SOCIALISTIC REPUBLIC OF CROATIA
**INSTITUTE FOR MECHANIZATION IN AGRICULTURE**
ZAGREB

# TEST BULLETIN: O. E. C. D. No. 616

Report on test in accordance with O. E. C. D. Standard Code for Agricultural Tractor Performance

Date of Approval: 16 th February 1979.




**TOMO VINKOVIĆ MODEL TV-624**
**FOUR - WHEEL - DRIVE DIESEL TRACTOR**
**equipped with 7.50-16 tyres**

Manufactured by: TOMO VINKOVIĆ, Tvornica traktora i ljevaonica, Bjelovar, Yugoslavia

Date of Tests: July — September 1978.

This report has been approved by the O. E. C. D. Coordinating Centre (C. N. E. E. M. A., Antony, France) as beeing in accordance with the O. E. C. D. Standard Code for the Official Testing of Agricultural Tractor Performance.

Date of Approval: 16th February 1979. Serial No. 616

The bulletin is based on engineering tests in accordance with the O. E. C. D. Tractor Code. It does not contain evaluation of the performance of the tractor on practical farm work.

In this report all performance characteristics are given according to the International System of Units.

The relation with the former Technical System of Units is given by the following formulas:

| | | | |
|---|---|---|---|
| Forces: | 1 N = 0.102 kp | or | 1 kp = 9.81 N |
| Powers: | 1 kW = 1.36 hp | or | 1 hp = 0.736 kW |
| Pressures: | 1 bar = 1.02 kp/cm² | or | 1 kp/cm² = 0.981 bar |
| | 1000 mbar = 750.1 mm Hg | | |

## TABLE OF CONTENTS


| | | Page |
|---|---|---|
| | Specification of tractor | 3 through 6 |
| | Fuel and lubricants used in tests | 6 |
| **COMPULSORY TESTS** | | |
| (1) | Main power take-off performance | |
| | Table with the results | 7 |
| | Diagrams with the results | 8, 9 |
| (2) | Drawbar performance test on a tarmacadam track | |
| | Table with the results | 10 |
| | Diagrams with the results | 11, 12, 13 |
| (3 and 4) | Turning space and turning circle | 14 |
| (5) | Location of centre of gravity | 14 |
| (6) | Tests of brakes | 14 |
| (7) | Measuring of ambient noise, emitted by tractor | 15 |
| (8) | Measuring of the noise at the driver's ear level | 15 |
| (9) | Test of power-lift and hydraulic pump performance | 16 |

| | |
|---|---|
| Tractor manufacturer: | TOMO VINKOVIĆ, Tvornica traktora i ljevaonica, YU — 43000 Bjelovar |
| Submitted for test by: | Manufacturer |
| Selected by: | Manufacturer by agreement with the Institute |
| Place of running-in: | Zagreb |
| Duration of running-in: | 30 hours |

## SPECIFICATION OF TRACTOR

**Tractor**

| | |
|---|---|
| Make: | TOMO VINKOVIĆ, Tvornica traktora i ljevaonica, Bjelovar |
| Model: | TV-624 |
| Type: | Articulated four-wheel-drive design |
| Serial No.: | 031 |

**Engine**

| | |
|---|---|
| Make: | LOMBARDINI, Fabrica italiana motori, Reggio-Emilia, Italia |
| Model: | 904 |
| Type: | Diesel-engine, air cooling, 4-stroke cycle, direct injection |
| Serial No.: | 1545735 |
| Cylinders: | 2 cylinders, vertical; 90 mm bore, 94 mm stroke, capacity 1196 $cm^3$; compression ratio 17.8 : 1; overhead valves |
| Fuel system: | FISPA diaphragme fuel feed pump; BOSCH type PFR 2 K 70 A 422/2 injection pump serial No. 0414172037; manufacturer's production setting 35.0 $mm^3$/stroke at rated engine speed; BOSH type OKLL multihole injection nozzles; injection pressure 206 bar; injection timing 14° before TDC; paper cartridge fuel filter; capacity of fuel tank 9.6 l |
| Governor: | LOMBARDINI, mechanically acting centrifugal, variable speed type governer; governed range of engine speed 1050 rev/min to 3150 rev/min; rated engine speed 3000 rev/min |
| Air cleaner: | FISPA oil bath type with pre-cleaner incorporated; oil capacity 0.3 l |
| Lubrication system: | Forced feed from gear type pump; FIAAM oil filter with replaceable cartridge; filter cartridge changing interval at all oil change; oil capacity (engine sump) 3.0 l; recommended oil change period 100 hours Recommended oil type acc. API service classification: Service CD; viscosity SAE 30 |
| Cooling system: | Air cooling from belt driven axial blower with 11 blades 190 mm diameter; 4200 rev/min at 3000 rev/min engine speed |
| Starting system: | Electrical; BOSCH screw-push starter motor 1.3 kW |
| Aid for cold starting: | decompressor |
| Exhaust silencer: | Reflexion type silencer on the left hand side of engine; mouth to the left hand side 760 mm above ground |

**Electrical equipment**

| | |
|---|---|
| Voltage: | 12 Volt |
| Generator: | DUCATI, 3 phase alternator, 12 V, 7.5 A |
| Battery: | 1 MUNJA lead acid battery, 12 V, 56 Ah at 20 hours rating |

**Transmission**

| | |
|---|---|
| Clutch: | Make: POBEDA, Novi Sad; dry single plate clutch 190 mm dia plate, pedal operated |
| Gearbox: | Own make; sliding gear type with 3 forward speeds + a 2 forward and 1 reverse range transfer-box at the input end |
| Front and rear axle and final drive: | Own make, crown and pinion with differential; differential lock fitted on front axle, operated by hand lever; spur gear final drive |
| Oil capacities: | Front axle housing and gearbox 10 l; rear axle housing 8 l; recommended oil changing period 500 hours<br>Recommended oil type acc. API service classification: service GL 3; viscosity SAE 90 |

Total ratios and speeds:

| Speed range | Gear No. | Number of engine revolutions for one revolution of driving wheel | Nominal travelling speed at rated engine speed of 3000 rev/min with 7.50—16 tyres, rolling radius 370 mm km/h |
|---|---|---|---|
| low | 1. | 251.43 | 1.66 |
| | 3. | 92.89 | 4.50 |
| | 5. | 34.60 | 12.09 |
| high | 2. | 171.40 | 2.44 |
| | 4. | 63.34 | 6.61 |
| | 6. | 23.59 | 17.74 |
| reverse | 1. | 171.40 | 2.44 |
| | 2. | 63.34 | 6.61 |
| | 3. | 23.59 | 17.74 |

**Power take-off**

| | |
|---|---|
| Type of drive: | Non independent proportional to engine speed p. t. o. directly driven from the transfer-box output |
| Location: | At rear of tractor, in median plane, 310 mm above ground |
| Dimension: | 21.5 mm dia — with 10 splines (not ISO standard) |
| Speed: | 2 x 2 preselectable speeds:<br>— »Low ratio« p. t. o. selector position:<br>— with transfer-box on the »high range« position 961.5 rev/min at rated engine speed,<br>— with transfer-box on the »low range« position (or »reverse«) 663.7 rev/min at rated engine speed |

540 rev/min standard p. t. o. speed at 2441 rev/min engine speed

— »High ratio« p. t. o. selector position:
  — with transfer-box on the »high range« position 1693.0 rev/min at rated engine speed,
  — with transfer-box on the »low range« position (or »reverse«) 1167.3 rev/min at rated engine speed

1000 rev/min standard p. t. o. speed at 2570 rev/min engine speed

Direction of rotation: Clockwise (transfer-box on high or low position) or anticlockwise (transfer-box on reverse position)

**Power lift**

Make: PRVA PETOLETKA, Trstenik; disintegrated construction; gear type pump directly driven by engine, supplies oil to a single acting ram cylinder; maximum oil pressure 123 bar; oil capacity 7.5 l; recommended oil type: hidraulic oil HD, viscosity SAE 70
Position control; hydraulic linkage lock for transport

**Implement linkage**

At rear: Three point linkage, not standardised, controlled by power lift; lifting range above ground from 130 mm to 605 mm

Holed bar: Long bar fitted on the clevis of lower links; lenght between the ball joints 580 mm; either side with 80 mm distance each. width 60 mm, thickness of the bar 25 mm. Height above ground adjustable by power lift. With lower links in horizontal position distance of holes centre line to rear axle centre 630 mm

**Streering** Own make spur streering, operated by hand wheel

**Brakes**

Service brake: Internal expanding brake, mechanically acting on rear wheels, operated by foot pedal. The four wheels are always mechanically engaged.

Parking brake: Service brakes operated by hand lever with ratchet

**Wheels** Two at front, two at rear, all tyres 7.50-16 TR, 4-ply pneumatic, steering by front wheels, all-wheel-drive; maximum permissible weight on each tyre 500 kg at 1.23 bar; track width 840 mm and 1000 mm by shifting the bub on the axle shaft
Track setting during test 1000 mm

Wheelbase: 1185 mm

**Tractor and ballast weights** (without driver, with power lift, full fuel tank and oil, as tested)

Weights:

| | Front kg | Rear kg | Total kg |
|---|---|---|---|
| Without ballast | 590 | 310 | 900 |
| With ballast | 690 | 410 | 1100 |

**Ballast:** Front: 1 weight per wheel 50 kg each = 100 kg
Rear: 1 weight per wheel 50 kg each = 100 kg

**Seat** Upholstered seat with back rest; adjustable spring with shock absorber; height of unloaded seat above footrest 530 mm, not adjustable

**Number of grease points** Whole tractor 10

**Overall dimensions**

Overall length: 2740 mm (with 3 point linkage in horizontal position)

Overall width: 1220 mm at 1000 mm track

Overall height: 1070 mm to top of streering wheel

Maximum ground clearance: 245 mm (brakes drums)

**Lightig**

| | Height above ground of centre mm | Dimensions of area mm | Distance from outside edge of tractor to centre mm |
|---|---|---|---|
| Headlights | 845 | 100 ∅ | 270 |
| Side lights | — | — | — |
| Rear lights | 830 | 120 x 20 | 150 |

Unrestricted beam angle of headlight in plan view 30°

## FUELS AND LUBRICANTS USED IN TESTS

**Laboratory and track tests**

Fuel: Diesel oil, specific gravity at 15°C 0.835 kg/dm³, cetane No. 58 (commercially available quality acc. to JUS B. H2.411)

Engine oil: INA SUPER 3 30 (SAE) (acc. JUS B.H3.169); viscosity at 50°C . . C

Transmission oil: INA HYPENOL 90 (SAE) (acc. JUS B.H3.304); viscosity at 50°C : 15°C

Power lift: INA HIDRAOL 70 HD (acc. JUS B.H3.275); viscosity at 50°C : 6.75°E

## COMPULSORY TESTS

(1) **MAIN POWER TAKE-OFF PERFORMANCE** (540 rev/min)

Date and location of test: 17th July 1978., Zagreb

Type of dynamometer: SCHENK hydraulic dinamometer Ul-40

| Horsepower, kW | Speeds, Engine rev/min | Speeds, P. t. o. rev/min | Fuel consumption Total 1/h | Fuel consumption Total kg/h | Fuel consumption Specific g/kWh | Specific energy kWh/l |
|---|---|---|---|---|---|---|
| Maximum power — 2 hour test | | | | | | |
| 14.8 | 3000 | 664 | 6.26 | 5.23 | 353 | 2.37 |
| ndard p. t. o. speed (540 rev/min) | | | | | | |
| 13.3 | 2441 | 540 | 5.32 | 4.44 | 334 | 2.50 |
| Speed recommended by the manufacturer for drawbar work | | | | | | |
| 14.8 | 3000 | 664 | 6.26 | 5.23 | 353 | 2.37 |
| **Fuel consumption at part loads** | | | | | | |
| (i) 85% of torque at maximum power | | | | | | |
| 12.6 | 3051 | 675 | 5.25 | 4.38 | 348 | 2.40 |
| (ii) unloaded | | | | | | |
| 0 | 3160 | 700 | 1.85 | 1.54 | — | — |
| (iii) 50% of the load defined in (i) | | | | | | |
| 6.3 | 3110 | 688 | 3.20 | 2.67 | 424 | 1.97 |
| (iv) maximum power | | | | | | |
| 14.8 | 3000 | 664 | 6.26 | 5.23 | 353 | 2.37 |
| (v) 25% of the load defined in (i) | | | | | | |
| 3.2 | 3151 | 697 | 2.50 | 2.09 | 653 | 1.28 |
| 75% of the load defined in (i) | | | | | | |
| 9.3 | 3074 | 680 | 4.24 | 3.54 | 381 | 2.19 |

No load, maximum engine speed: 3160 rev/min

Equivalent crankshaft torque at maximum power: 46.9 Nm

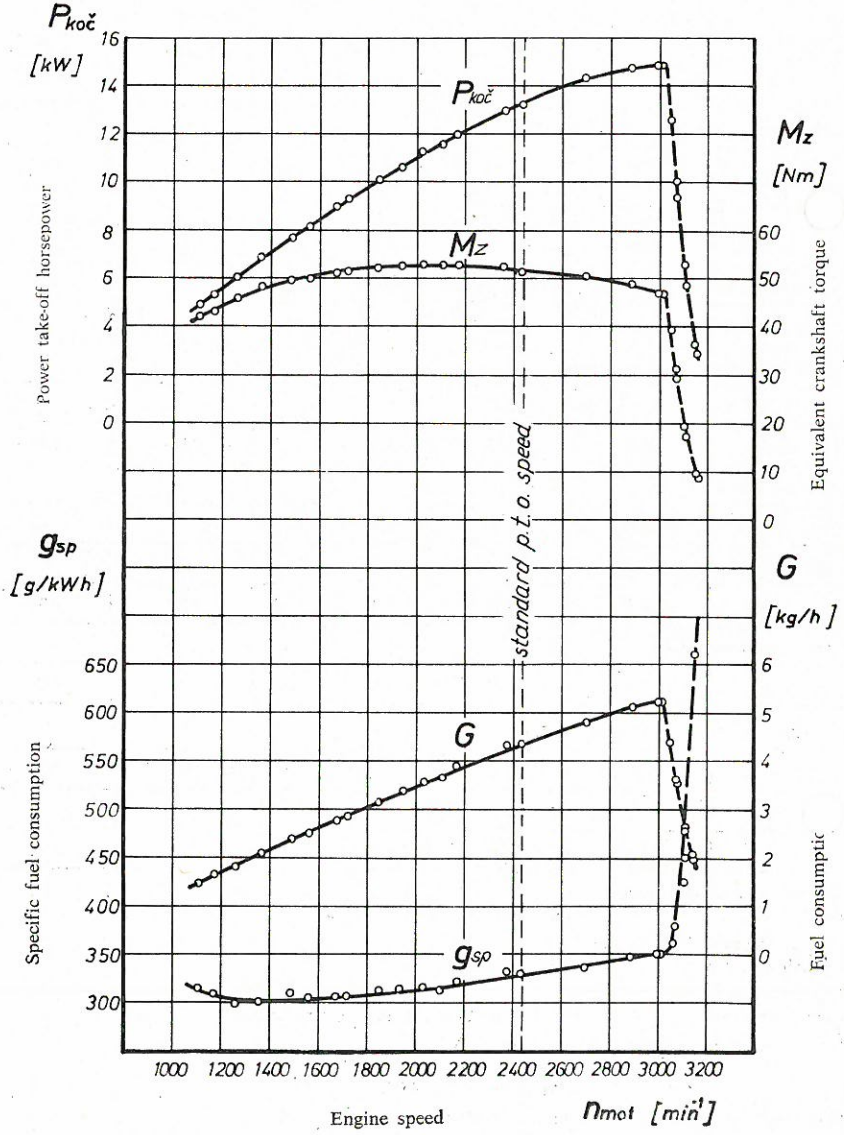
Maximum equivalent crankshaft torque: 53.5 Nm at 2102 rev/min engine speed

Mean atmospheric conditions: temperature 26°C;
pressure 1006 mbar
relative humidity 58%

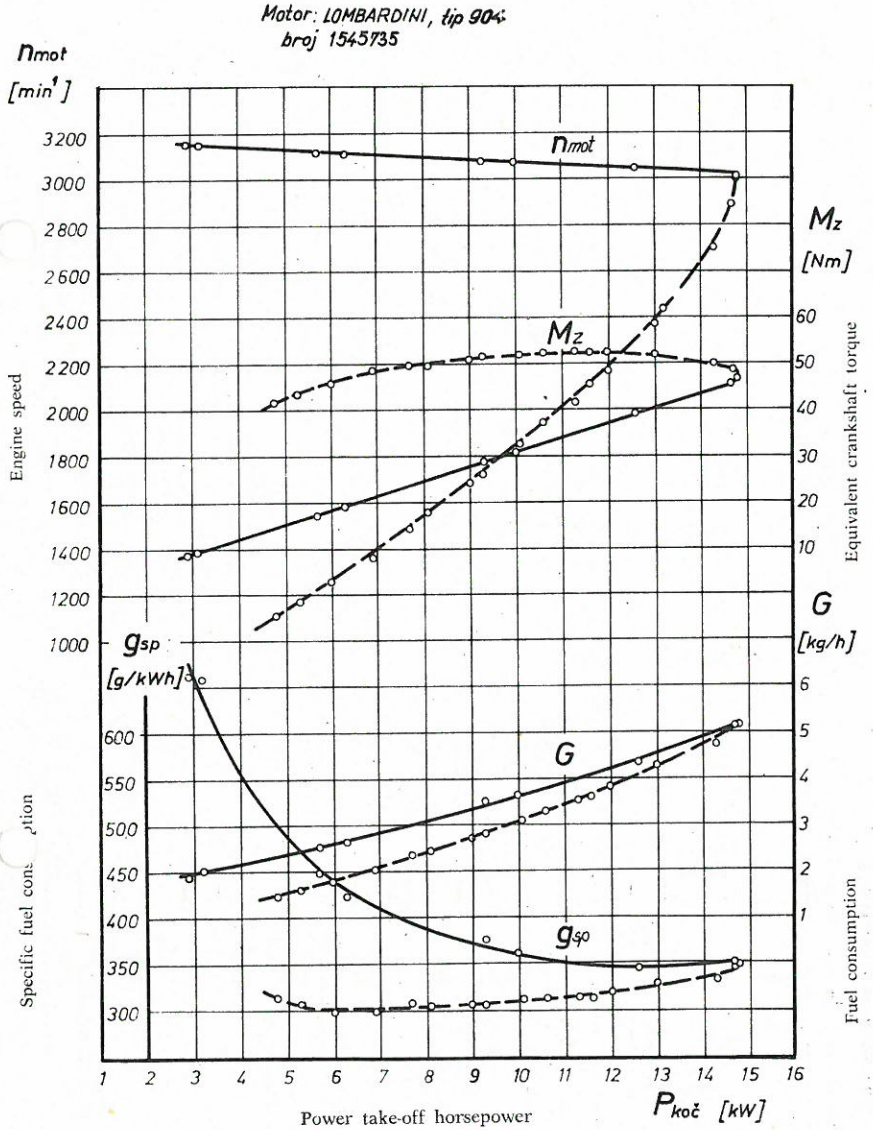
Maximum temperatures: engine oil 125°C;
coolant not recorded;
fuel 27°C

## POWER TAKE-OFF TEST

Motor: LOMBARDINI, tip 904
broj 1545735



## POWER TAKE-OFF TEST



(2) **DRAWBAR PERFORMANCE**

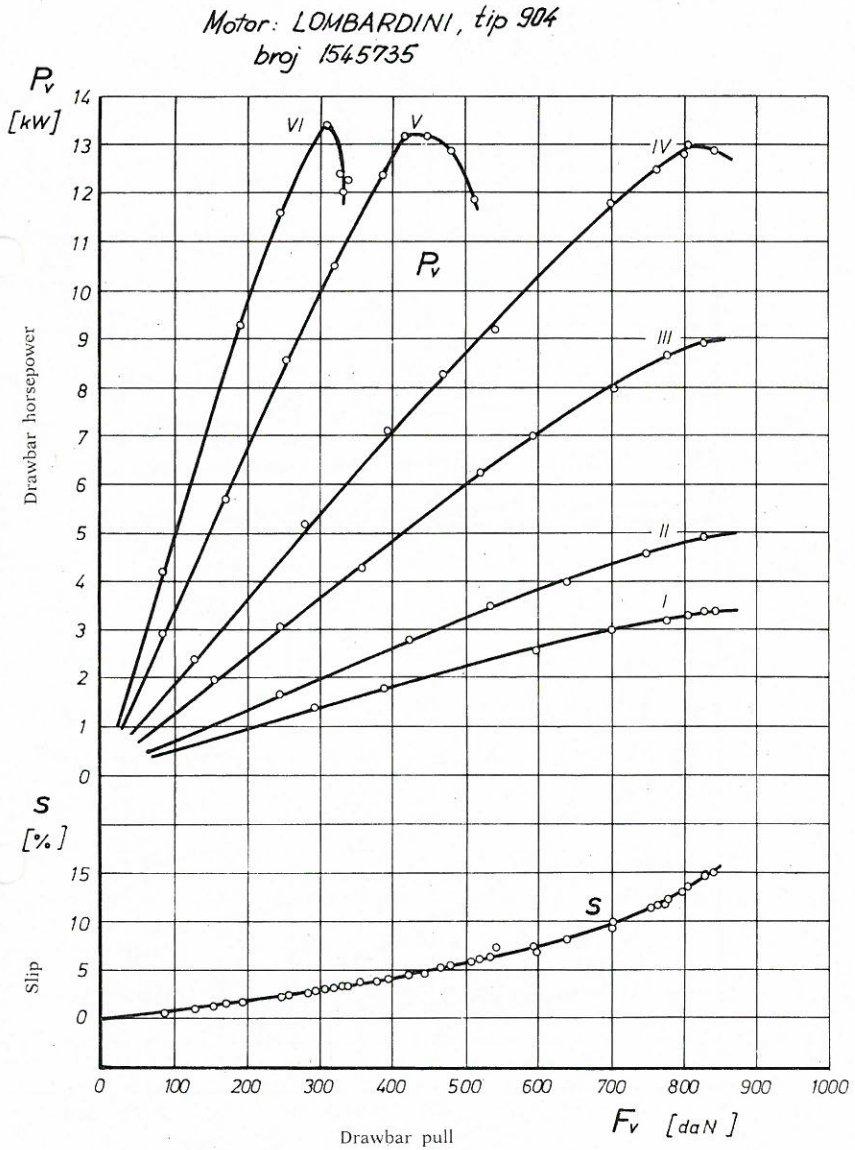
Date of tests: 22nd — 29th August 1978 Type of track: Tarmacadam Height of drawbar above ground: 285 mm

| Gear number, | Power, kW | Drawbar pull, N | Speed, km/h | Engine speed, rev/min | Wheelslip, % | Specific energy, kWh/l | Specific fuel consumption, g/kWh | Temperature, Fuel °C | Temperature, Coolant °C | Temperature, Engine °C | Atmospheric conditions: Temperature, °C | Atmospheric conditions: Relative humidity, % | Atmospheric conditions: Pressure, mbar |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (i) Maximum power (ballasted) | | | | | | | | | | | | | |
| 1. | 3.4 | 8440 | 1.45 | 3090 | 15.0 | 1.23 | 677 | 23 | not rec. | 72 | 24 | 70 | 1009 |
| 2. | 4.9 | 8290 | 2.12 | 3090 | 15.0 | 1.54 | 543 | 25 | not rec. | 74 | 26 | 65 | 1009 |
| 3. | 8.9 | 8290 | 3.89 | 3044 | 15.0 | 2.04 | 410 | 25 | not rec. | 78 | 27 | 54 | 1009 |
| 4. | 13.0 | 8040 | 5.80 | 3010 | 12.9 | 2.12 | 393 | 23 | not rec. | 80 | 25 | 88 | 1009 |
| 5. | 13.2 | 4200 | 11.30 | 2980 | 4.2 | 2.13 | 392 | 24 | not rec. | 84 | 26 | 63 | 1009 |
| 6. | 13.4 | 3070 | 15.80 | 2970 | 3.1 | 2.16 | 386 | 24 | not rec. | 80 | 26 | 60 | 1010 |
| (ii) Five hour test at 75% of pull at maximum power | | | | | | | | | | | | | |
| 4. | 10.7 | 6380 | 6.11 | 3040 | 8.3 | 2.22 | 376 | 23 | not rec. | 106 | 24 | 70 | 1009 |
| (iii) Five hour test at pull corresponding to 15% wheelslip in test (i) | | | | | | | | | | | | | |
| 3.* | — | 8430 | 4.05 | 3070 | — | — | — | 22 | not rec. | 105 | 24 | 72 | 1009 |
| (iv) Maximum power (unballasted) | | | | | | | | | | | | | |
| 1. | 3.1 | 7650 | 1.45 | 3110 | 15.0 | not rec. | not rec. | 15 | not rec. | 72 | 16 | 72 | 1011 |
| 2. | 4.6 | 7800 | 2.13 | 3106 | 14.9 | not rec. | not rec. | 15 | not rec. | 73 | 16 | 74 | 1011 |
| 3. | 8.5 | 7800 | 3.92 | 3085 | 15.0 | not rec. | not rec. | 16 | not rec. | 76 | 17 | 75 | 1011 |
| 4. | 12.4 | 7800 | 5.72 | 3070 | 15.0 | not rec. | not rec. | 15 | not rec. | 75 | 17 | 81 | 1014 |
| 5. | 13.4 | 4220 | 11.45 | 3000 | 4.6 | not rec. | not rec. | 16 | not rec. | 79 | 18 | 75 | 1014 |
| 6. | 13.3 | 2900 | 16.52 | 3000 | 3.5 | not rec. | not rec. | 16 | not rec. | 77 | 18 | 62 | 1014 |

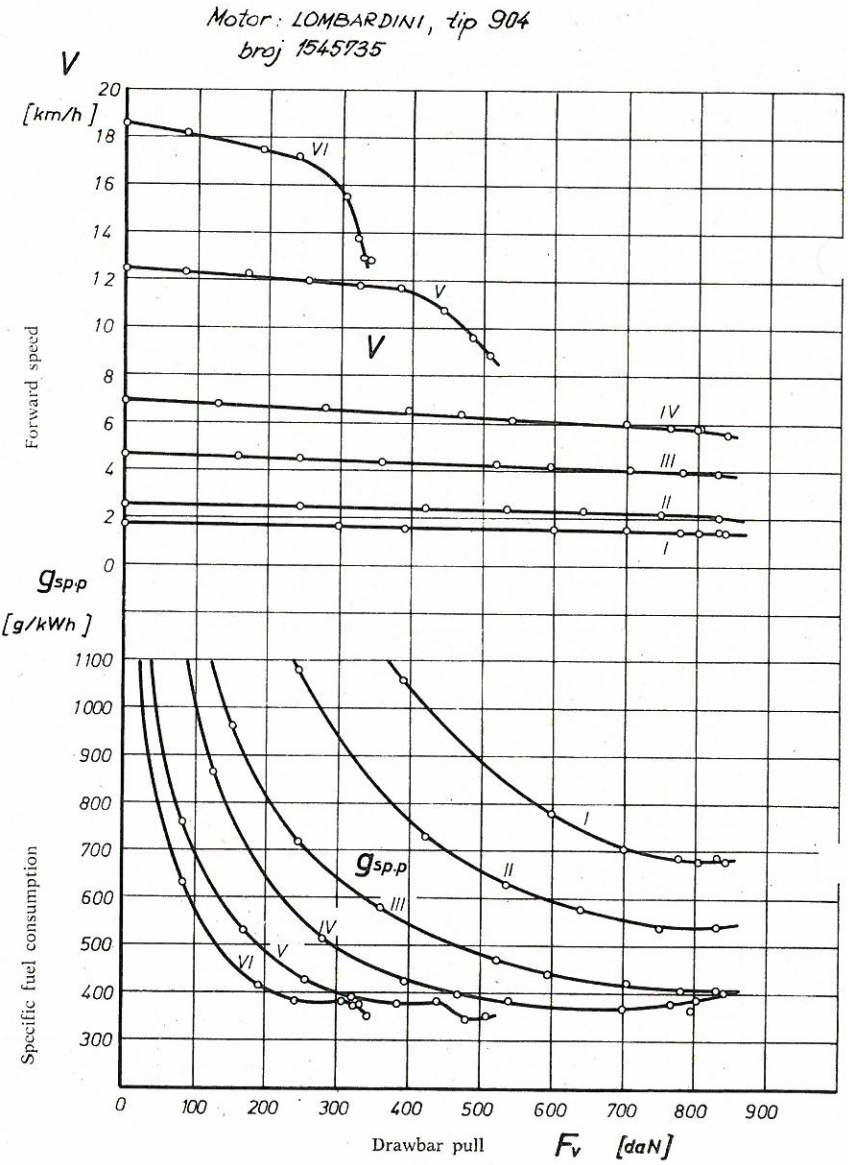
Total oil consumption during ten hour ration of tests (ii) and (iii): 21.2 g/h

* Test (iii) was carried out with additional ballast and the results for power, slip and fuel consumption have no practical significance

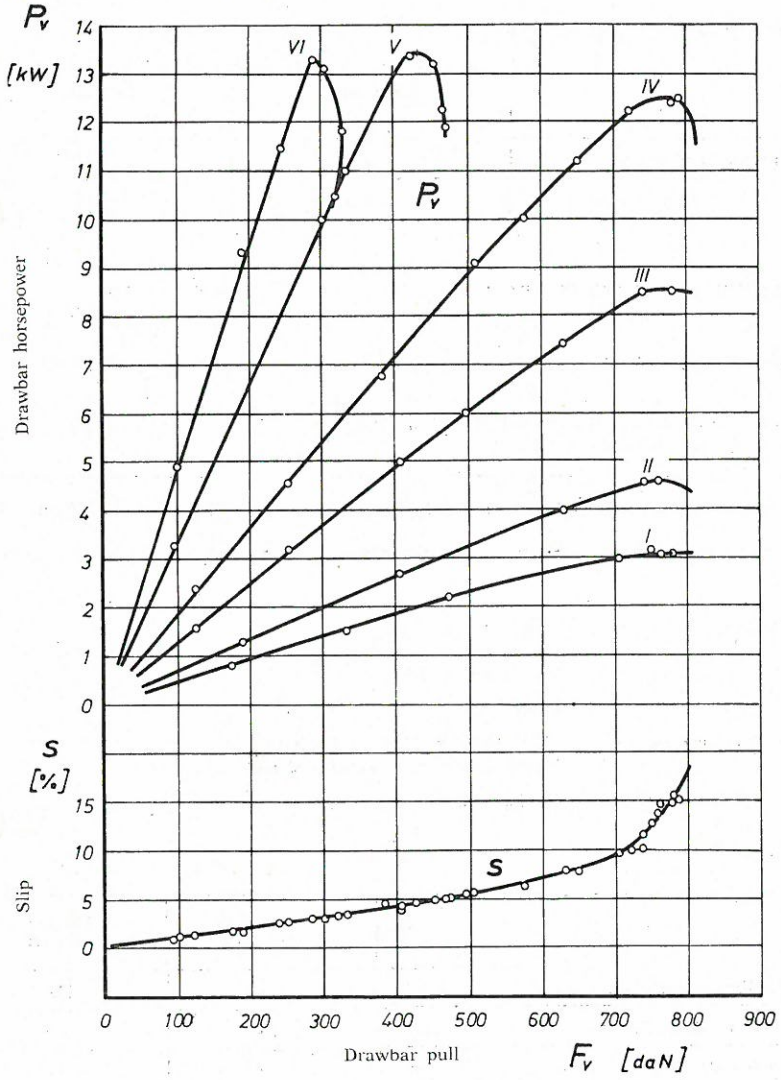
## DRAWBAR TEST ON A TARMACADAM TRACK, WITH BALLAST



## DRAWBAR TEST ON A TARMACADAM TRACK, WITH BALLAST



## DRAWBAR TEST ON A TARMACADAM TRACK, WITHOUT BALLAST



(3 i 4) **TURNING SPACE AND TURNING CIRCLE**

Wheel equipment: front and rear: 7.50 — 16; 4 ply, without ballast
Track of wheels: from and rear: 1000 mm

Individual wheel brake not applicable

| | Right hand m | Left hand m |
|---|---|---|
| Radius of turning space | 2.92 | 2.92 |
| Radius of turning circle | 2.83 | 2.83 |

(5) **LOCATION OF CENTRE OF GRAVITY** Without ballast

| | |
|---|---|
| Height above ground | 510 mm |
| Distance forward from the vertical plane containing the axis of the rear wheels | 729 mm |
| Distance from the median plane to the right hand | 10 mm |

(6) **BRAKING**

Date of tests: 7th September 1978
Type of track: tarmacadam
Type of decelerometer: MOTO METER, Herman Schleich Bremsverzögerungs — und Pedalkraftschreiber
Weight of ballasted tractor: 1175 kg with driver

**Cold brakes**

| | | Tractor without ballast | Tractor ballasted |
|---|---|---|---|
| Travelling speed of tractor | km/h | 18.0 | 18.0 |
| Maximum deceleration | m/s² | 5.4 | 4.8 |
| Stopping distance | m | 3.04 | 3.45 |
| Force exerted on the brake pedal | N | 560 | 589 |
| Force exerted on the brake pedal to achive a declleration of 2.5 m/s² | N | 235 | 275 |

**Brake fade characteristic** (hot tests)

| | | With ballast | Without ballast |
|---|---|---|---|
| Maximum deceleration: | hot/cold % | 106 | 99 |
| Stopping distance: | cold/hot % | 108 | 97 |
| Force on pedal: | cold/hot % | 94 | 101 |
| Weight of tractor with driver | | 1175 kg | 975 kg |

Efficiency of handbrake: facing down a slope of 16 %: good
facing up a slope of 16 %: good

Pull on handbrake: 353 N

## (7) MEASUREMENT OF AMBIENT NOISE EMITTED BY THE TRACTOR

Date of tests: 5th September 1978
Type of sound level meter: Brüel & Kjaer, type 2203
Type of track: tarmacadam
Exhaust location: left-hand side
Results of test: gear: 6th
travelling speed before acceleration: 13.5 km/h
sonud level: 85.5 dB (A)

## (8) NOISE MEASUREMENTS AT THE DRIVER'S EAR LEVEL

Date of test: 5th September 1978
Type of sound level meter and octave filter: Brüel & Kjaer, type 2203 with octave band noise analyzer type 1613
Type of track: tarmacadam
Type of frequency analyser: octave filter with eight bands width 37.5 to 9 600 Hz

**Results of test:**

| Gear number | Drawbar pull at which the tractor develops the maximum sound level N | Travelling speed, km/h | Sound level dB (A) | Loundess, sones |
|---|---|---|---|---|
| 1 | 6250 | 1.50 | 95.0 | 97.3 |
| 2 | 6220 | 2.22 | 95.5 | 99.0 |
| 3 | 6000 | 4.12 | 96.0 | 100.6 |
| 4* | 6050 | 5.50 | 95.5 | 98.2 |
| 5 | 3200 | 9.50 | 96.0 | 104.0 |
| 6 | light load | 17.60 | 96.5 | 103.9 |

* The 4th gear corresponds to the travelling speed nearest to 7.25 km/h

## (9) POWER LIFT AND HYDRAULIC PUMP PERFORMANCE

Date and location of test: 16th and 17th July 1978., Zagreb

Hydraulic fluid: make and type: INA HIDRAOL 90 HD
viscosity: 6.75°E/50°C
viscosity index: 100

**Power lift**

Type of linkage lock for transport: hydraulic

Opening pressure of the cylinder over-pressure relief valve: no valve fitted

**PUMP CHARACTERISTICS**

| | |
|---|---|
| ( i) Opening pressure of relief valve: | 113 bar |
| Sustained pressure by the open relief valve: | 120 bar |
| Pump delivery rate: | |
| ( ii) at minimum presure: | 11.64 l/min |
| (iii) at maximum hydraulic power: | 9.82 l/min |
| Delivery pressure: | 120 bar |
| Hydraulic power: | 1.96 kW |

The standard frame is not applicable to the special, not standardised design of the power lift

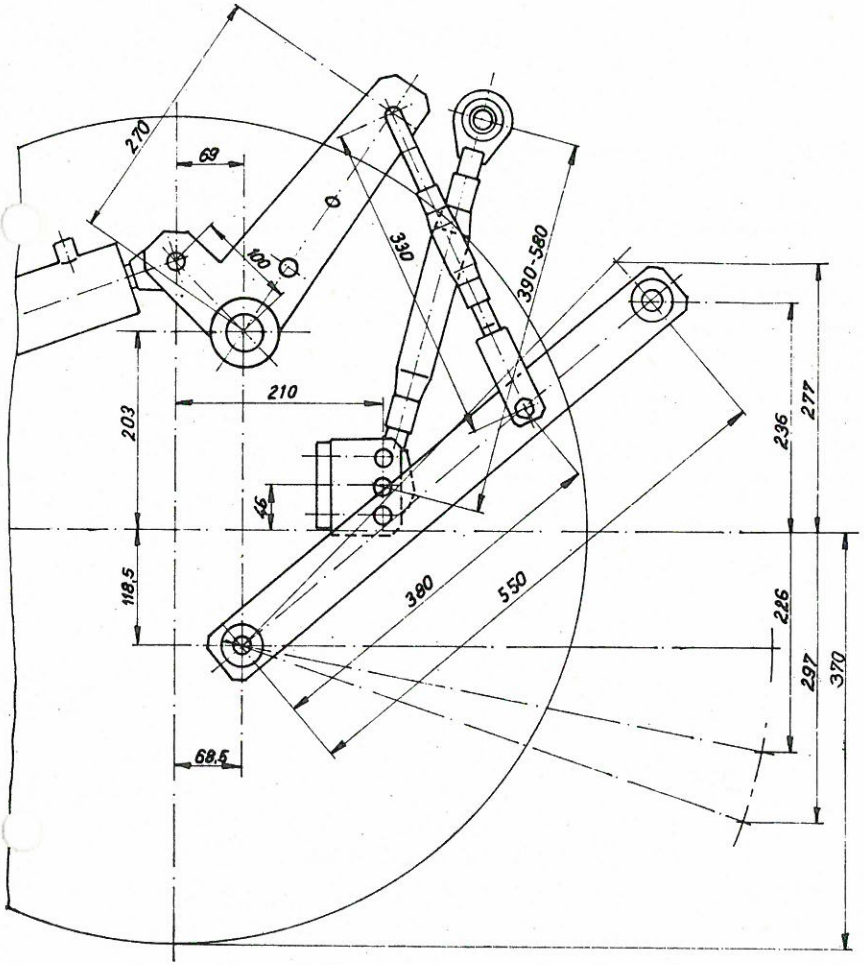
**LIFTING FORCES**

| Lifting heights relative horizontal lower links mm | — 105 | 0 | + 100 | + 200 | + 300 | + 355 |
|---|---|---|---|---|---|---|
| Force N N | 5610 | 6690 | 7720 | 8700 | 9900 | 6070 |

Maximum lifting force exerted throghout the whole range 5610 N.

Front of tractor does not lift at maximum lifting force.

## LINKAGE GEOMETRY




*Mjerilo: 1:5*

## LINKAGE GEOMETRY

| | |
|---|---|
| Projected lenght in side view: | mm |
| Lower links | 550 |
| Lift arms | 270 |
| Lift rods | 330 |
| Top link | 390 — 580 |
| Distance of lift rod connection point from pivot point of lower link | 380 |
| The folloving dimensions are given relative to rear axle centre 370 mm above ground | |
| Lower link pivot point | 68.5 mm behind, 118.5 mm below |
| Top link pivot point | 210 mm behind, 46 mm above |
| Life arm pivot point | 69 mm behind, 203 mm above |
| Maximum and minimum height of lower link hitch points | 236 mm above, 226 mm below |
| Height of lower link hitch points above ground when locked in highest transport position | 606 mm |

Date: 29th September 1978

Head of Testing Division: V. OBELIĆ

Officer in charge: D. HORVAT

Director: I. TODORIĆ

Printed by: »Zrinski«, Čakovec