.

4. BRAKING

Date of tests 24.5 and 7.-8.8.1991

4.1 Cold service braking device test

	Speed before application of brakes km/h	Braking device control force kN	Mean deceleration m/s^2
Ballasted tractor	42.2	0.3 0.4 0.5 0.6	2.0 2.6 3.2 3.7
Unballasted tractor	41.6	0.3 0.4 0.5 0.6	3.0 3.7 4.5 5.1

4.2 Fade test

Speed before application of brakes km/h	Braking device control force kN	Mean deceleration m/s^2
41.9	0.3 0.4 0.5 0.6	1.9 2.6 3.2 3.9

Abnormal deviation of tractor from its original course: None

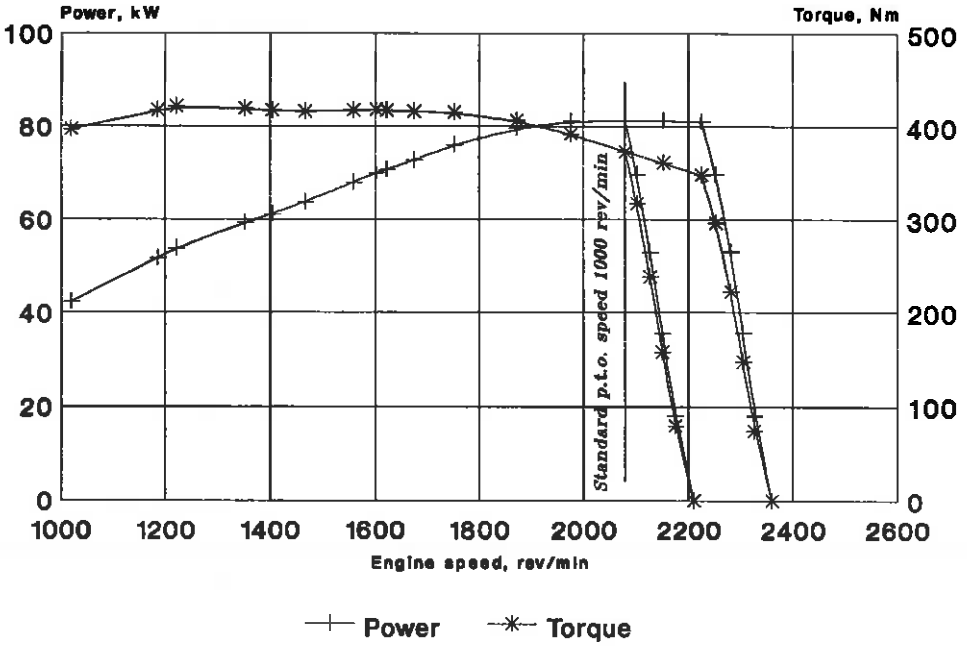
Abnormal vibration: None

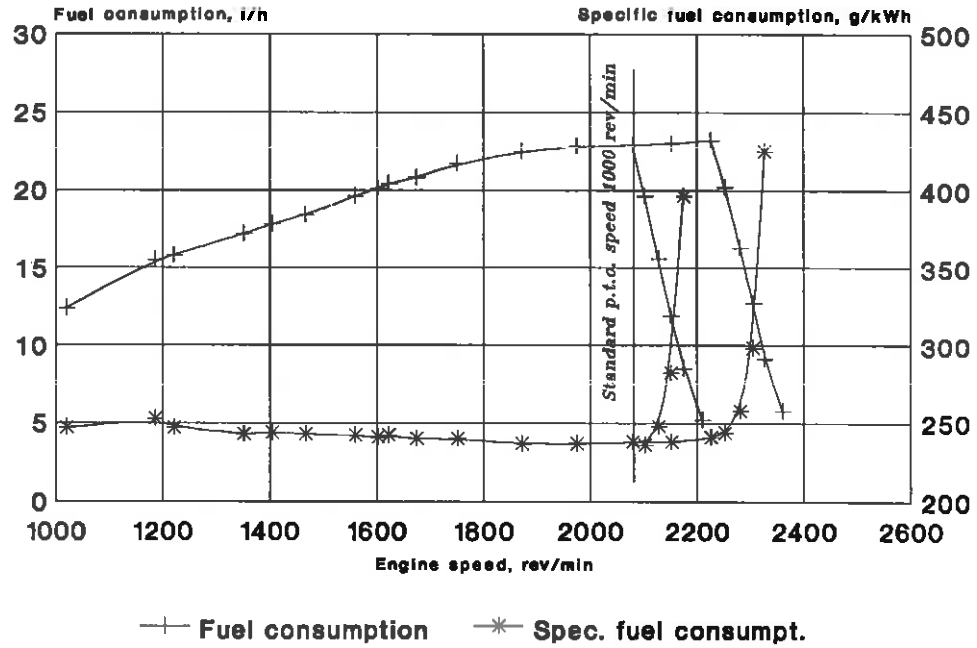
Brake heating method: Actuating of brake for 1 km with pedal force corresponding to 1 m/s^2

4.3 Parking braking device test

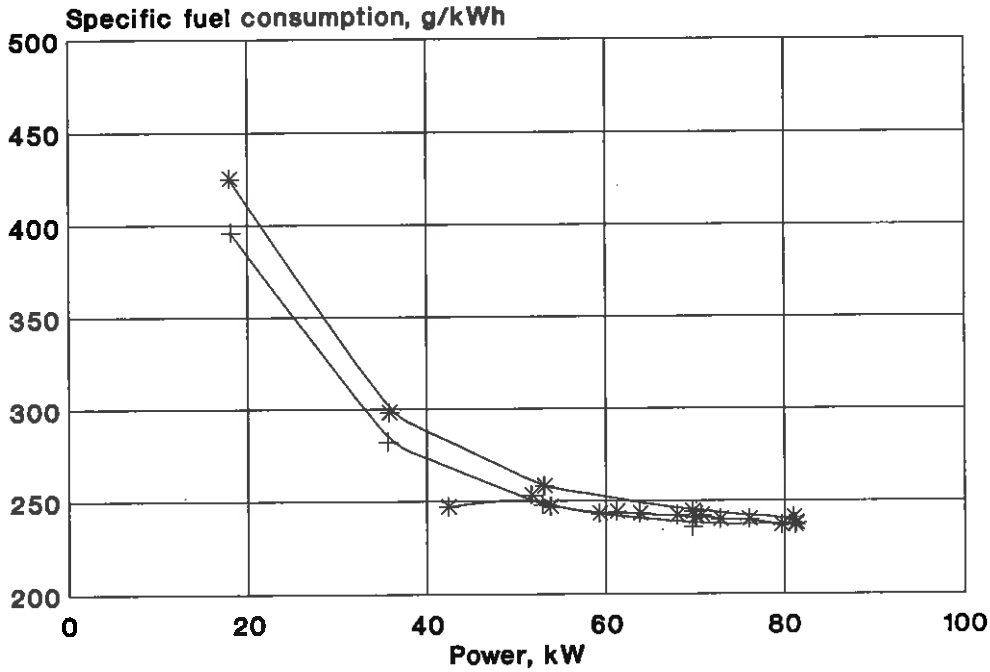
	Uphill	Downhill
Braking device control force	0.28 kN	0.28 kN

Valmet 8100 (4WD)





Valmet 8100 (4WD)



STATE RESEARCH INSTITUTE OF ENGINEERING IN AGRICULTURE AND FORESTRY

Director Henrik Sarin

Test engineer Ari Lemminkäinen

Valtion maatalousteknologian tutkimuslaitos

PAINORASTERI OY 1992