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STATE RESEARCH INSTITUTE OF ENGINEERING IN AGRICULTURE AND FORESTRY

TEST BULLETIN: O.E.C.D. No. 1350 FULL CODE

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



URSUS 4512 (2WD)

Manufactured by: Zrzeszenie Przemyslu Ciagnikowego, Warszawa, Poland

Date of approval: 24th January 1992
Serial No. 1350 FULL CODE

This bulletin is based on engineering tests in accordance with the OECD 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 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 5
POWER LIFT 6
TRAILER HITCH I 8
TRAILER HITCH II 8
SWINGING DRAWBAR 9
HOLED DRAWBAR 9
STEERING 9
BRAKES 10
WHEELS 10
PROTECTIVE STRUCTURE 10
DRIVER'S SEAT 10
MISCELLANEOUS 10
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 PERFORMANCE 15
4. TURNING AREA AND TURNING CIRCLE 18
5. LOCATION OF CENTRE OF GRAVITY 18
6. BRAKING 18
7. MEASUREMENT OF EXTERNAL NOISE LEVEL 19

I. SPECIFICATION OF THE TRACTOR

Tractor manufacturer's name and address	Zrzeszenie Przemyslu Ciagnikowego zm URSUS ul. Traktorzysttow 10 02-495 Warszawa, Poland
Submitted for test by	The manufacturer
Selected for test by	The manufacturer
Place of running-in	ZM URSUS, Poland
Duration of running-in	50 h
Location of test	VAKOLA, Finland

TRACTOR

Make/Model/Type	URSUS/4512/Rear wheel drive, unit construction
Number of driving wheels	2
Serial number	0034411
1st serial number	000001

ENGINE

Make/Model/Type	URSUS/4390/4-stroke, direct injection, water cooled
Serial number	LD22590 P 000409 S

Cylinders

Number/disposition	4/vertical, in line
Bore/stroke	98,43 mm/127 mm
Capacity	3865 cm^3
Compression ratio	16
Arrangement of valves	Overhead
Cylinder liners	Dry, replaceable
Supercharging	None
Fuel system	
Fuel feed system	47 PM 04 mechanical feed pump
Make/Model/Type of fuel filter	WF PZL Sedziszow/FPW 5.8/replaceable cartridge filter with sediment bowl
Capacity of fuel tank	80 dm^3
Make/Model/Type of injection pump	WSK Poznan, distributor pump, type DPA 3241 F350
Serial number	0217 BF
Manufacturer's production setting of injection pump	52 $\pm$ 1 mm^3/stroke at 900 r/min (at rated engine speed and full load)
Timing	23° before TDC
Make/Model/Type of injectors	WSK PZL II/NK 4567.10A
Injection pressure	16,6 MPa

Governor	
Make/Model/Type	WSK Poznan, mechanical type
Governed range of engine speed	From 750 to 2280 rev/min
Rated engine speed	2000 rev/min
Air cleaner	
Pre-cleaner	
Make/Model/Type	ZSM BRODNICA, cyclon type
Location of air intake	Under the bonnet, front of the tractor
Main-cleaner	
Make/Model/Type	ZSM BRODNICA, oil bath type
Maintenance indicator	None
Lubrication system	
Type of feed pump	Gear pump
Type of filter	Full flow replaceable paper cartridge
Number	1
Cooling system	
Type of coolant	Anti-freeze
Type of pump	Centrifugal
Number of fan blades	4
Fan diameter	412 mm
Coolant capacity	15,5 dm^3 (including cab heating)
Type of temperature control	Thermostat
Superpressure system	70 kPa
Starting system	
Make/Model/Type	ELMOT/R11g.12V, solenoid engaged
Starter motor power rating	2,9 kW
Cold starting aid	Thermostart
Safety device	Only operable when Hi-Low lever is in neutral position
Electrical system	
Voltage	12 V
Generator	
Make/Model/Type	ELMOT/A 124 F/alternative 44A
Power	0,5 kW
Battery	1
Rating	100 Ah at 20 hours
Exhaust system	
Make/Model/Type	URSUS
Location	At the right hand side of the tractor, 2620 mm above ground

TRANSMISSION

Clutch

Make/Model/Type	URSUS, dual clutch, dry
Number of plates	2
Diameter of plates	Driving clutch 305 mm, PTO clutch 2254 mm
Method of operation	Mechanical pedal operated

Gear box

Make/Model/Type	URSUS, sliding gears and planetary reduction unit
Arrangement	Gear box with 4 forward and 1 reverse speeds; 1-4 and R lever; 2 ranges: Low and High lever
Number of gears	8 forward, 2 reverse
Available options	None

Rear axle and final drives

Make/Model/Type	URSUS, crown wheel and pinion differential, planetary final drives
Differential lock	
Type	Mechanical, dog clutch
Method of engagement	Pedal
Method of disengagement	Self-disengaging

Front axle

Make/Model/Type	URSUS, telescopic width adjustment

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 2000 rev/min km/h
1	Forward Low	232,85	2,3
2		162,86	3,3
3		119,24	4,5
4		88,83	6,1
1	Forward High	59,71	9,0
2		40,71	13,2
3		29,81	18,1
4		22,21	24,3
1	Reverse	175,39	3,1
2		43,85	12,3

(*) Calculated with a tyre dynamic radius index of 715 mm (ISO 4251/1-1984)

POWER TAKE-OFF

Main power take-off

Type	Independent
Method of engagement	Sliding coupler operated by two position lever
Number of shafts	2
Method of changing power take-off shaft ends and speeds	By changing pto shafts: 6 spline for 540 rpm and 21 spline shaft for 1000 rpm

Power take-off proportional to engine speed

540 rev/min

Location	At the rear of the tractor
Diameter of power take-off shaft end	35 mm
Number of splines	6, in conformity with ISO 500/1979
Height above ground	585 mm
Distance from the median plane of the tractor	0 mm
Distance behind rear-wheel axis	296 mm
PTO speed at rated engine speed (2000 rev/min)	640 rev/min
Engine speed at standard power take-off speed	1686 rev/min
Ratio of rotation speeds (engine speed/p.t.o speed)	3,125
Power restriction and maximum torque	None
Direction of rotation (viewed from behind tractor)	Clockwise

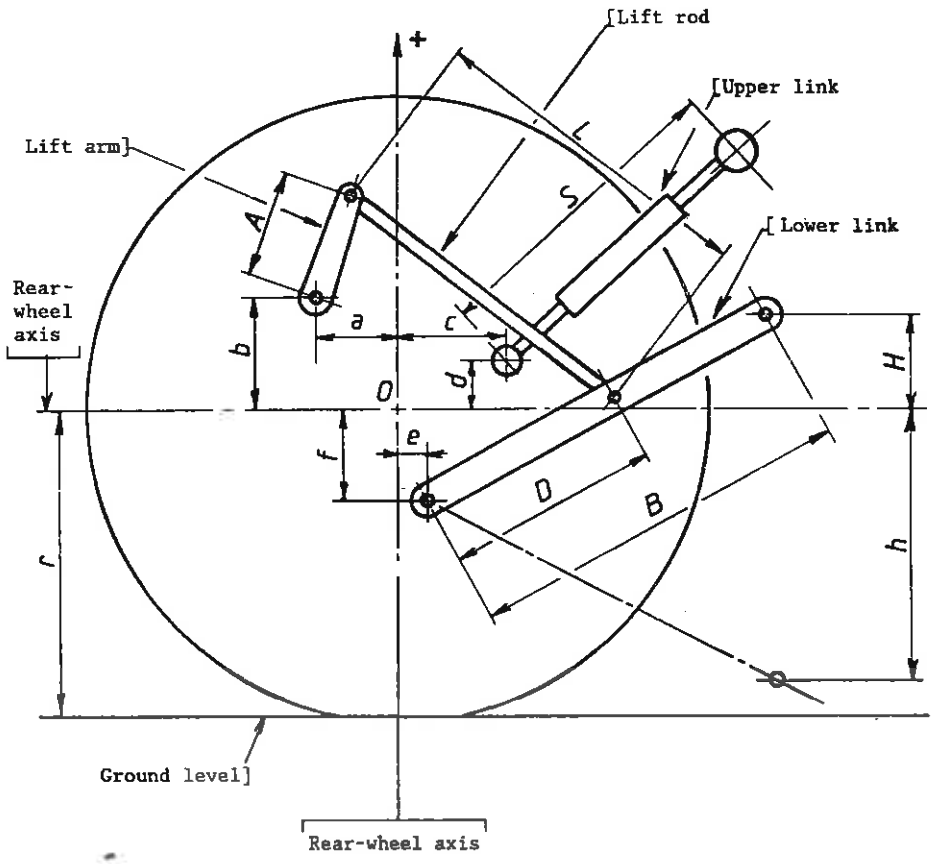
1000 rev/min

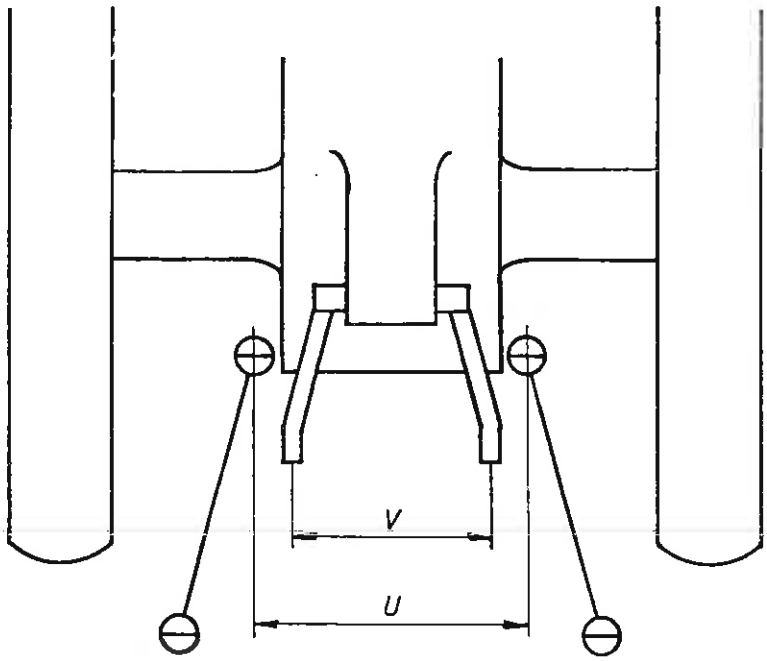
Location	At the rear of the tractor
Diameter of power take-off shaft end	35 mm
Number of splines	21, in conformity with ISO 500/1979
Height above ground	585 mm
Distance from the median plane of the tractor	0 mm
Distance behind rear-wheel axis	296 mm
PTO speed at rated engine speed (2000 rev/min)	1182 rev/min

Engine speed at standard power take-off speed	1692 rev/min
Ratio of rotation speeds	1,692
Direction of rotation	Clockwise
Power take-off proportional to ground speed	
PTO shaft	Same as in 540 rev/min
Travelling distance for one revolution of power take-off shaft	0,60 m (540 rev/min)
Number of power take-off shaft revolutions for one revolution of (rear) driving wheels	7,5 (540 rev/min)
Direction of rotation with forward gear engaged	Clockwise

POWER LIFT

Make/Model/Type	URSUS
Type of hydraulic system	Open centre system
Type and number of cylinders	One internal, single acting
Type of linkage lock for transport	None
Relief valve pressure setting	21.4-22.4 MPa
Lift pump type	4-cylinder piston pump
Transmission between pump and engine	From PTO transmission
Type and number of filters	One suction streiner
Site of oil reservoir	Transmission housing
Type, number and location of tapping points	Four push-pull tapping at the rear of the tractor
Maximum volume of oil available to external cylinders	16 dm^3
Maximum pressure in the external	17.5 + 0.5 MPa
Three point linkage	
Category	2, according to standard ISO 730/2-1979
Category adapter	None


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


V
U

		Dimension or range mm	Settings used in test mm
Length of lift arms	(A)	267	267
Length of lower links	(B)	975	975
Distance of lift arm pivot point from rear-wheel axis : horizontally	(a)	196	196
: vertically	(b)	232	232
Horizontal distance between the 2 lower link point	(u)	492	492
Horizontal distance between the 2 lift arm end points	(v)	534	534
Length of upper link	(S)	from 610 to 850	745
Distance of upper link pivot point from rear wheel axis : horizontally	(c)	190, 202, 216	190
: vertically	(d)	from to 205, 170, 130	205
Distance of lower link pivot point from rear wheel axis : horizontally	(e)	34 forward	34
: vertically	(f)	212	212
Distance of lower link pivot points to lift rod pivot points on lower links	(D)	from 430 to 485	485
Length of lift rods	(L)	from 605 to 690	625
Height of lower hitch points relative to the rear-wheel axis : in low position	(h)	from 675 to 455	515
: in high position	(H)	from 280 to 135	235
Height above ground of lower hitch points when locked in transport position (*)			

(*) Assuming r = 715 mm tyre dynamic radius index of ISO 4251/1-1984.

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

TRAILER HITCH I

Type	Hitch-hook
Hook diameter	47 mm
Height above ground	335-355 mm
Distance of hitch point from rear-wheel axis, horizontally	441, 606, 656, 691, 741 mm
Distance of hitch point from power take-off shaft end:	
- vertically	Below 235, 244, 249, 251, 256 mm
- horizontally	Behind 145, 310, 360, 395, 445 mm
Maximum vertical permissible load	13,2 kN

TRAILER HITCH II

Type	Clevis with rubber shock absorber

Hole diameter	31 mm
Height above ground	910 mm
Distance of hitch point from rear-wheel axis, horizontally	591 mm
Distance of hitch point from power take-off shaft end:	
- vertically	335 mm
- horizontally	295 mm
Maximum vertical permissible load	8,8 kN

SWINGING DRAWBAR

Type	Universal hitch
Height above ground	
Maximum	320 mm
Minimum	300 mm
Distance of hitch point from rear-wheel axis, horizontally	526-826 mm
Distance of hitch point from power take-off shaft end	
- vertically	190 - 120 mm
- horizontally	230 - 530 mm
Distance of pivot point from rear-wheel axis, horizontally	314 mm
Diameter drawbar pin hole	34 mm
Maximum vertical permissible load	13,2 kN

HOLED DRAWBAR

Number of holes	6
Distance between holes	120, 80, 40, 80, 120 mm
Hole diameter	22 mm
Thickness/width of the drawbar	25 mm/80 mm
Height above ground	
- minimum	40 mm
- maximum	995 mm
Horizontal distance to power take-off shaft end (rear)	632 mm

STEERING

Make/Model/Type	URSUS/ball and screw, mechanical
Method of operation	Power steering
- pump(s)	1
- ram(s)	1
Working pressure	11 MPa

BRAKES

Service brake

Make/Model/Type	URSUS/oil immersed disc brakes acting on rear wheels
Method of operation	Two pedals, mechanically actuated, independent or combined operation
Trailer braking take-off	Air brakes, optional

Parking brake

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

WHEELS

Number	4
- front	Steering
- rear	Driving
Wheelbase	2223 mm

Track width adjustment:

	Minimum mm	Maximum mm	Adjustment method
Front	1378	1990	Telescopic front axle
Rear	1370	2220	Offset lug rims and reversing wheel centres

PROTECTIVE STRUCTURE

Make/Model/Type	URSUS/07/protective cab
Manufacturer's name and address	URSUS, Zrzeszenie Przemyslu Ciagnikowego, Warszawa, POLAND
Protective device:	Cab, not fitted
OECD approval number	CSS 0149/2

DRIVER'S SEAT

Make/Model/Type	Agromet/MFP3/3/Grammer
Type of suspension	Spiral spring
Type of damping	Hydraulic damper
Range of adjustment:	
- longitudinal	200 mm
- vertical	60 mm

MISCELLANEOUS None

LIGHTING

	Height above ground centre mm	Size mm	Distance from outside edge of lights to median plane of tractor mm
Headlights	1050	ø 120	212
Sidelights	1660	65 x 85	738
Rearlights	1570	65 x 95	722
Reflector	1320	ø 75	808

II. TEST CONDITIONS

Overall dimensions

	Length mm	Width		Height at top of	
		Minimum mm	Maximum mm	Protective structure mm	Exhaust silencer mm
Ballasted	3970	1860	2600	2540	2620
Unballasted	3750	1860	2600	2540	2620

Ground clearance
(unballasted tractor) 310 mm

Clearance-limiting part Hitch-hook

Tractor mass
(with cab):

	Ballasted		Unballasted	
	Without driver kg	With driver kg	Without driver kg	With driver kg
Front	1400	1410	1140	1150
Rear	2340	2405	1810	1875
Total	3740	3815	2950	3025

Ballast

	Weights		
	Number	Total mass kg	Water kg
Front	8	210	-
Rear	4	190	390

Tyres and track width specifications

	Front	Rear
Tyres:		
- dimensions	7.50-16	13.6-36
- ply rating	6PR	6PR
- type	diagonal	diagonal
- maximum load (tyre manufacturer's)	7.1 kN	16.15 kN
- maximum load (tractor manufacturer's)	7.3 kN	15.9 kN
- inflation pressure (tyre manufacturer's)	250 kPa	160 kPa
- dynamic radius index	376 mm	715 mm
Chosen track width	1480 mm	1500 mm

Oils and lubrication

Capacity and change interval

	Capacity dm³	Oil change h	Filter change h
Engine	7,0	250	250
Gear box*)	42	1000	500[1)]
Final drive (rear)	2 x 1,7	500	-
Steering -hydrostatic	1,2	1000	500
-manual	0,9	1000	-

*) Includes rear axle and hydraulic system.
1) Only filter cleaning

	Recommended	Used during test
Engine oil		Recommended
- Type	AP, CC	
- Viscosity	SAE 10W/30 below -1°C SAE 20W/40 above -1°C	
- Classification		
Transmission oils		Recommended
- Type		
- Viscosity	SAE 80-90	
- Classification	API GL4	
Steering oil (hydrostatic)		Recommended
- Type	ATF	
- Viscosity	SAE 10W/30	
- Classification	API GL4	
Steering oil (manual)		Recommended
- Type		
- Viscosity	SAE 80-90	
- Classification	API GL4	

Grease — Universal grease

Number of lubrication points — 12

Fuel

Type — Dieseloil, in conformity with national standard

Density at 15 °C — P.t.o. test 841 g/dm³
drawbar power test 838 g/dm³

III. TEST RESULTS

COMPULSORY TEST RESULTS

1. MAIN POWER TAKE-OFF

Date and location of tests 1.3.1990/VAKOLA

Type of dynamometer Schenk W 40

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						
42,4	2000	640	11,1	13,2	262	3,20
1.2 POWER AT RATED ENGINE SPEED						
42,4	2000	640	11,1	13,2	262	3,20
1.3 STANDARD POWER TAKE-OFF SPEED (540 rev/min)						
39,0	1686	540	9,7	11,5	248	3,38
1.4 PART LOADS 1.4.1 The torque corresponding to maximum power at rated engine						
42,4	2000	640	11,1	13,2	262	3,20
1.4.2 85% of torque obtained in 1.4.1						
36,6	2034	651	9,8	11,7	268	3,14
1.4.3 75% of torque defined in 1.4.2						
27,9	2069	662	7,8	9,3	281	2,99
1.4.4 50% of torque defined in 1.4.2						
18,8	2088	668	6,2	7,4	328	2,56
1.4.5 25% of torque defined in 1.4.2						
9,5	2112	676	4,6	5,5	488	1,72
1.4.6 Unloaded						
-	2134	683	3,1	3,7	-	-
1.5 PART LOADS AT STANDARD POWER TAKE-OFF SPEED (540 REV/MIN) 1.5.1 The torque corresponding to maximum power						
39,0	1686	540	9,7	11,5	248	3,38
1.5.2 85% of torque obtained in 1.5.1						
33,9	1725	552	8,3	9,8	244	3,45
1.5.3 75% of torque defined in 1.5.2						
26,0	1762	564	6,6	7,9	254	3,30
1.5.4 50% of torque defined in 1.5.2						
17,6	1784	571	5,2	6,2	294	2,85
1.5.5 25% of torque defined in 1.5.2						
9,0	1819	582	3,7	4,4	408	2,05
1.5.6 Unloaded						
-	1850	592	2,3	2,7	-	-

No load maximum engine speed	2134 rev/min
Torque[1] at maximum power	202 Nm
Maximum torque[1]	237 Nm
at engine speed	1219 rev/min
Mean atmospheric conditions	
Temperature	24 °C
Pressure	97,5 kPa
Relative humidity	18 %
Maximum temperatures	
Coolant	81 °C
Engine oil	125 °C
Fuel	55 °C
Engine air intake	25 °C

[1] Equivalent crankshaft torque

2. HYDRAULIC POWER AND LIFTING FORCE

2.1 Hydraulic power test

Date of tests	17.11.1989
Sustained pressure with relief valve open	17,5 MPa
Pump delivery rate at minimum pressure	32,5 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	11,5	15,8	3,0
Flow rate and hydraulic pressure corresponding to maximum hydraulic power	30,7	14,0	7,2

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	715 mm	715 mm
Maximum corrected force exerted through full range	15,9 kN	13,9 kN
Corresponding pressure of hydraulic fluid	20,2 MPa	20,2 MPa
Moment about rear-wheel axis	15,0 kNm	21,6 kNm
Maximum tilt angle of mast from vertical	-	14 degrees

[1] 90 % of the maximum lifting pressure. External hydraulics and power lift have different relief valves.

Linkage settings for test - see Table 1.1 and Figures 1.1 and 1.2

Lifting height relative to the horizontal plane including the lower link pivot points										
mm	-293	-288	-200	-100	0	+100	+200	+300	+422	+427
Lifting forces (the values measured are corrected to correspond to a hydraulic pressure equivalent to 90 % of the actual relief valve pressure setting or to maximum power delivered by the hydraulic system, whichever is lower)										
At the hitch points kN	15,9		17,3	18,4	19,3	19,9	20,2	20,4	21,3	
Corresponding pressure: 20,2 MPa										
At the frame kN		15,3	16,7	17,1	16,3	17,1	16,7	16,3		13,9
Corresponding pressure: 20,2 MPa										

3. DRAWBAR PERFORMANCE

Date of tests 21.5-29.5.1990

Type of track Tarmacadam

		Tyre inflation pressure	
	Height of drawbar above ground	Front	Rear
Unballasted	360 mm	180 kPa	100 kPa
Ballasted	360 mm	200 kPa	130 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 (unballasted tractor)													
L1	9,4	16,4	2,1	2110	15,0	559	1,50	32	79	97	14	33	101,3
L2	14,1	17,1	3,0	2093	15,0	442	1,89	35	84	100	14	33	101,3
L3	18,3	16,2	4,1	2082	14,6	397	2,11	35	84	101	11	33	101,3
L4	25,2	16,8	5,4	2061	14,6	342	2,45	37	85	103	10	33	101,3
H1	35,4	16,0	8,0	2011	13,3	315	2,66	38	84	104	10	33	101,3
H2	37,3	10,8	12,4	1998	7,4	308	2,72	37	85	98	13	33	101,3
H3	36,6	7,6	17,4	2007	5,5	318	2,64	36	83	100	11	33	101,3
H4	35,5	5,4	23,6	1995	4,0	328	2,56	37	82	91	11	33	101,3

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	Tempera-ture	Relative humidity	Pressure
	kW	kN	km/h	rev/min	%	g/kWh	kWh/l	°C	°C	°C	°C	%	kPa
3.2 MAXIMUM POWER IN TESTED GEARS (ballasted tractor)													
L1	12,3	21,6	2,1	2106	14,7	473	1,77	32	81	96	8	65	100,9
L2	18,3	21,9	3,0	2099	14,7	391	2,14	33	81	97	12	65	100,9
L3	23,4	21,2	4,0	2067	15,0	352	2,38	34	84	96	8	65	100,9
L4	31,4	21,2	5,3	2032	14,6	328	2,56	38	85	97	8	65	100,9
H1	37,1	16,2	8,3	2005	9,8	311	2,69	39	83	98	8	65	100,9
H2	37,0	10,5	12,7	2011	5,8	311	2,69	37	83	91	9	65	100,9
H3	36,2	7,4	17,2	1990	4,3	316	2,65	36	79	90	9	65	100,9
H4	34,3	5,3	23,5	1973	3,4	336	2,49	34	78	92	8	65	100,9
3.3.1 FIVE-HOUR TEST at 75 % of pull at maximum power on gear H1													
H1	29,5	12,1	8,8	2051	6,6	313	2,68	44	84	110	11	65	101,5
3.3.2 FIVE-HOUR TEST at pull corresponding to 15 % wheelslip													
L4	32,4	22,0	5,3	2030	-	-	-	47	85	113	13	37	101,7

Oil consumption during ten hours duration of tests 3.3.1 and 3.3.2 — 42 g/h

4. TURNING AREA AND TURNING CIRCLE

Wheel equipment if several sets of tyres are tested.

	With brakes		Without brakes	
	Right-hand m	Left-hand m	Right-hand m	Left-hand m
Radius of turning area	3,9	3,8	4,3	4,2
Radius of turning circle	3,7	3,6	4,1	4,0

5. LOCATION OF CENTRE OF GRAVITY

Height above ground — 890 mm

Distance forward from the vertical plane containing the axis of the rear-wheels — 845 mm

Distance from the median plane of the tractor — 0 mm

6 . BRAKING

Date of tests — 19.6.1990

6.1 Cold service braking device test

	Speed before application of brakes km/h	Braking device control force kN	Mean deceleration m/s^2
Ballasted tractor	25,4	0,31	3,2
Unballasted tractor	25,7	0,28	3,4

6.2 Fade test

Speed before application of brakes km/h	Braking device control force kN	Mean deceleration m/s^2
25,6	0,37	3,4

Maximum deviation of tractor from its original course — None

Abnormal vibration — None

Brake heating method — Towing

6.3 Parking braking device test

	Uphill	Downhill
Braking device control force	0,31 kN	0,31 kN

7. MEASUREMENT OF EXTERNAL NOISE LEVEL

Date of tests	14.8.1990
Sound level meter	
Make/Model/Type	Brüel & Kjaer 2209
Type of track	Tarmacadam
Gear Number	H4
Travelling speed before acceleration	19,4 km/h
Sound level	84,0 dB(A)

8. REPAIRS None

9. REMARKS None

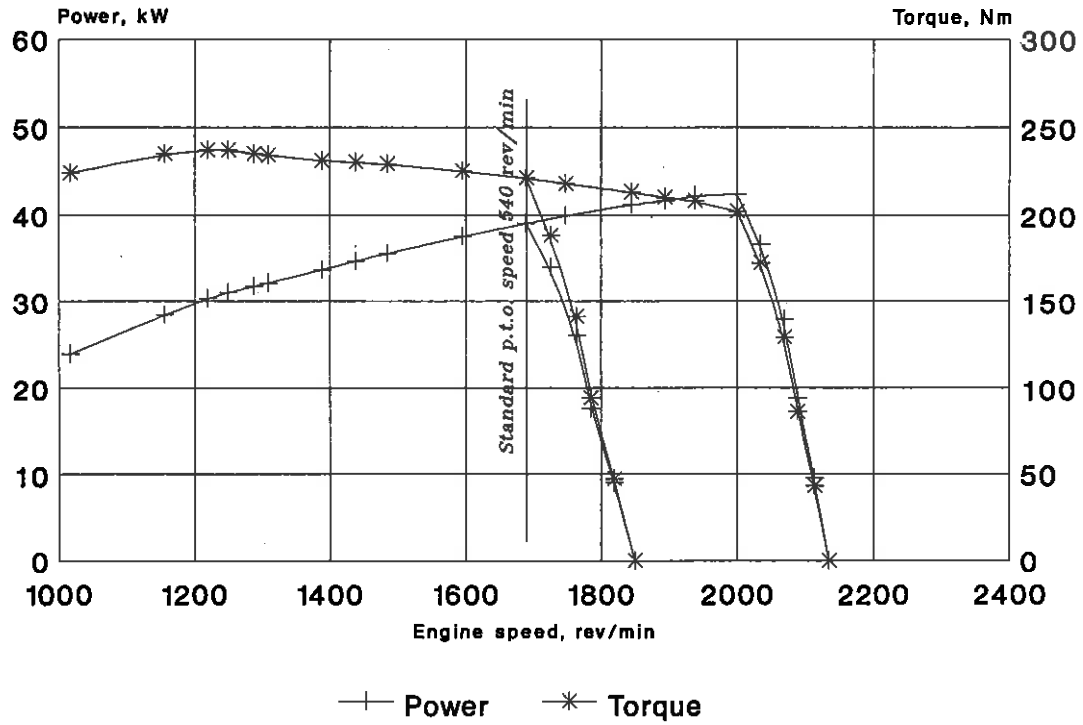
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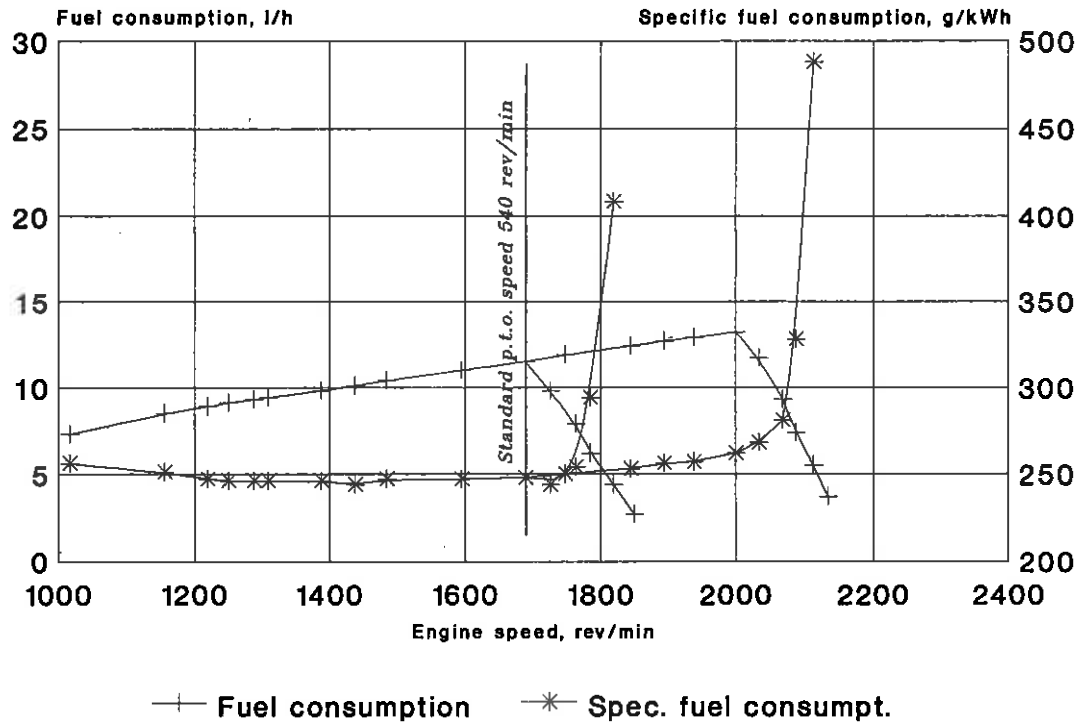
May 14th 1992

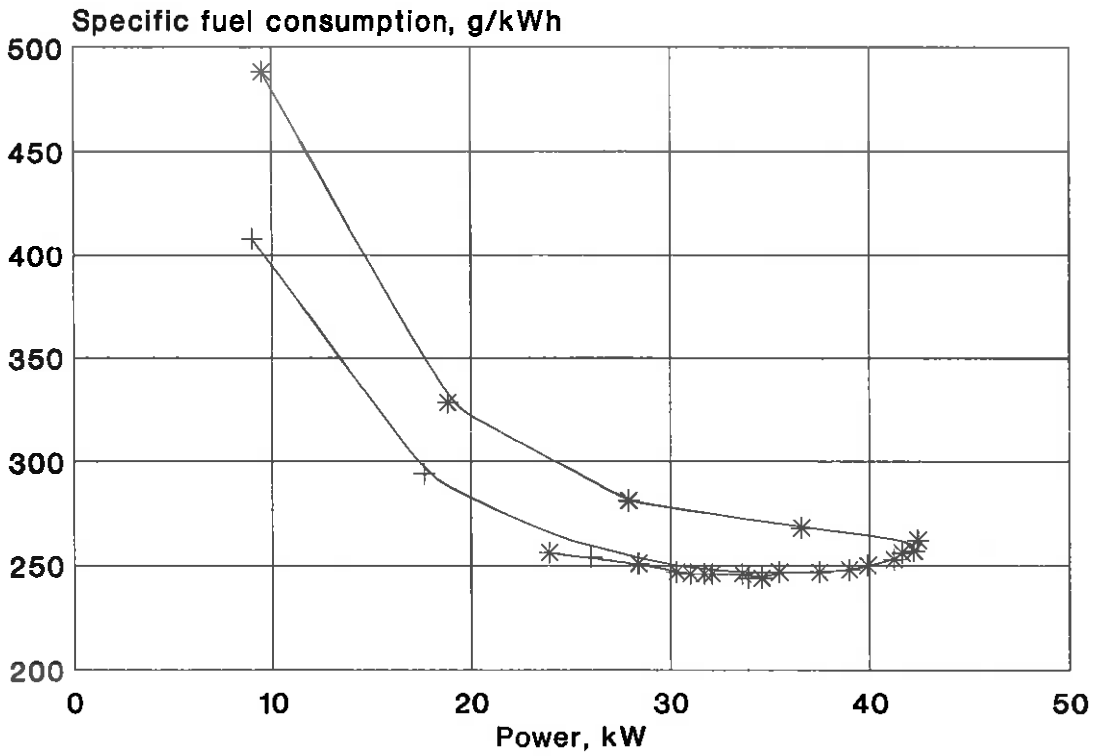
Director Henrik Sarin

Test engineer Ari Lemminkäinen

Valtion maatalouskoneiden tutkimuslaitos


Power, kW
Torque, Nm
60
50
40
30
20
10
0
300
250
200
150
100
50
0
1000
1200
1400
1600
1800
2000
2200
2400
Standard p.t.o. speed 540 rev/min
Engine speed, rev/min
Power
Torque


Fuel consumption, l/h
Specific fuel consumption, g/kWh
30
25
20
15
10
5
0
500
450
400
350
300
250
200
1000
1200
1400
1600
1800
2000
2200
2400
Standard p.t.o. speed 540 rev/min
Engine speed, rev/min
Fuel consumption
Spec. fuel consumpt.


Specific fuel consumption, g/kWh
500
450
400
350
300
250
200
0
10
20
30
40
50
Power, kW

PAINORASTERI OY 1992