COMITATO DI COORDINAMENTO PER L'OMOLOGAZIONE
DELLE MACCHINE AGRICOLE IN ITALIA

No. 340 / O. E. C. D.

REPORT ON TEST IN ACCORDANCE WITH O. E. C. D.
TEST CODE FOR AGRICOLTURAL TRACTORS

# GOLDONI UNIVERSAL 221

**Manufactured by:** GOLDONI & C.
Migliarina di Carpi - MODENA (ITALY)



**Date of tests:** April - June 1970

This report has been approved by the O.E.C.D. Coordinating Centre (C.N.E.E.M.A. - France) as being in accordance with the O.E.C.D. Tractor Test Code.

**Date of approval:** 14th September 1970

CENTRO DI OMOLOGAZIONE DELL'ISTITUTO DI MECCANICA AGRARIA
UNIVERSITA' DEGLI STUDI DI BOLOGNA - ITALIA

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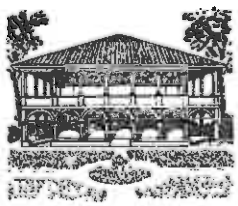
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This bulletin is based on engineering tests in accordance with the O.E.C.D. Tractor Code. It does not contain an evalutation of the performance of the tractor on practical farm work.

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— **Tractor manufacturer:** Goldoni & C. - Migliarina di Carpi (Modena) Italy.

— **Submitted for test by:** the manufacturer.

— **Selected by:** manufacturer with the agreement of « Istituto di Meccanica agraria - University of Bologna ».

— **Place of running in:** Goldoni & C. workshop - Migliarina di Carpi.

— **Duration of running in:** 40 hrs for the tractor transmission; 80 hrs for the engine.

## I - SPECIFICATION OF TRACTOR

— Make: Goldoni & C.
— Model: Universal 221
— Type: four wheels drive, articulated steering frame
— Serial: no. 42202

### ENGINE

— Make: Lombardini S.p.A. Reggio Emilia - Italy
— Model: LDA 820
— Type: direct injection diesel
— Serial no.: 794872

**Cylinders:** one cylinder, vertical; bore 102 mm; stroke 100 mm; total capacity: 817 $cm^3$; compression ratio: 17.5; overhead valves; dry cylinder.

**Fuel system:** gravity feed; Lombardini 273-3730-15 filter; capacity of fuel tank: 7 liters.

BOSCH injection pump, model PFR 1 K 70/344/2 serial no. FM 2 4905; manufacturer's production setting for injection pump 52 $mm^3$ for cycle at fuel temperature 15°C. OMA injection nozzles model P 292.6531.13; injection pressure: 180 $Kg/cm^2$.

**Governor:** make Lombardini; mechanical type with centrifugal weights governed range of engine speed 1000-3200 rev/min.

**Air cleaner:** Lombardini model 6183-3701-36 oil bath type with cyclone precleaner Fispa 2071.01; oil capacity: 0.3 liters; flow 2200 l/min.

**Lubrication system:** forced feed from gear type pump make Lombardini; centrifugal filter; recommended oil change period: 100 hrs; oil capacity: 2.6 liters.

**Cooling system:** air cooled impeller assisted; centrifugal impeller, diameter 308 mm, with 28 blades belt driven fan; flow 900 $m^3/h$ at 3000 rev/min.

## STARTING SYSTEM

Electric BOSCH model J D (R), 12 V, 1,8 metric h.p. motor.

## ELECTRICAL SYSTEM

**Voltage:** 12 V; DUCATI model 40.35.50.91.00 alternator

**Battery:** DELTA 6RR4A, capacity 59 Ah.

## TRANSMISSION

**Clutch:** make PITTERI-VIOLINI model F 187.1, single dry plate type; diameter 190 mm; pedal operated.

**Gearbox:** own make; mechanical; 6 forward speeds and 3 reverse.

**Front and rear axle and final transmission:** own make, model Universal; differential with crown wheel, pinion and gear final drives. Foot-pedal operated differential lock on two axles.

The front and rear axle are coupled by an universal joint.

**Oil capacities:** gearbox and final front transmission 8.9 liters; final rear transmission 5.2 liters.

Recommended oil change period 1000 working hrs.

| Gear | Number of engine revolutions for one revolution of driving wheel | Theoretical travelling speed for 3000 rev/min rated speed of engine Km/h |
|---|---|---|
| 1st | 351.713 | 1.11 |
| 2nd | 159.045 | 2.44 |
| 3rd | 98.827 | 3.95 |
| 4th | 64.573 | 6.03 |
| 5th | 29.193 | 13.35 |
| 6th | 18.141 | 21.49 |
| 1st R | 260.515 | 1.50 |
| 2nd R | 117.808 | 3.31 |
| 3rd R | 73.208 | 5.32 |

## POWER TAKE-OFF

**Main:**

— Location: at the rear of tractor, central position, hand lever operated

— Dimensions: 34.8 x 28.9 x 8.6 mm (1.3/8 in.) (DIN 9611-ASAE S. 203.6) 6 spline.
— Height above ground: 408 mm
— Speeds proportional at engine speed: two,
551 or 911 rev/min at 3000 rev/min rated engine speed
2941 or 3292 engine rev/min at 540 or 1000 rev/min p.t.o. speeds
Direction of rotation: clockwise viewed from tractor rear.
— Speed proportional to travelling speed
one p.t.o. revolution for 0.14 m
15.02 p.t.o. revolution for one revolution of driving wheels
Direction of rotation: clockwise in forward speeds; anti-clockwise in reverse speeds.

**Accessory:**

— Location: at the rear of the tractor, central position under the main p.t.o., hand lever operated.
— Dimensions: 30 x 26 x 6 mm, 6 spline
— Height above ground: 326 mm
— Speeds proportional at engine speed: two,
551 or 911 rev/min at 3000 rev/min rated engine speed.
2941 or 3292 engine rev/min at 540 or 1000 rev/min p.t.o. speeds.
Direction of rotation: anti-clockwise viewed from tractor rear.
— Speeds proportional to travelling speed:
one p.t.o. revolution for 0.14 m
15.02 p.t.o. revolution for one revolution of driving wheels.
Direction of rotation: anti-clockwise in forward speeds, clockwise in reverse speeds.

**Facultative:**

— Location: front p.t.o. central position, under the gearbox
— Dimensions: 25 x 21 x 5 mm, 6 spline.
— Height above ground: 268 mm.
— Speeds proportional at engine speed: two,
441 or 729 rev/min at 3000 rev/min rated engine speed.
Direction of rotation: clockwise viewed from tractor rear.

## BELT PULLEY

None fitted.

## POWER LIFT

— Own make, model Universal

— Hydraulic system: a gear pump driven from front of engine supplying oil at a pressure of 100 Kg/cm² to two ram cylinders.
These two cylinders move three point linkage on which are attached the implements.
Oil capacity: 4.7 liters
Vertical displacement of the hitch point 515 mm, starting from 35 mm above ground level.

## DRAWBAR

— Holed drawbar swinging connected in three point linkage.
— Height above ground: continous adjustement front 35 to 550 mm above ground level.
— Distance from rear axle: maximum 680 mm; lateral adjustment 180 mm.
— Pivot connection position to rear wheels center: horizontal distance 110 mm, vertical distance 110 mm.

## HITCH

— Clevis type adjustable in two position.
— Height above ground of the centre of the clevis: 242 or 506 mm.
— Distance from rear axle: 350 mm.
— Position referred to the principal power take-off: vertical distance 166 or 98 mm; horizontal distance: 20 mm.

## STEERING

— Own make; mechanical type working on the centre, pivot of the tractor by mean of: steering wheel, worm gear box, connecting rod.

## BRAKES

— Own make; mechanical expanding shoe brakes mounted on front and rear axle: operated by a single pedal for normal braking action (on rear axle) and by a hand lever with ratched for parking (on front axle).

## DRIVE WHEELS

— Two at front and two at rear; tyres « Tractor agricolo » 6.00-16, 4 ply pneumatic - Maximum permissible weight on each tyre: 350 Kg at 1.3 Kg/cm² internal air pressure (optional: tyres « Tractor agricolo » 7.50-16, 4 ply pneumatic - maximum permissible weight on each tyre:

485 Kg at 1.2 Kg/cm² internal air pressure).

— Track width 634 - 744 - 816 and 926 mm, changed by reversing wheel centres.

— Wheelbase: 1050 mm.

## TRACTOR WEIGHTS

(with fuel full tank, oil, no driver)

| | On front wheels Kg | On rear wheels Kg | Total Kg |
|---|---|---|---|
| Without ballast . . . | 484 | 262 | 746 |
| With maximum ballast . | 544 | 322 | 866 |

Ballast: four, 30 Kg each, one for wheels.

## SEAT

— Own make, elastic rubber mounting; Range of adjustments: 50 mm

## NUMBER OF GREASE POINTS: 4

## OVERALL DIMENSIONS

| | Overall lenght m | Overall width m | Overall height m |
|---|---|---|---|
| Without ballast . . . | 2.69 | 0.79-0.90-0.97-1.08 | 1.07 (1) |
| With maximum ballast . | 2.69 | 0.93-0.93-0.97-1.08 | 1.07 (1) |

(1) to top of steering wheel.

Minimum ground clearance: 0,21 m to bottom of rear frame.

## LIGHTING

| | Height above ground of centre cm | Diameter cm | Distance of centre from outside edge of tractor cm |
|---|---|---|---|
| Headlights . . . . . | 71 | 10.5 | 36 (1) |
| Side lights . . . . . | 76 | 7x6.5 | 17 (1) |
| Rear lights . . . . . | 72 | 7x6.6 | 13 (1) |
| Reflectors . . . . . | 67 | 5x4.5 | 11 (1) |

(1) with overall width of 0,97 m.

## FUEL AND LUBRICANTS USED IN TESTS

**Fuel:** Agricultural diesel oil; density 0.825 Kg/l at 15°C, cetano number: 56.
**Engine oil:** Esso Universal Tractor Oil, SAE 20W/40 - Viscosity index, 121.3
**Transmission oil:** Esso Universal Tractor Oil, SAE 80/90 - Viscosity index, 121.3.

# II - COMPULSORY TEST

### 1) MAIN POWER TAKE-OFF PERFORMANCE

— Date and location of tests: 16th April 1970 - Experimental Centre of Cadriano of the Istituto di Meccanica Agraria - University of Bologna
— Type of dynamometer: Electrical, Type IMABo 65.

| Horse power metric h.p. | Speed | | Fuel consumption | | |
|---|---|---|---|---|---|
| | engine rev/min | p.t.o. rev/min | hourly l/h | specific g/metric h.p.h | h.p.h for unit of volume metric h.p. h/l |
| At maximum power - 2 hours test | | | | | |
| 18.3 | 3001 | 551 | 4.68 | 211 | 3.91 |
| At standard p.t.o. speed (540 ± 10 rev/min) | | | | | |
| 18.2 | 2930 | 538 | 4.76 | 216 | 3.82 |
| At the speed recommended by the manufacturer for drawbar work | | | | | |
| 18.3 | 3001 | 551 | 4.68 | 211 | 3.91 |
| At part loads | | | | | |
| I 16.2 | 3142 | 577 | 4.07 | 207 | 3.98 |
| II 1.6 | 3235 | 594 | 1.75 | 917 | 0.91 |
| III 8.3 | 3202 | 588 | 2.72 | 271 | 3.05 |
| IV 18.3 | 3001 | 551 | 4.68 | 211 | 3.91 |
| V 4.2 | 3235 | 594 | 2.00 | 391 | 2.10 |
| VI 12.2 | 3159 | 580 | 3.42 | 231 | 3.57 |

No. load maximum engine speed: 3235 rev/min
Torque (*) at maximum power: 4.4 m Kg
Maximum torque (*): 5.2 m Kg at 1857 rev/min of the engine

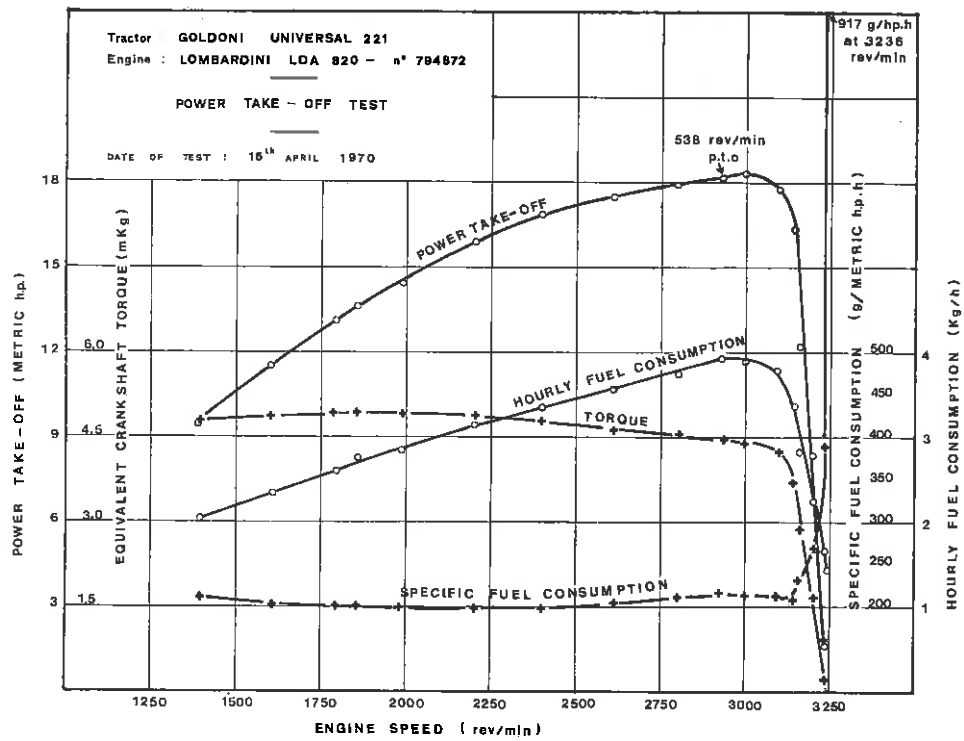
(*) The torque is the equivalent crankshaft torque.

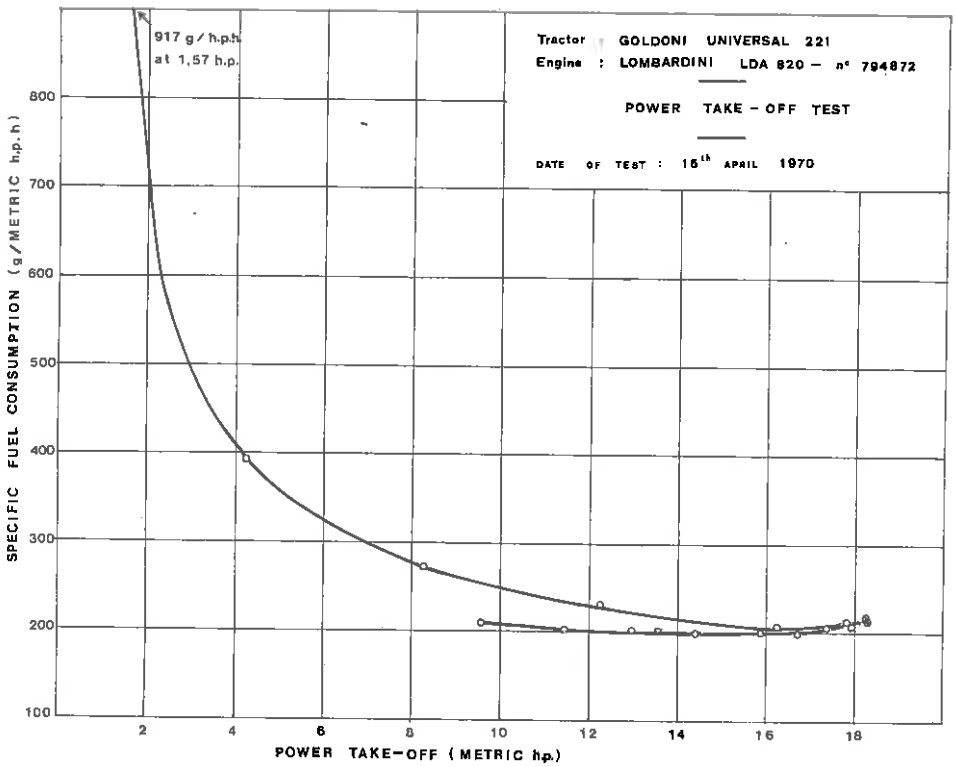
— **Mean atmospheric conditions:**

| | |
|---|---|
| Temperature: | 16.8°C |
| Pressure | 766.5 mm Hg |
| Relative humidity: | 40% |

— **Max. temperature of engine:**

| | |
|---|---|
| Coolant: | 69°C |
| Engine oil: | 86°C |
| Fuel: | 22°C |


Tractor GOLDONI UNIVERSAL 221
Engine : LOMBARDINI LDA 820 – n° 794872
POWER TAKE – OFF TEST
DATE OF TEST : 16th APRIL 1970
917 g/hp.h at 3236 rev/min
538 rev/min p.t.o
POWER TAKE-OFF
HOURLY FUEL CONSUMPTION
TORQUE
SPECIFIC FUEL CONSUMPTION
POWER TAKE-OFF (METRIC h.p.)
EQUIVALENT CRANKSHAFT TORQUE (mKg)
SPECIFIC FUEL CONSUMPTION (g/METRIC h.p.h)
HOURLY FUEL CONSUMPTION (Kg/h)
ENGINE SPEED (rev/min)


917 g/h.p.h at 1,57 h.p.
Tractor GOLDONI UNIVERSAL 221
Engine : LOMBARDINI LDA 820 – n° 794872
POWER TAKE – OFF TEST
DATE OF TEST : 16th APRIL 1970
SPECIFIC FUEL CONSUMPTION (g/METRIC h.p.h)
POWER TAKE-OFF (METRIC h.p.)

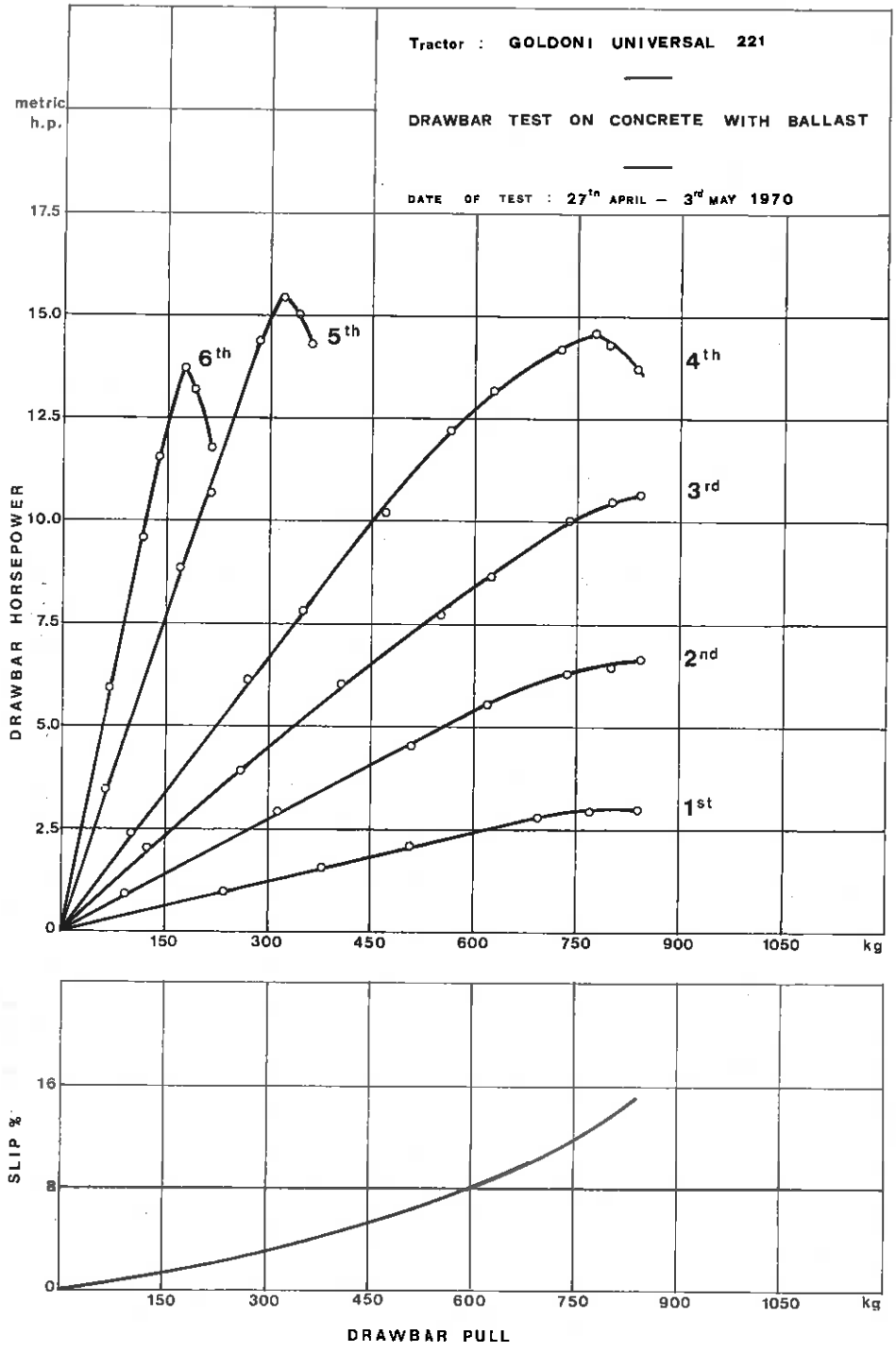
## 2) DRAWBAR PERFORMANCE

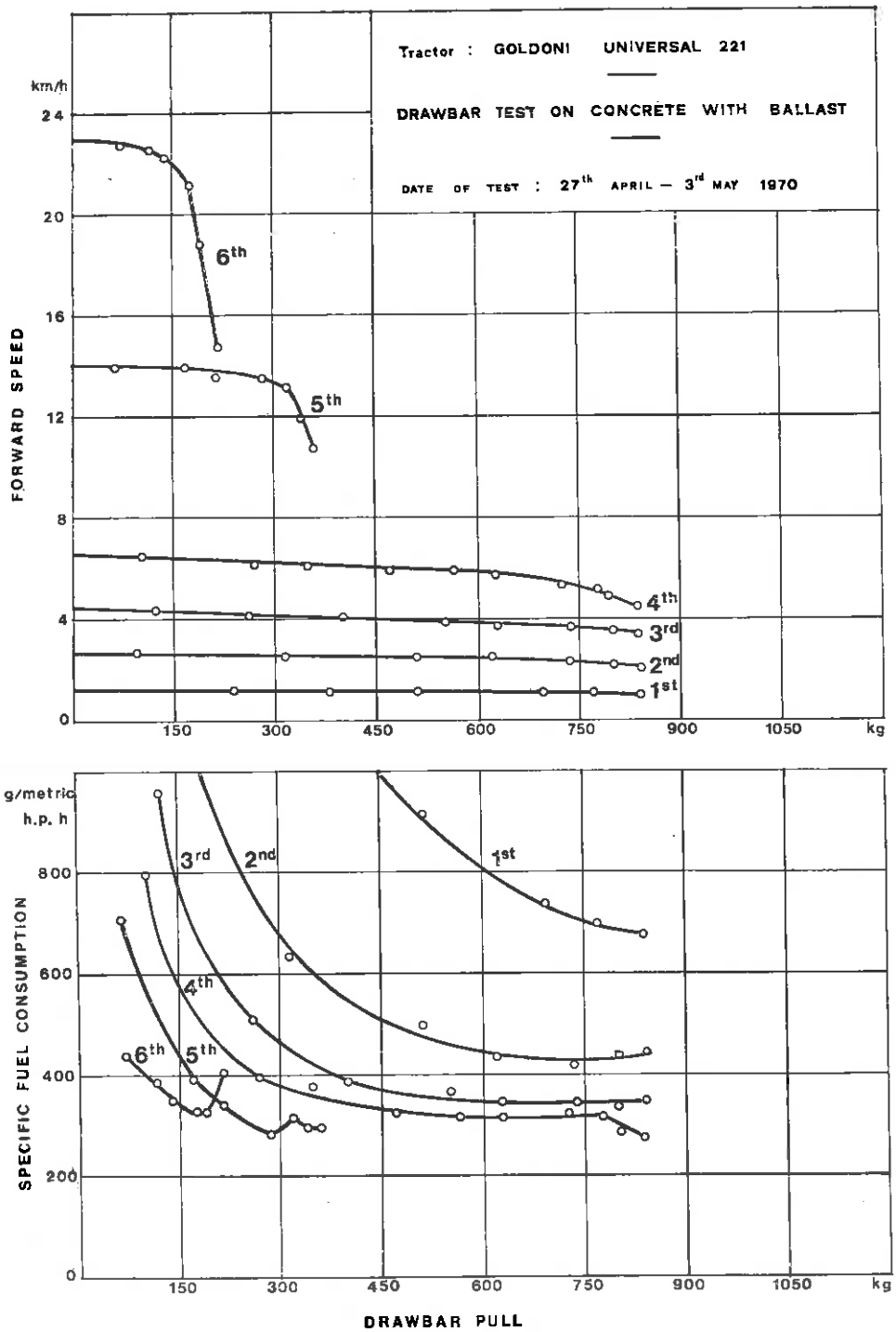
— Date of test: from 27th April to 3rd May 1970
— Type of track: concrete
— Height of drawbar above ground: 242 mm

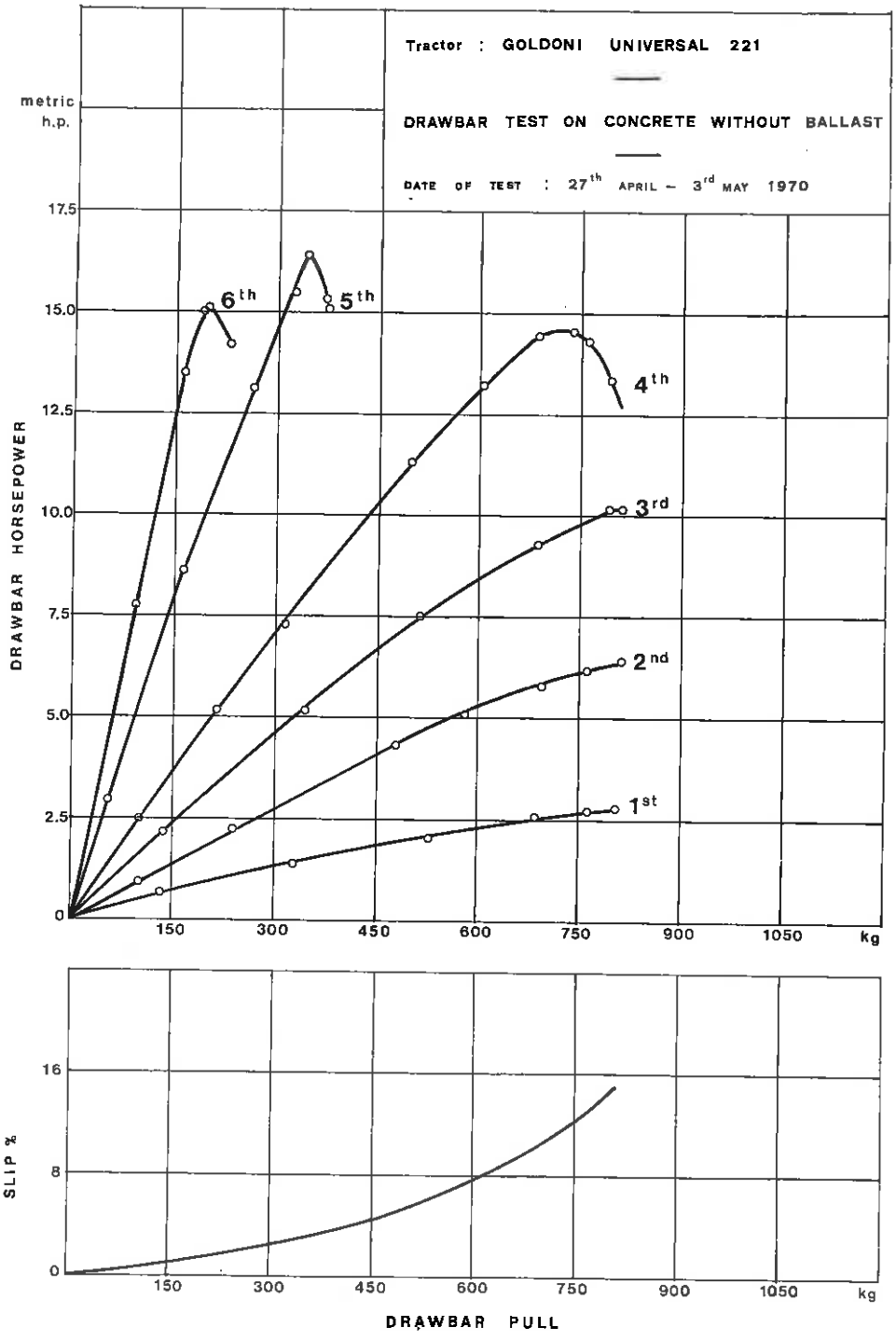
| Gear | Power (metric h.p.) | Drawbar pull (Kg) | Engine speed (rev/min) | Wheel slip % | Fuel consumption | | Temperature °C | | | Atmospheric conditions | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | h.p.h/l | g/h.p.h Specific | Fuel | Cooling air | Engine oil | Temperature ° C | Relative humidity % | Pressure mm Hg |
| I) Maximum power (with ballast) | | | | | | | | | | | | |
| 1st | 3.0 | 840 | 3230 | 15.0 | 1.23 | 672 | 17 | 54 | 68 | 16 | 48 | 760 |
| 2nd | 6.6 | 840 | 3230 | 15.1 | 1.87 | 442 | 17 | 53 | 65 | 16 | 48 | 760 |
| 3rd | 10.7 | 835 | 3200 | 14.8 | 2.32 | 356 | 17 | 54 | 62 | 16 | 48 | 760 |
| 4th | 14.6 | 775 | 3100 | 11.9 | 2.65 | 311 | 17 | 55 | 63 | 16 | 48 | 760 |
| 5th | 15.5 | 320 | 3020 | 2.1 | 2.64 | 313 | 17 | 63 | 63 | 16 | 48 | 760 |
| 6th | 13.7 | 175 | 2995 | 0.8 | 2.50 | 330 | 17 | 63 | 63 | 16 | 48 | 760 |
| II) Five hour test at 75% of pull at maximum power | | | | | | | | | | | | |
| 4th | 6.4 | 287 | 3208 | 2.6 | 2.18 | 378 | 19 | 56 | 58 | 18 | 46 | 762 |
| III) Five hour test at pull corresponding to 15% wheelslip in test I (*) | | | | | | | | | | | | |
| 2nd | 6.7 | 845 | 3225 | 15.2 | 1.85 | 445 | 21 | 50 | 62 | 21 | 45 | 761 |
| IV) Maximum power (without ballast) | | | | | | | | | | | | |
| 1st | 2.8 | 805 | 3235 | 14.9 | 1.10 | 751 | 16 | 58 | 57 | 15 | 48 | 761 |
| 2nd | 6.4 | 810 | 3220 | 15.0 | 1.83 | 452 | 16 | 51 | 57 | 15 | 48 | 761 |
| 3rd | 10.3 | 800 | 3166 | 14.7 | 2.32 | 356 | 25 | 62 | 64 | 25 | 50 | 761 |
| 4th | 14.6 | 740 | 3078 | 12.8 | 2.69 | 307 | 25 | 63 | 70 | 25 | 48 | 761 |
| 5th | 16.4 | 340 | 3046 | 2.1 | 3.01 | 274 | 20 | 64 | 67 | 18 | 52 | 761 |
| 6th | 15.1 | 200 | 3012 | 0.6 | 2.86 | 288 | 20 | 62 | 65 | 19 | 51 | 761 |

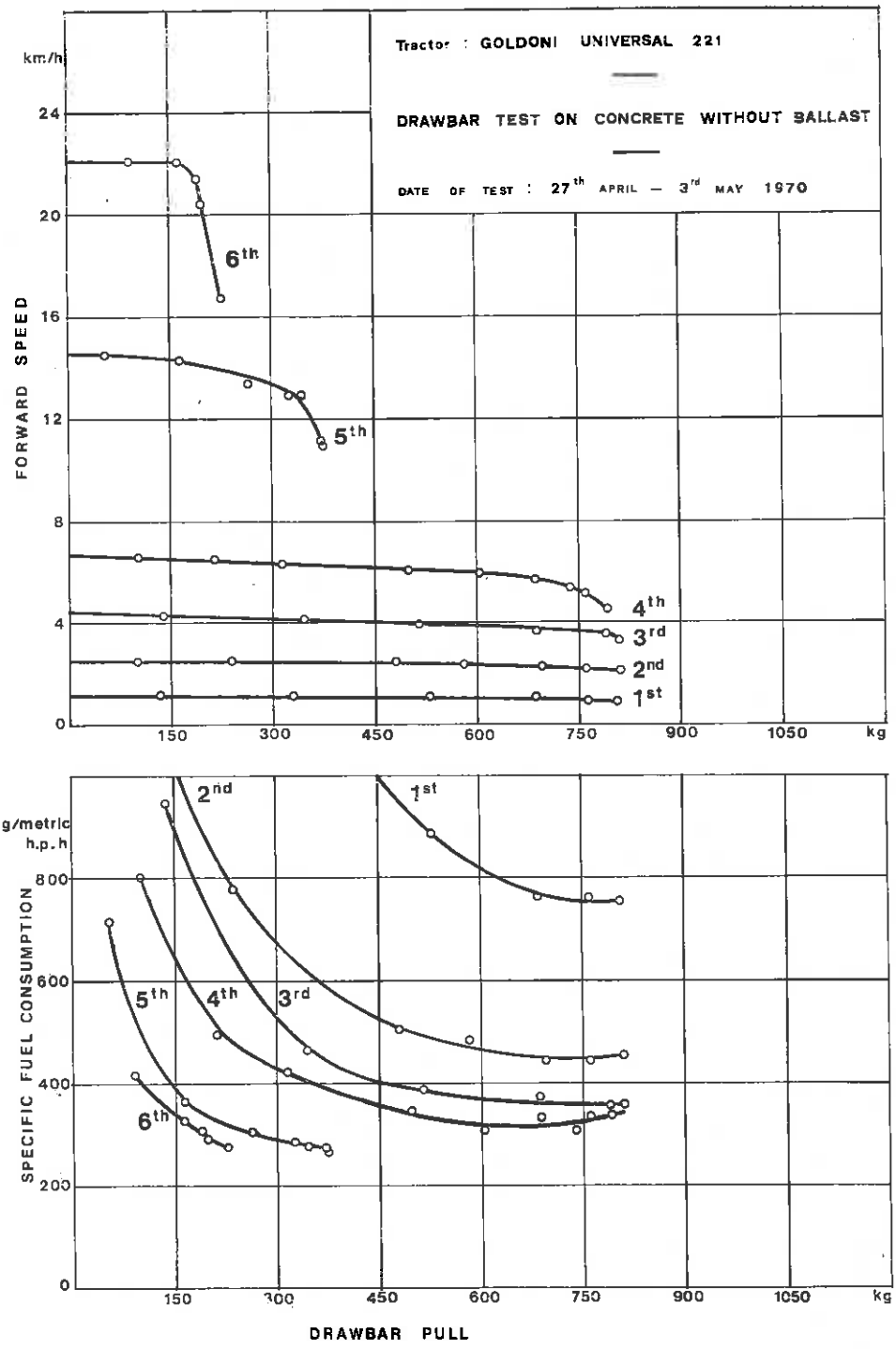
Oil consumption during ten hours duration of test II and III: 11.5 gr/h

(*) Test n. III carried out with 240 Kg ballast.


Tractor : GOLDONI UNIVERSAL 221
DRAWBAR TEST ON CONCRETE WITH BALLAST
DATE OF TEST : 27th APRIL – 3rd MAY 1970
metric h.p.
DRAWBAR HORSEPOWER
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0
6th
5th
4th
3rd
2nd
1st
150
300
450
600
750
900
1050
kg
SLIP %
16
8
0
DRAWBAR PULL


Tractor : GOLDONI UNIVERSAL 221
DRAWBAR TEST ON CONCRETE WITH BALLAST
DATE OF TEST : 27th APRIL – 3rd MAY 1970
FORWARD SPEED
km/h
24
20
16
12
8
4
0
6th
5th
4th
3rd
2nd
1st
150
300
450
600
750
900
1050
kg
SPECIFIC FUEL CONSUMPTION
g/metric h.p. h
800
600
400
200
0
3rd
2nd
1st
4th
6th
5th
150
300
450
600
750
900
1050
kg
DRAWBAR PULL


Tractor : GOLDONI UNIVERSAL 221
DRAWBAR TEST ON CONCRETE WITHOUT BALLAST
DATE OF TEST : 27th APRIL – 3rd MAY 1970
metric h.p.
DRAWBAR HORSEPOWER
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0
6th
5th
4th
3rd
2nd
1st
150
300
450
600
750
900
1050
kg
SLIP %
16
8
0
DRAWBAR PULL


Tractor : GOLDONI UNIVERSAL 221
DRAWBAR TEST ON CONCRETE WITHOUT BALLAST
DATE OF TEST : 27th APRIL – 3rd MAY 1970
km/h
FORWARD SPEED
24
20
16
12
8
4
0
6th
5th
4th
3rd
2nd
1st
150
300
450
600
750
900
1050
kg
g/metric h.p.h
SPECIFIC FUEL CONSUMPTION
800
600
400
200
0
2nd
1st
5th
4th
3rd
6th
150
300
450
600
750
900
1050
kg
DRAWBAR PULL

## 3-4) TURNING SPACE AND TURNING CIRCLE

— Details of wheel equipment: as in specification without ballast; track width, front and rear axles 816 mm.

| | Without brakes | |
|---|---|---|
| | right hand m | left hand m |
| Radius of turning space . . . | 2.28 | 2.34 |
| Radius of turning circle . . . | 2.20 | 2.26 |

No « with brake » test has been carried out since tractor is not provided with steering brakes.

## 5) LOCATION OF CENTRE OF GRAVITY

| | m |
|---|---|
| Height above ground . . . . . | 454 |
| Distance forward from the vertical plane containing the axis of the rear wheels . . . . . | 634 |
| Distance from the median plane of tractor . . . | 0 |

## 6) BRAKING

— Date of test: 18th May 1970 - Cadriano
— Type of track: concrete
— Travelling speed of tractor: 22.5 Km/h

**Cold brakes**

| | | with ballast | without ballast |
|---|---|---|---|
| Deceleration | $m/s^2$ | 7.42 | 7.99 |
| Stopping distance | m | 2.66 | 2.51 |
| Force on brake pedal | Kg | 42 | 45 |

**Brake fade characteristics** (hot tests)

— Deceleration hot/deceleration cold x 100: 94 %
— Stopping distance cold/stopping distance hot x 100: 97 %
— Force on pedal cold/force on pedal hot x 100: 92 %

**Efficacy of parking brake**

— No rotation of the wheels is observed when the tractor is pulled forward or backward with parking brake locked.
Pull on parking brake: cold = 39 Kg; hot = 41 Kg

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

— Date of test: 9th June 1970 - Cadriano
— Type of sound level meter: Brüel and Kjaer, type 2203
— Type of track: concrete

**Results of tests**

— Gear: 6th
— Travelling speed: 17.5 Km/h
— Sound level: 94.2 dBA

## 8) NOISE MEASUREMENT AT THE DRIVER'S EAR LEVEL

— Date of test: 9th June 1970 - Cadriano
— Type of sound level meter and octave filter: Brüel and Kjaer - Types: 2203 and 1613.
— Type of track: concrete
— Type of frequency analyzer: with eleven octave from 31.5 to 31.500 Hz.

**Result of tests**

| Gear | Travelling speed (*) Km/h | Loudness Sones |
|---|---|---|
| 4th | 5.3 | 180 |

(*) The speed relevant to 4th gear is the nearest to 7.25 Km/h.

## 9) POWER LIFT

— Date and location of test: 1th June 1970-Cadriano.
— Hydraulic fluid: Esso Universal Tractor Oil 20 W/40 - Viscosity Index: 121.3.

| | Vertical movement mm | Maximum force exerted through full range Kg | Pressure Kg/cm² |
|---|---|---|---|
| **Linkage giving maximum mechanical advantage** | | | |
| — at lower hitch points (height above ground in down position: 35 mm) . . . . . | 515 | 640 | 98 |
| — at standard frame . . . . . | 640 | 345 | 98 |
| **Linkage giving minimum mechanical advantage** (none fitted) | | | |

— Linkage load at which umballasted front end of tractor lifts off the ground: 765 Kg.
— Type of linkage lock for transport: hydraulic
— Opening pressure of relief valve: 100 Kg/cm².

**Test Engineers**

Dr. Ing. Cesare De Zanche

Dr. Agr. Antonio Marocchi

HEAD OF TRACTOR TEST CENTRE
Prof. Dr. Giorgio Casini - Ropa

DIRECTOR OF ISTITUTO
OF MECCANICA AGRARIA
UNIVERSITY OF BOLOGNA
Prof. Ing. Enzo Manfredi

Bologna, 6th July 1970

TIP.PEDRAZZINI-FABBRICO-TEL.95822