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VALTION MAATALOUSTEKNOLOGIAN TUTKIMUSLAITOS
STATE RESEARCH INSTITUTE OF ENGINEERING IN AGRICULTURE AND FORESTRY

TEST BULLETIN: O.E.C.D. No. 1205/1

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



URSUS 2812 2 WD

Manufactured by: Zrzeszenie Przemyslu Ciagnikowego, Warszawa, Poland

Date of approval: 30.5.1989 Serial No. 1205/1

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This bulletin is based on engineering tests in accordance with the O.E.C.D. Standard Code 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 O.E.C.D. Coordinating Centre (CEMAGREF France) as being in accordance with the O.E.C.D. Standard Code for the Official Testing of Agricultural Tractors.

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1. 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 with the agreement of the institute
Place of running in:	ZM URSUS, POLAND
Duration of running in:	50 h
Location of test	VAKOLA, FINLAND

1.1. TRACTOR:

- Make:	Ursus
- Model:	2812
- Type:	Rear wheel drive, unit construction
- Serial number:	0019824
- First serial No:	000 001

1.2. ENGINE

- Make:	Ursus
- Model:	3250
- Type:	4-stroke, direct injection, water cooled
- Serial No:	CE22666 P 37678 N

Cylinders:

- Number and disposition:	3, vertical, in line
- Bore:	91,44 mm
- Stroke:	127,00 mm
- Capacity:	2502 cm^3
- Compression ratio:	16,5:1
- Arrangement of valves:	Overhead
- Cylinder liners:	Dry, replaceable

Fuel system:

- Fuel feed system:	47 PM03 mechanical feed pump
- Make, type and model of fuel filters:	WF PZL SEDZISZOW/FPV-57 replaceable cartridge filter with sediment bowl
- Tank capacity:	58 l
- Make, type and model of injection pump:	WSK POZNAN, distributor pump, type DPA 3233F760
- Manufacturers production setting of injection pump:	46,0 mm^3/stroke at 700 rpm
- Injection timing:	20 +-2° before TDC
- Make, type and model of injectors:	WSK PZL II/WK 4S67.9C, multihole
- Injection pressure:	17,2 MPa

Governor:

- Make and model:	WSK POZNAN
- Type:	Mechanical
- Governed range of engine speed:	750...2180 rev/min
- Rated engine speed:	2000 rev/min

Air cleaner:

- Main cleaner:
  - Make: ZSM BRODNICA/358.000
  - Type: oil bath type
  - Oil capacity: 0,47 l
- Pre-cleaner:
  - Make: ZSM BRODNICA/359.000
  - Type: Cyclon
- Type of maintenance indicator: None
- Air intake position: Over the bonnet, front of tractor

Lubrication system:

- Type of feed and pump: Splash and pressuure lubrication, forced feed from gear pump
- Type of filter: Full flow replaceable paper cartridge
- Filter change period: 250 h
- Total oil capacity including filter: 6,8 l
- Oil change period: 250 h

Cooling system:

- Type of coolant: Anti-freeze
- Type of pump: Centrifugal
- Fan diameter: 393 mm
- Number of fan blades: 4
- Type of temperature control: Thermostat
- Coolant capacity: 10,2 l without cab, 11,2 l with cab
- System pressure: 70 kPa

Starting systems:

- Make and model:	ELMOT /R11h.12V, solenoid engaged
- Starter motor power rating:	2,9 kW
- Safety features:	Only operable when the gear level is in neutral position
- Cold starting aid:	Flame plug

Electrical systems:

- Voltage:	12 V
- Earth polarity:	Negative
- Make of generator:	ELMOT/A124F
- Type of generator:	Alternator
- Power of generator:	44 A
- Capacity of battery:	90 Ah at 20 h rating
- Number of batteries:	1

Exhaust system:

- Make:	URSUS
- Expansion chamber diameter, length:	ø 100 mm, 625 mm
- Position:	At the left hand side of the engine
- Height of outlet above ground:	2540 mm

1.3. TRANSMISSION

Clutch:

- Make and model:	URSUS
- Type:	Dry dual clutch
- Number of plates:	2
- Diameter of plates:	driving clutch 305 mm, pto-clutch 254 mm
- Method of operation:	pedal

Gear box:

- Make:	URSUS
- Type:	Sliding gears and planetary reduction unit
- Arrangement:	Two hand levers: High-Low lever and 1-4 and R lever
- Number of speeds:	8 forward, 2 reverse

Rear axle and final drives:

- Make:	URSUS
- Type:	Crown wheel and pinion differential

Differential lock:

- Type:	Mechanical, dog clutch
- Method of engagement:	Pedal
- Method of disengagement:	Self-disengaging

Front axle:

- Make and type:	URSUS, telescopic width adjustment

Transmission oils:

- Gear box, rear axle and hydraulics:
  - Capacity: 32 l
  - Change period: 500 h
  - Strainer clean period: 500 h

Total ratios and speeds:

Group	Gear	Number of engine revolution for one revolution of the driving wheel	Nominal travelling speed at rated engine speed, 2000 rev/min[1)] km/h
Forward			
	1	200,99	2,4
Low	2	137,04	3,5
	3	100,33	4,8
	4	74,75	6,5
Forward			
	1	50,25	9,6
High	2	34,26	14,1
	3	25,08	19,2
	4	18,69	25,8
Reverse			
	1	147,58	3,3
	2	36,89	13,1

1) Tyres: 12.4-32, calculated with a tyre dynamic index of 635 mm (ISO 4251/1-1984)

1.4. POWER TAKE-OFF

- Type:	Independent
- Number of shafts:	One
- Number of speeds:	Two
- Method of engagement:	Sliding gear operated by three position lever
- Clutch plate:	ø 254 mm, dual clutch

540 rev/min PTO:

- Ratio:	3,312
- Distance from the median plane of the tractor:	0 mm
- Distance behind rear axle:	300 mm
- Height above ground (12.4-32 tyres):	515 mm
- Nominal diameter of power take-off shaft:	35 mm
- Number of splines:	6, according to ISO 500/1979
- Speed at rated engine speed:	604 rev/min
- Engine speed at standard power take-off speed:	1788 rev/min
- Power restrictions:	None
- Direction of rotation, viewed facing driving end:	Clockwise

1000 rev/min PTO: not available

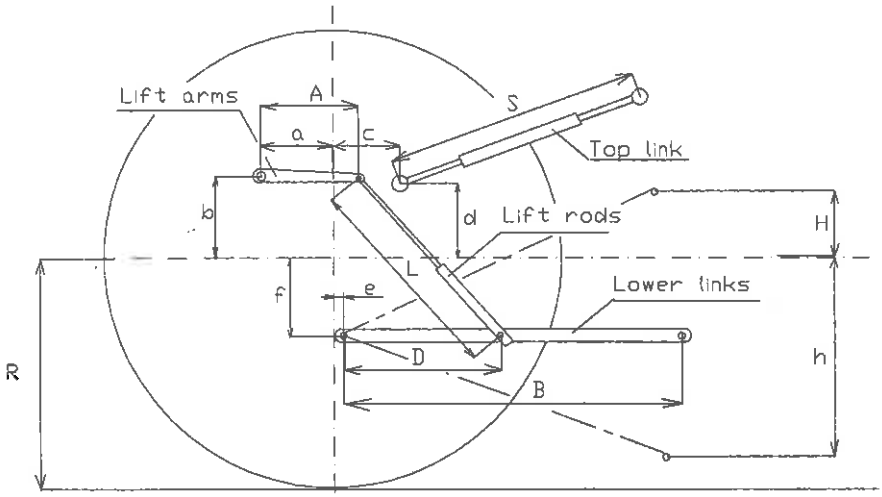
Proportional to ground speed PTO

- PTO shaft	Same as in 540 rev/min
- Travelling distance for one revolution of PTO-shaft	0,55 m
- Number of PTO-shaft revolutions for one revolution of rear wheels	7,3
- Direction of rotation with forward gear engaged (viewed facing driving end)	Clockwise

1.5. POWER LIFT

- Make:	URSUS
- Type and number of cylinders:	One internal, single acting
- Opening pressure of the cylinder safety valve:	20,7 MPa
- Type of pump:	4-cylinder piston pump
- Pump drive:	From PTO transmission
- Pressure of the relief valve setting:	15,8 - 19,2 MPa
- Number of filters:	1
- Type of filters:	Suction strainer
- Oil change period:	500 h
- Strainer clean period:	500 h
- Oil capacity:	32 l (Gear box, rear axle and hydraulics)
- Controls:	Draught-position control, response control, upper link sensing
- Type of oil tappings:	Push-pull
- Location of oil tappings:	At the rear of the tractor
- Number of oil tappings:	2

- Maximum oil delivery which may be taken off through oil tappings: 10 l
- Maximum pressure in the external hydraulic system 15,7 - 17,1 MPa
- Pressure utilizable for continuous hydraulic motor work: 14 MPa
- Three point linkage:
- Category: 2, according to standard ISO 730/2-1979
- Method of category changing: None



		Dimension or range mm	Settings used in test mm
Rear tyres (12.4-32) radius	R	635	
Front tyres (6.00-16) radius	r	340	
Length of lift arms	A	267	267
Length of lower links	B	890	890
Distance of lift arm pivot point from rear wheel centre line:			
- horizontally	a	-196	-196
- vertically	b	233	233
Horizontal distance between the two lower link connection points	u	496	496
Horizontal distance between the two lift arms end	v	545	545
Length of top link	S	590...830	645
Distance of top connection points from rear wheel centre line:			
- horizontally	c		
	1.point	194	194
	2.point	201	
- vertically	d		
	1.point	227	
	2.point	276	276

Distance of lower link pivot points from rear wheel centre line:			
- horizontally	e	-45	-45
- vertically	f	114	114
Distance of lower link pivot points to lift rods pivot points on lower links	D	460	460
Length of lift rods	L	545...610	570
Height of lower link hitch points:			
- low position	h	355...560	435
- high position	H	200...325	165

1.6. SWINGING DRAWBAR — Not fitted on tractor tested,optional

1.7. TRAILER HITCH 1

- Type:	Telescopic hitch-hook
- Height above ground:	322 mm
- Distance of hitch point from rear axle, horizontally:	427,542,592,627,677 mm
- Distance of hitch point from power take-off shaft end:	
- vertically:	196 mm below
- horizontally:	127,242,292,327,377 mm behind
- Hook diameter	47 mm
- Maximum vertical load on hitch-hook:	8,7[1] kN at maximum distance

[1] restricted by tyre load carrying capacity

1.8. TRAILER HITCH 2

- Type	Clevis with rubber shock absorber
- Height above ground:	865 mm
- Distance of hitch point from rear axle, horizontally:	586 mm
- Distance of hitch point from power take-off shaft end:	
- vertically:	315 mm above
- horizontally:	280 mm behind
- Drawbar pin hole diameter	31 mm
- Maximum vertical load on clevis	8,8[1] kN

1.9. STEERING

- Type:	Ball and screw, mechanical
- Make:	URSUS
- Oil capacity	0,9 l

1.10. BRAKES

Service brake:

- Type:	Dry drum brakes acting on rear wheels
- Make:	URSUS
- Method of operation:	Two pedals, mechanically actuated, independent or combined operation
- Trailer brake take-off:	Air brakes, optional

[1] Restricted by tyre load carrying capacity

1.11. WHEELS

Steering wheels:	Front wheels
- Number:	2
- Tyres:	
- Size:	6.00-16
- Ply rating:	6
- Type of casing:	Diagonal
- Maximum permissible mass on each tyre:	560 kg
- Corresponding inflation pressure:	330 kPa
- Track widths:	1350, 1500, 1800 mm
- Method of adjustment:	Telescopic front axle
Driving wheels:	Rear wheel drive
- Number:	2
- Tyres:	
- Size:	12.4-32
- Ply rating:	6
- Type of casing:	Diagonal
- Maximum permissible mass on each tyre:	1355 kg
- Corresponding inflation pressure:	170 kPa
- Track widths:	1350,1360,1500,1640,1790,1800,1950 mm
- Method of adjustment:	Offset lug rims and reversing wheel centres
Wheelbase:	1930 mm

1.12. SPECIFICATION OF THE PROTECTIVE STRUCTURE

The test tractor was equipped with a frame. The tractor can be equipped with a protective cab.

Driver's seat:

- Make and model:	Agromet/MFP-2/1 Grammer
- Type of suspension:	Spiral spring
- Type of damping:	Hydraulic damper
- Range of adjustment:	
- longitudinal:	115 mm
- vertical:	35 mm
Mudguard seat:	None

1.13. LIGHTNING

	Height above ground of centre with 12.4-32 tyres m	Size mm	Distance from outside edge of tractor at 1500 mm trackwidth to centre mm
Headlights	0,90	ø 120	765
Sidelights	1,50	60x 60	245
Rear lights	1,36	65x 95	325
Reflectors	1,08	ø 75	135

1.14. TEST CONDITIONS

Overall dimensions (Front 6.00-16, rear 12.4-32)

	Length	Width		Heigh to top of	
		minimum	maximum	exhaust silencer	protective frame
	m	m	m	m	m
Without ballast	3,20	1,69	2,29	2,54	2,24
With ballast	3,42	1,69	2,29	2,54	2,24

Ground clearance

- Minimum ground clearance: 285 mm
- Clearance limiting part: Hitch-hook

Tractor mass

Tractor mass with tanks full and protective frame

	Ballasted		Unballasted	
	Without driver	With driver	Without driver	With driver
	kg	kg	kg	kg
Front	950	960	730	740
Rear	1710	1775	1290	1355
Total	2660	2735	2020	2095

Ballast	Number of weights	Mass kg	Water kg
Front	8	210	-
Rear	4	190	240
Additional	-	-	-

Tyres and track widths during tests

	Dimensions	Track setting
- Front:	6.00-16 6 PR	1500 mm
- Rear:	12.4-32 6 PR	1500 mm

Fuel used in test:

- Fuel:Dieseloil, according to national standards
- Specific gravity at 15°: 0,84

1.15. RECOMMENDED OILS

Capacities and change interval

	Capacity l	Oil change h	Filter change h
Engine	6,8	250	250
Gear box, rear axle and hydraulics	32,0	500	500
Steering	0,9	500	-
Air cleaner	0,5	250	

Specifications of oils

	Recommended	Used in tests
Engine oil:		
Type:	API CC	Multagri
Viscosity:	SAE 10W/30 below -1 C SAE 20W/40 above -1 C	10W 30
Transmission oils:[1]		
Type:	API GL 4	Multagri TM
Viscosity:	SAE 80 - 90	80 - 90

Recommended grease:	Universal grease
Number of grease points:	13

1.16. REMARKS AND REPAIR: None

[1] Includes hydraulic oil

2. COMPULSORY TEST RESULTS

2.1. MAIN POWER TAKE-OFF PERFORMANCE

Date and location of test: 16.5.1988
Type of dynamometer: Schenk W 400

Power	Speed		Fuel consumption			
	Engine	Power take-off	Hourly		Specific	Specific energy
kW	rev/min	rev/min	l/h	kg/h	g/kWh	kWh/l
1.1	MAXIMUM POWER - 2 hour test at rated engine speed					
28,0	2000	604	7,9	6,7	238	3,52
1.2	POWER AT RATED ENGINE SPEED					
28,0	2000	604	7,9	6,7	238	3,52
1.3	STANDARD POWER TAKE-OFF SPEED (540 rev/min)					
26,7	1788	540	7,4	6,2	231	3,63

Power	Speed		Fuel consumption			
	Engine	Power take-off	Hourly		Specific	Specific energy
kW	rev/min	rev/min	l/h	kg/h	g/kWh	kWh/l
1.4 PART LOADS						
1.4.1 The torque corresponding to maximum power at rated engine speed						
28,0	2000	604	7,9	6,7	238	3,52
1.4.2 85% of torque obtained in 1.4.1						
24,4	2050	619	7,1	5,9	243	3,45
1.4.3 75% of torque defined in 1.4.2						
18,6	2083	629	5,8	4,8	260	3,22
1.4.4 50% of torque defined in 1.4.2						
12,6	2119	640	4,5	3,7	297	2,82
1.4.5 25% of torque defined in 1.4.2						
6,4	2149	649	3,3	2,7	429	1,95
1.4.6 Unloaded						
-	2169	655	2,1	1,7	-	-

Power	Speed		Fuel consumption			
	Engine	Power take-off	Hourly		Specific	Specific energy
kW	rev/min	rev/min	l/h	kg/h	g/kWh	kWh/l
1.5 PART LOADS AT STANDARD POWER TAKE-OFF SPEED (540 rev/min)						
1.5.1 The torque corresponding to maximum power						
26,7	1788	540	7,4	6,2	231	3,63
1.5.2 85% of torque obtained in 1.5.1						
23,6	1861	562	6,6	5,5	233	3,60
1.5.3 75% of torque defined in 1.5.2						
18,1	1904	575	5,4	4,5	248	3,38
1.5.4 50% of torque defined in 1.5.2						
12,3	1940	586	4,1	3,4	276	3,03
1.5.5 25% of torque defined in 1.5.2						
6,2	1973	596	3,0	2,5	399	2,10
1.5.6 Unloaded						
-	2003	605	1,8	1,5	-	-

- No load maximum engine speed 2169 rev/min
- Torque[1] at maximum power 134 Nm
- Maximum torque[1] 155 Nm
  at engine speed 1215 rev/min

[1] equivalent crankshaft torque

- Mean atmospheric
  - Temperature 20 °C
  - Pressure 1017 mbar
  - Relative humidity 53 %
- Maximum temperatures
  - Coolant 92 °C
  - Engine oil 109 °C
  - Fuel 54 °C
  - Engine air intake 25 °C

2.2. HYDRAULIC POWER AND LIFTING CAPACITY

Hydraulic power test:

Date of tests:	24.5.1988
Sustained pressure with relief valve open	16,2 MPa
Pump delivery rate at minimum pressure	18,8 l/min

	Flow rate l/min	Pressure MPa	Power kW
Flow rate corresponding to a hydraulic pressure equivalent to 90 per cent of the actual relief valve pressure setting and corresponding hydraulic power	14,8	14,5	3,6
Flow rate and hydraulic pressure corresponding to maximum hydraulic power	15,9	14,0	3,7

Tapping point used for test: external tapping.

Power lift test:

	Height of lower hitch point above ground in down position	Vertical movement	Maximum corrected force exerted through full range	Corresponding pressure of hydraulic fluid[1]	Moment about rear axle	Max. tilt angle of mast from vertical
	mm	mm	kN	MPa	kNm	degrees
at hitch points	200	600	11,3	17,1	15,2	-
on the frame	200	625	10,1	17,1	15,6	15

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

Lifting heights relative to the horizontal plane including the lower link pivot points:

Lifting forces at hitch points (corresponding pressure 17,1 MPa)

mm	-321	-200	-100	0	100	200	279	304
kN	11,3	12,0	12,9	13,4	14,7	14,2	16,5	-

Lifting forces at test frame (corresponding pressure 17,1 MPa)

mm	-321	-200	-100	0	100	200	279	304
kN	10,1	10,9	10,9	11,3	10,7	10,4	-	10,1

2.3. DRAWBAR PERFORMANCE

- Date of test: 24.8.-2.9.1988
- Type of track: Tarmacadam
- Type and size of tyres: - Front 6.00-16
  - Rear 12.4 -32

Height of drawbar above ground: 600 mm

Tyre inflation pressure: Front 2,0 bar; Rear 1,0 bar

Gear no	Power	Drawbar pull	Speed	Engine speed	Slip of wheels	Specific energy	Specific consumption	Temperature			Atmospheric conditions		
								Fuel	Coolant	Engine	Temperature	Relative humidity	Pressure
	kW	kN	km/h	rev/min	%	kWh/l	g/kWh	°C	°C	°C	°C	%	mbar
Maximum drawbar power in tested gears (unballasted tractor)													
L1	8,8	14,8	2,2	2119	14,8	2,01	417	42	80	85	24	75	1009
L2	12,8	14,8	3,1	2086	14,6	2,39	352	43	82	91	27	75	1009
L3	17,3	14,9	4,2	2049	14,5	2,63	320	46	83	93	25	75	1009
L4	22,9	14,3	5,8	2001	10,0	2,86	294	45	83	92	23	75	1009
H1	24,6	9,8	9,0	1995	4,9	2,97	283	46	84	90	22	75	1009
H2	24,5	6,5	13,6	2008	3,2	3,00	280	46	83	88	22	75	1009

Gear no	Power	Drawbar pull	Speed	Engine speed	Slip of wheels	Specific energy	Specific consumption	Temperature			Atmospheric conditions		
								Fuel	Coolant	Engine	Temperature	Relative humidity	Pressure
	kW	kN	km/h	rev/min	%	kWh/l	g/kWh	°C	°C	°C	°C	%	mbar
Maximum drawbar power in tested gears (ballasted tractor)													
L1	11,6	19,6	2,1	2113	15,4	2,25	373	42	82	92	22	80	999
L2	17,5	20,5	3,0	2064	14,7	2,63	319	41	83	90	19	80	999
L3	22,7	19,6	4,2	1999	12,6	2,79	301	44	85	92	23	80	999
L4	24,0	14,5	5,9	2003	7,5	2,98	282	44	82	91	20	80	999
H1	24,4	9,7	9,1	1999	4,6	3,00	280	45	83	88	18	80	999
H2	23,7	6,3	13,6	2008	2,9	2,92	288	42	81	85	22	80	999
Five hour test at 75 % of pull at maximum power on gear L4													
L4	19,3	10,9	6,3	2063	4,9	2,91	289	44	84	103	19	52	1022
Five hour test at pull corresponding to 15 % wheelslip													
L2	17,6	20,2	3,1	2058	-	-	-	45	84	103	19	52	1021

Oil consumption during 10 h test was 54 g/h

2.4. TURNING CIRCLE AND TURNING AREA

	With brakes		Without brakes	
	Right hand m	Left hand m	Right hand m	Left hand m
Radius of turning circle	3,3	3,1	3,8	3,6
Radius of turning area	3,5	3,3	4,0	3,8

2.5. LOCATION OF CENTRE OF GRAVITY

- Height above ground 780 mm
- Distance forward from the vertical plane containing the axis of the rear wheels 680 mm
- Distance from median plane of tractor 0 mm

2.6. BRAKING

Date of tests 20.9.1988

- Cold braking device test:

	Travelling speed	Pedal force	Mean deceleration
	km/h	N	m/s^2
Ballasted tractor	27,0	980	3,1
Unballasted tractor	27,5	845	3,2

- Fade test:

Travelling speed	Pedal force	Mean deceleration
km/h	N	m/s^2
27,4	880	3,3

Abnormal deviation of tractor from its original course:	none
Abnormal vibration:	none
Brake heating method:	towing

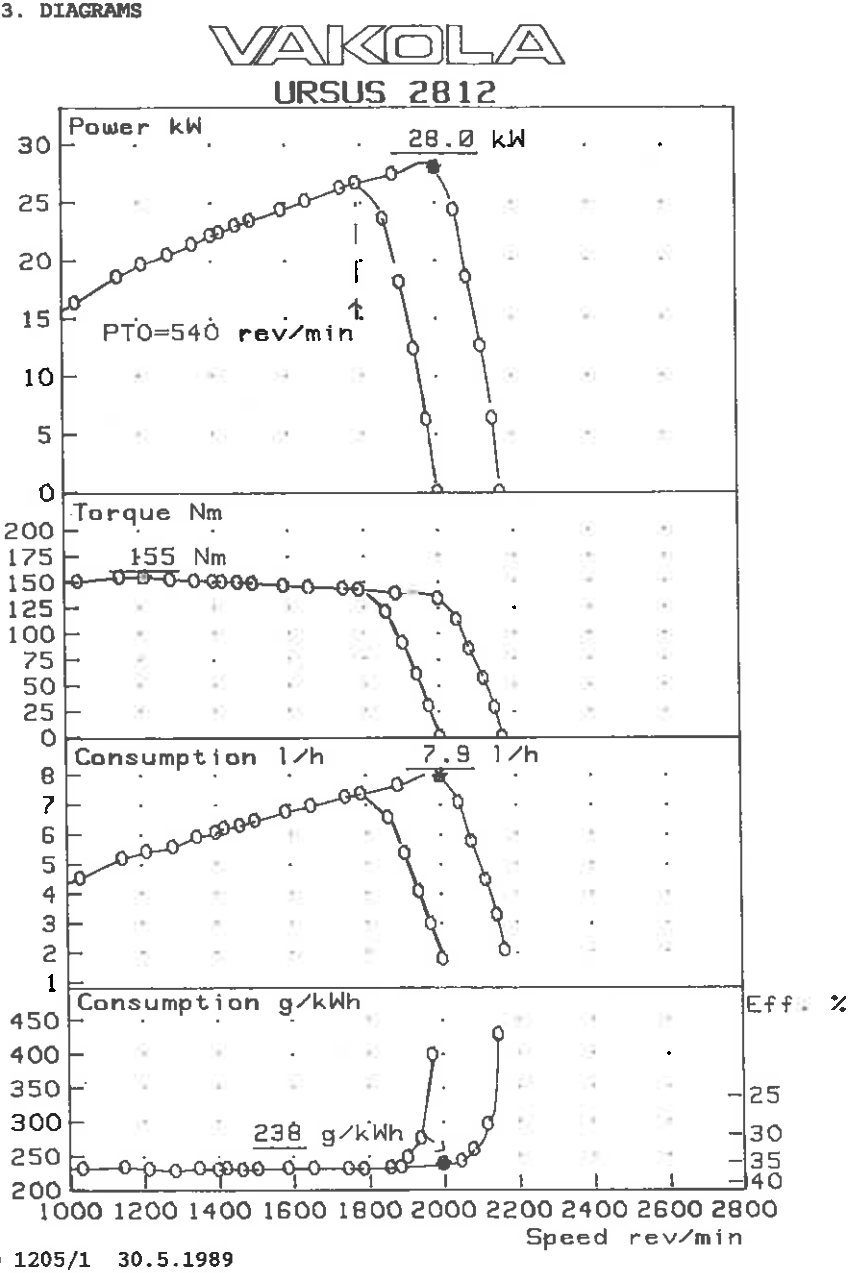
- Parking braking device test:

	Up	Down
Braking device control force N	700	500

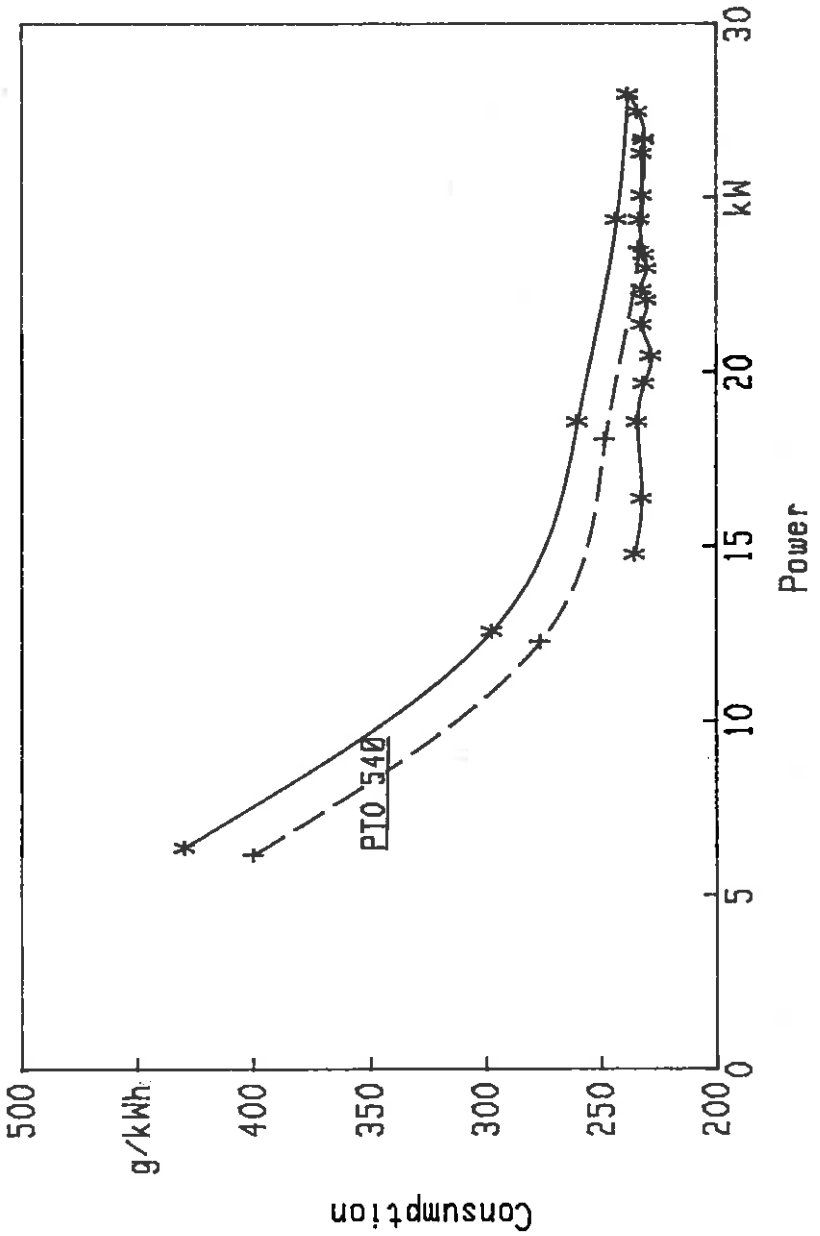
2.7. MEASUREMENT OF EXTERNAL NOISE LEVEL

- Date of tests	28.4.1988
- Sound level meter	Brüel & Kjaer 2209
- Type of track	tarmacadam
- Gear number	H 4
- Travelling speed before acceleration	18 km/h
- Sound level	88 dB(A)

3. DIAGRAMS



OECD 1205/1 30.5.1989


Consumption
g/kWh
500
400
350
300
250
200
0
5
10
15
20
30
kW
Power
PTO 540

Valtion painatuskeskus
Kampin VALTIMO
Helsinki 1989