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

TEST BULLETIN: O.E.C.D. No. 1020

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



VALMET 605-4

Manufactured by:	Valmet Corp., Tractor Works, Jyväskylä, Finland
Date of approval:	29.9.1986

ISSN 0428-

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This bulletin is based on engineering tests in accordance with the O.E.C.D. Restricted 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

Tractor manufactrers name and address:	Valmet Corp. Tractor Works Tourula Box 7, 44201 Suolahti Finland
Submitted for test by:	The manufacturer
Selected for test by:	The manufacturer with the agreement of the institute
Place of running in:	Valmet Corp., Tourula
Duration of running in:	20 h

I SPECIFICATION OF THE TRACTOR

TRACTOR:

- Make:	Valmet
- Model:	605-4
- Type:	Four wheel drive, unit construction
- Seriel number:	506 869
- First seriel No:	500 003

ENGINE:

- Make:	Valmet
- Model:	TD 33 DS 6
- Type:	4-stroke, direct injection, turbocharged, water cooled
- Seriel No:	54025

Cylinders:

- Number and disposition:	3, vertical, in line
- Bore:	108 mm
- Stroke:	120 mm
- Capacity:	3300 cm^3
- Compression ratio:	16:1
- Arrangement of valves:	Overhead
- Cylinder liners:	Wet, replaceable

Supercharging:

- Make:	Holset
- Model:	HID
- Type of drive:	Exhaust
- Pressure:	110 kPa

Fuel system:

- Fuel feed system	Bosch FP/KS mechanical feed pump
- Make, type and model of fuel filters:	Lucas CAV fuel strainer and Bosch replaceable cartridge filter

- Tank capacity:	180 l
- Make, type and model of injection pump	Bosch PES 3A, in line
- Manufacturers production setting of injection pump	84,5 +- 1 cm^3/1000 stroke/1125 rpm at full load
- Injection timing	21° before TDC
- Make, type and model of injectors:	Bosch DLLA 150 S 804, 4 holes
- Injection pressure	20 MPa

Governer:

- Make and Model:	Bosch RSV
- Type:	Mechanical
- Governed range of engine speed	650...2450 r/min
- Rated engine speed	2250 r/min

Air cleaner:

- Main cleaner:	
- Make:	Valmet
- Type:	Dry cleaner with safety element
- Oil capacity:	None
- Pre-cleaner:	
- Make:	Valmet
- Type:	Cyclon
- Type of maintenance indicator:	Under pressure switch
- Air intake position:	Under the bonnet

Lubrication system:

- Type of feed and pump:	Forced feed from gear pump
- Type of filter:	Full flow replaceable paper filter
- Filter change period:	200 h
- Total oil capacity including filter:	9,7 l
- Oil change period:	200 h

Cooling system:

- Type of coolant:	Anti-freeze
- Type of pump:	Centrifugal
- Fan diameter:	430 mm
- Number of fan blades:	6
- Type of temperature control:	Thermostat
- Coolant capacity:	13,5 l
- System pressure:	40 kPa

Starting system:

- Make and model:	Lucas CAV M127 or Bosch JF
- Starter motor power rating:	3 kW
- Safety features:	Only operable when clutch pedal is pressed, double start lock
- Cold starting aid:	Thermostart Lucas CAV 357-8 and automatic excess fuel and automatic injection delay

Electrical system:

- Voltage:	12V
- Earth polarity:	Negative
- Make of generator:	Lucas A 133/65
- Type of generator:	Alternator
- Power of generator:	65 A at 2164 r/min
- Capacity of battery:	160 Ah at 20 h rating
- Number of batteries:	1

Exhaust system:

- Make:	Valmet
- Expansion chamber diameter length	ϕ 130 mm, 545 mm
- Position:	On the bonnet
- Height of outlet above ground	2680 mm

TRANSMISSION

Clutch:

- Make and model:	LUK Al 43102901
- Type:	Dry single acting
- Number of plates:	1
- Diameter of plates:	310 mm
- Method of operation:	pedal

Gear box:

- Make:	Valmet
- Type:	Constant mesh, fully synchronized
- Arrangement:	Two hand levers
- Number of speeds:	16 forward, 8 reverse

Rear axle and final drives:

- Make:	Valmet
- Type:	Crown wheel and pinion differential, planetary final drives

Differential lock:

- Type:	Multidisc
- Method of operation:	Electrohydraulically by a press button

Front axle and final drives:

- Make:	Valmet
- Type:	Crown wheel and pinion differential, planetary final drives
- Driven from:	Gearbox
- Differential lock:	
- Type:	Limited slip
- Method of operation:	Self locking

Transmission Oils:

- Gear box, rear axle, hydraulic and final drives:
  - Capacity 51 l
  - Change period 800 h
  - Filter change period 400 h
- Front wheel drive:
  - Differential 4 l
  - Final drive 2x1 l
  - Oil change period 800 h

Total ratios and speeds:

Group	Gear	Number of engine revolution for one revolution of the driving wheel	Nominal travelling speed of rated engine speed, 2250 r/min[1] km/h
Forward			
L	1L	192,35	3,3
	H	153,11	4,1
	2L	137,61	4,6
	H	109,54	5,8
	3L	96,96	6,5
	H	77,18	8,2
	4L	77,41	8,2
	H	61,62	10,3
H	1L	56,99	11,1
	H	45,37	13,9
	2L	40,77	15,5
	H	32,46	19,5
	3L	28,73	22,0
	H	22,87	27,6
	4L	22,94	27,6
	H	18,26	34,6
Reverse			
R	1L	120,69	5,2
	H	96,07	6,6
	2L	86,35	7,3
	H	68,73	9,2
	3L	60,83	10,4
	H	48,42	13,0
	4L	48,57	13,0
	H	38,66	16,3

1) Tyres: 16.9-34

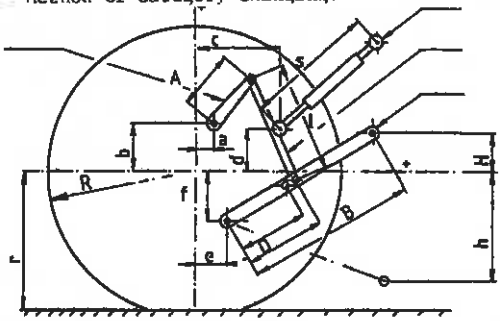
POWER TAKE-OFF

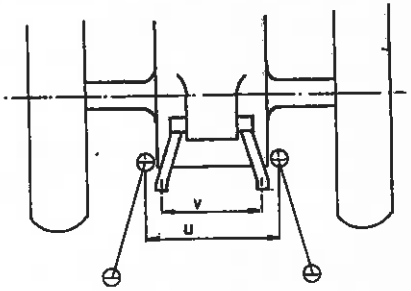
- Type:	Independent
- Number of shafts:	Two
- Number of speeds	Two
- Method of engagement	Hand lever operated electrohydraulical multi plate clutch together with a collar shifter
- Clutch plates:	ø 110 mm, 6 plates
- Proportional Engine Speed	P.T.O.
540 r/min PTO:	
- Ratio:	3,506
- Distance from the median plane of the tractor:	0 mm
- Distance behind rear axle:	470 mm
- Height above ground (16.9-34 tyres):	635 mm
- Nominal diameter of power take-off shaft:	35 mm
- Number of splines:	6, according to ISO 500
- Speed at rated engine speed:	642 r/min
- Engine speed at standard power take-off speed:	1893 r/min
- Power restrictions:	None
- Direction of rotation, viewed facing driving end:	Clockwise
1000 r/min PTO:	
- Ratio:	2,038
- Distance from the median plane of the tractor:	0 mm
- Distance behind rear axle:	470 mm
- Height above ground (16.9-34 tyres)	752 mm
- Nominal diameter of power take-off shaft	35 mm
- Number of splines	21, according to standard ISO 500
- Speed at rated engine speed:	1030 r/min
- Engine speed at standard power take-off speed:	2038 r/min
- Direction of rotation, viewed facing driving end:	Clockwise
- Proportional Ground speed:	P.T.O. (Optional, not fitted)
- Type:	Independent, operated through 540 r/min pto
- Number of power take-off shaft revolutions for one revolution of rear wheels:	40,73 corresponding to 118 mm travel for one revolution of pto (16.9-34 tyres)
- Direction of rotation viewed facing driving end	clockwise

POWER LIFT

- Make:	Valmet
- Type and number of rams:	None
- Type and number of cylinders:	Two external
- Opening pressure of the cylinder safety valve:	22 MPa
- Type of pump:	Gear pump

- Pump drive:	From PTO transmission
- Pressure of the relief valve setting:	17 MPa
- Number of filters:	2
- Type of filters:	Suction strainer and pressure filter
- Oil change period:	800 h
- Filters change period:	400 h
- Oil capacity:	51 l (Gearbox, rear axle, final drives and hydraulics)
- Controls:	Draught-position control, operating speed control, lower link sensing
- Type of oil tappings:	Push-pull
- Location of oil tappings:	At the rear of the tractor
- Number of oil tappings:	3
- Maximum oil delivery which may be taken off through oil tappings:	20 l normal, 30 l with extra oilfilli.
- Pressure utilizable for continuous hydraulic motor work:	15 MPa
- Three point linkage:	2, according to standard ISO 730
- Category:	None
- Method of category changing:	





Rear tyres (16.9-34) radius	R	755 mm
Front tyres (12.4-24) radius	r	553 mm
Length of lift arms	A	310 mm
Length of lower links	B	910 mm
Distance of lift arm pivot point from rear wheel centre line:		
- horizontally	a	105 mm
- vertically	b	278 mm
Horizontal distance between the two lower connection points	u	585 mm
Horizontal distance between the two lift arms end	v	589 mm
Length of top link	S	550...740 mm
Distance of top connection points from rear wheel centre line:		
- horizontally	c	476 mm
- vertically	d	243 mm
Distance of lower connection points from rear wheel centre line:		
- horizontally	e	195 mm
- vertically	f	258 mm

Distance of lower connection points to lift rods pivot on lower links	D	365, 430 mm
Length of lift rods	L	550...695 mm
lift rods pivot on lower links	D	365,430 mm
Length of lift rods	L	550...695 mm
Height of lower link hitch points:		
- low position	h	555 mm
- high position	H	52 mm

SWINGING DRAWBAR: Not fitted on tractor tested, optional

TRAILER HITCH

- Type:	Hitch-hook, according to ISO 6489/1
- Height above ground:	490 mm
- Distance of hitch point from rear axle, horizontally:	485 mm
- Distance of hitch point from power take-off shaft end:	
- vertically:	270 mm below
- horizontally:	10 mm behind
- Maximum vertical load on hitch-hook:	40 kN

HOLED DRAWBAR: None

STEERING

- Type:	Hydrostatic
- Make:	Danfoss orbitrol
- Working pressure:	9 MPa
- Oil change period:	800 h
- Filter change period:	400 h

BRAKES:

Service brake

- Type:	Oil immersed disc brakes
- Make:	Girling
- Method of operation:	Two pedals, hydraulically actuated, independent or combined operation
- Trailer brake take-off:	Hydraulic, optional

Parking brake

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

WHEELS

Steering wheels	Front wheels
- Number:	2
- Tyres:	
- Size:	12.4 - 24
- Ply rating:	8
- Type of casing:	Diagonal

- Maximum permissible mass on each tyre:	1415 kg
- Corersponding inflation pressure:	230 kPa
- Track widths:	1695, 1735, 1895, 1935, 2105, 2295 mm
- Method of adjustment:	Offset lug rims and reversing wheel centres
Driving wheels:	Four wheel drive
- Number:	4
- Tyres:	
- Size:	16.9 - 34
- Ply rating:	8
- Type of casing:	Diagonal
- Maximum permissible mass on each tyre:	2380 kg
- Corresponding inflation pressure:	170 kPa
- Track widths:	1602, 1698, 1852, 1896, 1996, 2086 mm
- Method of adjustment:	Offset lug rims and reversing wheel centres
WHEELBASE:	2290 mm

OVERALL DIMENSIONS (Front 12.4-24, rear 16.9-34)

	Length	Width		Height to top of	
		minimum	maximum	exhaust silencer	safety cab
	m	m	m	m	m
Without ballast	4,29	2,04	2,53	2,68	2,67

GROUND CLEARANCE

- Minimum ground clearance:	435 mm
- Clearance limiting part:	Front axle and hitch-hook

SPECIFICATION OF THE SAFETY STRUCTURE

- OECD approval number:	CSD No 0609/-a(c)
- Trade name:	Volvo BM Valmet H 505...805
- Safety structure manufacturers name:	Volvo BM Hallsbergsverken
- Safety device:	Cab
Details of materials used in the construction:	
- Main frame:	40 x 40 x 3 hollow section killed steel
- Mountings:	Rubber bushes
- Cladding:	Steel sheet 2 and 3 mm
- Roof:	Steel sheet 1,5 mm
- Padding:	Noise reduction materials
- Type of windscreen:	Tempered safety glass

Driver's seat:

- Make and model:	Grammer DS 85 H3
- Type of suspension:	Spiral spring
- Type of damping:	Hydraulic damper
- Range of adjustment:	
- longitudinal	150 mm
- vertical	± 30 mm

Mudguard seat: None

LIGHTNING

- Unrestricted beam angle of headlight in plan view: 108°

	Height above ground of centre with tyres: 16.9-34 m	Size mm	Distance from outside edge of tractor at 1698 mm trackwidth to centre mm
Headlights	1,09	90x150	908
Sidelights	1,68	65x 90	390
Rear lights	1,67	65x 90	435
Reflectors	1,45	40x180	390

CONDITIONS DURING TEST

Track setting:

- Front:	1735 mm
- Rear:	1698 mm

Tractor mass without ballast

With tanks full and cab, without driver

	Front	Rear	Total
kg	1530	2040	3570

Fuel used in test:

- Fuel:	Dieseloil, according to national standards
- Specific gravity at 15°:	0,83

RECOMMENDED OILS

	Recommended	Used in tests
- Engine oil: Type: Viscosity:	API CD SAE 10W/30, under -20°C SAE 5W/20 or SAE 5W/30	Texaco Universal Tractor Oil 10W/30
- Transmission oils:[1] Type: Viscosity:	API GL-4, STOU SAE 10W/30	Teboil Hypoid
- Front wheel drive oils: Type Viscosity:	API GL-5 (EP) or API GL-4 80W/90 or 10W/30	Texaco Hypoid 80/90
- Recommended grease:	Universal grease	
- Number of grease points:	15	

1) Includes hydraulic and steering oils.

II TEST RESULTS

1. MAIN POWER TAKE-OFF PERFORMANCE

Tractor: Valmet 605-4
Date and location of test: 22.8.1985
Type of dynamometer: Schenk W 400

Power kW	Speed		Fuel consumption		
	Engine rev/min	Power take-off rev/min	Hourly l/h	Specific g/kWh	Specific energy kWh/l
MAXIMUM POWER - 2 hour test at rated engine speed					
51,2	2250	642	15,7	256	3,26
STANDARD POWER TAKE-OFF SPEED (540 rev/min)					
48,2	1893	540	14,0	241	3,45
PART LOADS					
(1) 85 % of torque obtained at maximum power					
44,9	2317	661	14,3	266	3,13
(2) 75 % of torque defined in (1)					
34,1	2352	671	11,9	290	2,87
(3) 50 % of torque defined in (1)					
23,1	2383	680	9,4	338	2,46
(4) 25 % of torque defined in (1)					
11,7	2411	688	6,8	487	1,71
(5) Unloaded					
-	2464	703	4,3	-	-

Part loads, the governor hand level in the position corresponding to the standard power take-off speed at full load (540 rev/min)

Power kW	Speed		Fuel consumption		
	Engine rev/min	Power take-off rev/min	Hourly l/h	Specific g/kWh	Specific energy kWh/l
(1) The torque corresponding to maximum power at standard power take-off speed					
48,2	1893	540	14,0	241	3,45
(2) 85 % of torque obtained at maximum power					
42,3	1952	557	12,3	242	3,44
(3) 75 % of torque defined in (2)					
32,2	1987	567	10,1	261	3,19
(4) 50 % of torque defined in (2)					
21,8	2008	573	7,6	291	2,85
(5) 25 % of torque defined in (2)					
11,0	2033	580	5,9	449	1,85
(6) Unloaded					
-	2079	593	3,0	-	-

STANDARD SPECIFIC FUEL CONSUMTPION 266/338/242/291/ g/kWh
- No load maximum engine speed 2464 rev/min
(*) Torque at maximum power 217 Nm
(*) Maximum torque 268 Nm
1440 rev/min

at engine speed

- Mean atmospheric
  - Temperature 18 °C
  - Pressure 1003 mbar
  - Relative humidity 81 %
- Maximum temperatures
  - Coolant 90 °C
  - Engine oil 104 °C
  - Fuel 34 °C
  - Engine air intake 30 °C

(*) The torque is the equivalent crankschaft torque

2. LIFTING CAPACITY AND HYDRAULIC POWER

Date and location of tests: Vihti 20.3.1986

Hydraulic fluid

Make and type: Teboil Hypoid

Viscosity SAE 10 W/30

Type of hydraulic system: open

Hydraulic fluid temperature: 60 °C

Power lift Test

	Height of lower hitch point above ground in mm	Vertical movement mm	Maximum corrected force exerted through full kN	Corresponding pressure of hydraulic fluid MPa	Moment about rear axle kNm	Max. tilt angle of mast over range of degrees
at hitch points	200	607	37,0	15,9	41,1	-
on the frame	200	607	29,4	15,9	50,6	4

Main linkage dimensions - see drawing on page 8

Lifting heights relative to the horizontal plane including the lower link pivot points							
mm	-297	-200	-100	0	100	200	310
Lifting forces at hitch points (corresponding pressure 15,3 MPa)							
kN	39,3	39,3	39,3	38,7	38,0	37,2	37,0
Lifting forces at test frame (corresponding pressure 15,3 MPa)							
kN	40,3	39,5	37,0	34,8	32,6	30,5	29,4

Hydraulic power test

Substained pressure with relief valve open 17,2 MPa

Pump delivery rate at minimum pressure 52,7 l/min

Flow rate corresponding to a hydraulic pressure equivalent to 90 per cent of the actual relief valve pressure setting and corresponding hydraulic power

Flow rate	48,6 l/min
Pressure	15,5 MPa
Power	12,6 kW

Flow rate and hydraulic pressure corresponding to maximum hydraulic power

Flow rate	48,6 l/min
Pressure	15,5 MPa
Power	12,6 kW

Tapping point used for tests: external tapping

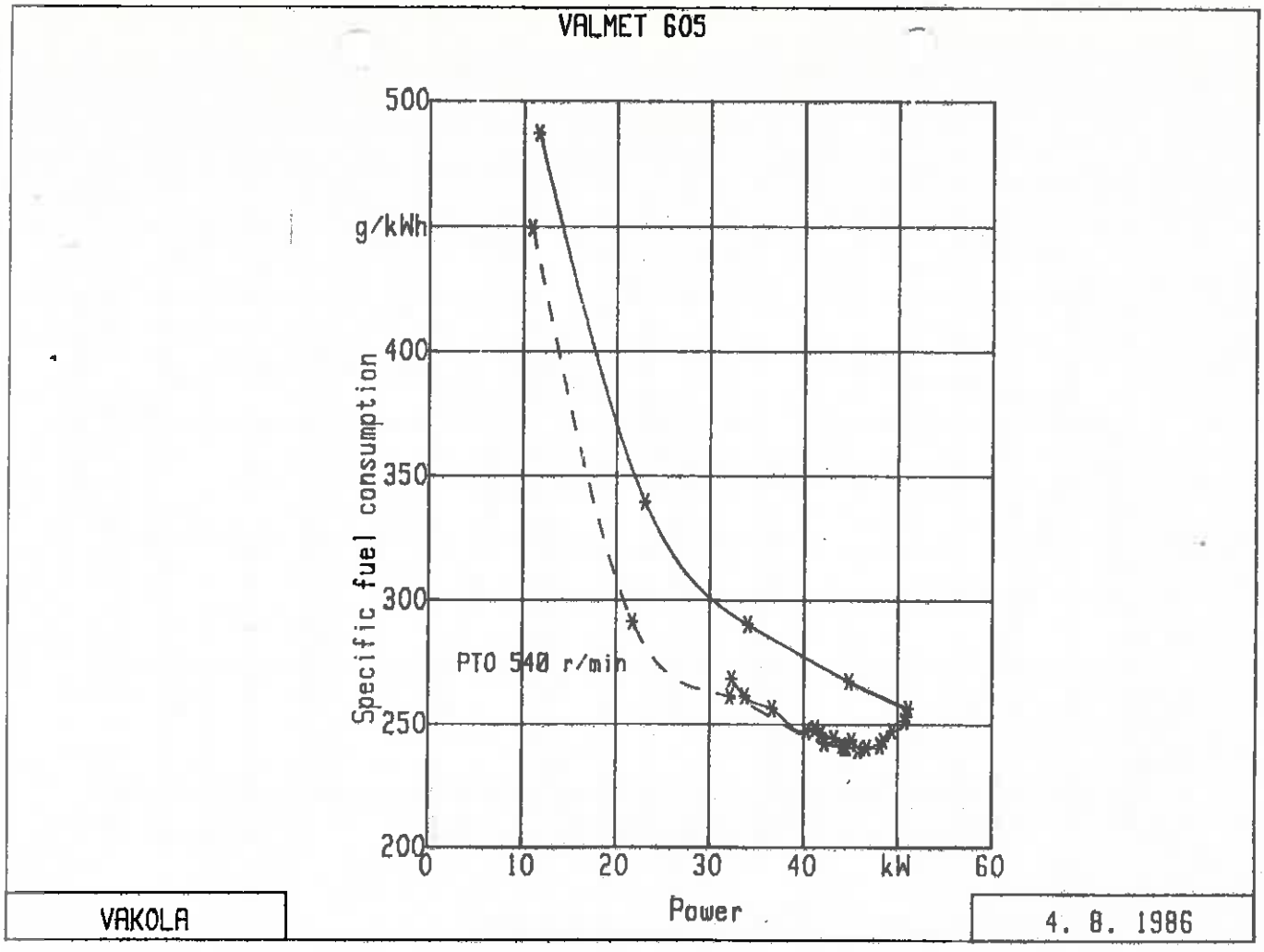
(3) - MAXIMUM POWER, TRANSMISSION AND FUEL CONSUMPTION AT THE DRAWBAR (UNBALLASTED TRACTOR)

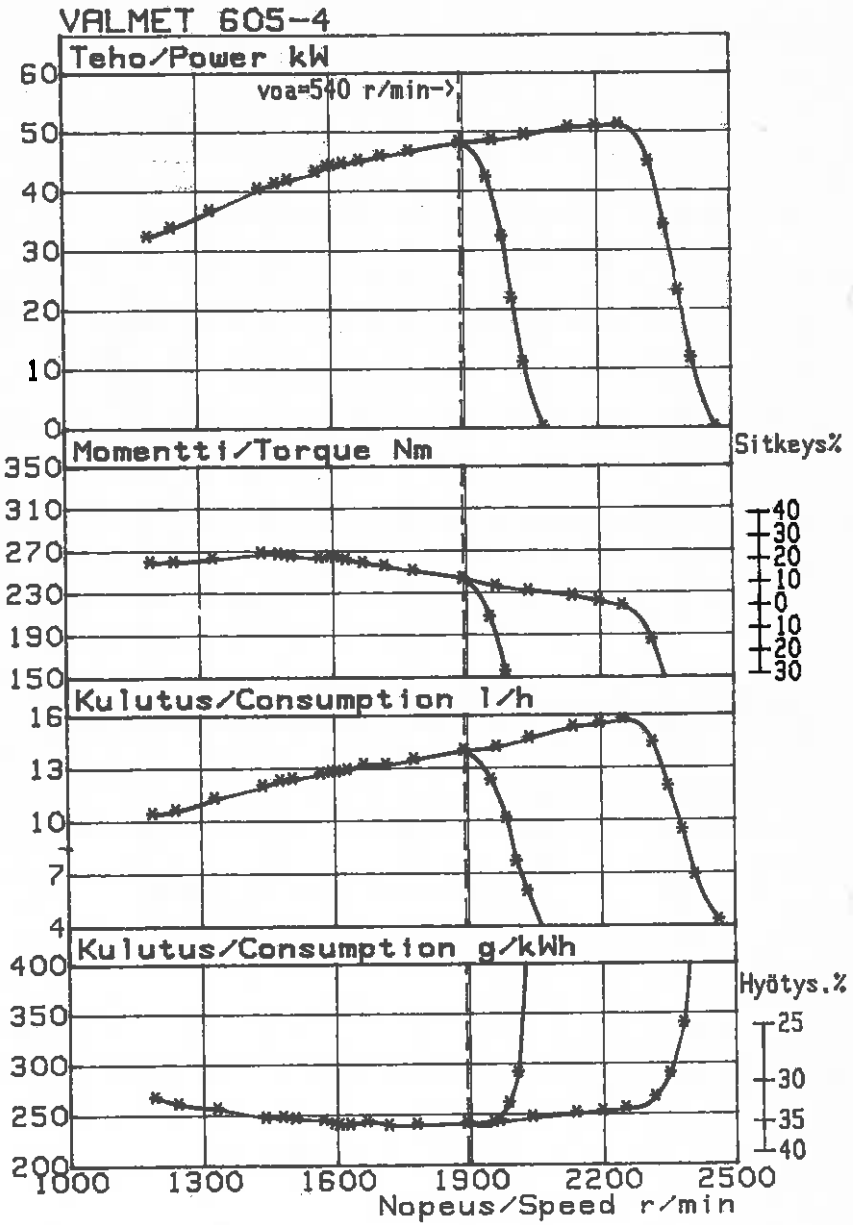
- Date of tests: 23.9.1985
- Type of track: Tarmacadam
- Type and size of tyres:
  - Front: 12.4-24
  - Rear: 16.9-34

Height to drawbar above ground: 505 mm

Tyre inflation pressure: Front 1,5 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
(1) MAXIMUM DRAWBAR POWER IN TESTED GEARS													
L1H	32,7	31,7	3,7	2345	14,4	2,23	370	31	87	76	13	55	1001
L2L	35,4	31,3	4,1	2322	14,6	2,21	372	31	87	74	12	55	1001
L2H	42,6	28,3	5,4	2251	6,8	2,61	316	28	88	71	13	55	1001
L3L	42,1	24,2	6,3	2256	4,6	2,61	314	32	88	75	12	55	1001
L3H	43,5	19,8	7,9	2248	3,8	2,73	300	36	87	81	11	55	1001
L4L	42,1	19,1	7,9	2254	3,9	2,53	324	36	88	83	11	55	1001
L4H	42,6	15,3	10,0	2253	3,3	2,73	300	37	87	84	12	55	1001
H1L	42,6	14,1	10,9	2253	2,8	2,64	310	37	86	84	12	55	1001
H1H	42,2	11,1	13,7	2250	2,2	2,64	310	37	88	83	13	55	1001
H2L	41,1	9,6	15,4	2263	2,1	2,62	313	37	87	83	11	55	1001
2) TRANSMISSION AND FUEL CONSUMPTION CHARACTERISTICS													
(i) Selected gear L3H (highest maximum available power).													
L3H	43,5	19,8	7,9	2248	3,8	2,73	300	36	87	81	11	55	1001
(ii) A pull equal to 75 % of the pull corresponding to maximum power at rated speed													
L3H	34,3	14,8	8,4	2345	2,7	2,45	334	35	86	83	12	55	1001
(iii) A pull equal to 50 % of the pull corresponding to maximum power at rated speed													
L3H	23,7	10,0	8,5	2380	2,0	2,12	386	36	86	83	13	55	1001
(iv) The same pull as in (ii), reduced engine speed													
L4H	35,0	14,8	8,5	1909	2,9	2,80	293	36	87	82	13	55	1001
(v) The same pull as in (iii), reduced engine speed													
L4H	23,9	9,9	8,6	1918	1,8	2,51	327	37	87	82	16	55	1001


VALMET 605
500
g/kWh
400
350
300
250
200
Specific fuel consumption
PTO 540 r/min
0
10
20
30
40
kW
60
Power
VAKOLA
4. 8. 1986


VALMET 605-4
Teho/Power kW
voa=540 r/min->
60
50
40
30
20
10
0
Momentti/Torque Nm
350
310
270
230
190
150
Sitkeys%
40
30
20
10
0
10
20
30
Kulutus/Consumption l/h
16
13
10
7
4
Kulutus/Consumption g/kWh
400
350
300
250
200
Hyötys.%
25
30
35
40
1000
1300
1600
1900
2200
2500
Nopeus/Speed r/min

Helsinki 1986. Valtion painatuskeskus