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

No. 341 / O. E. C. D.

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

GOLDONI UNIVERSAL 218

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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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 218
— Type: four wheels drive, articulated steering frame.
— Serial no. 42202

ENGINE

— Make: Lombardini S.p.A. Reggio Emilia - Italy
— Model: LDA 100
— Type: direct injection diesel
— Serial no. 733364

Cylinders: one cylinder, vertical; bore 100 mm; stroke 90 mm; total capacity: 707 cm^3; compression ratio: 17; 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 70/302, serial no. 0 414 171 020; manufacturer's production setting for injection pump 52 mm^3 for cycle at fuel temperature 15°C. BOSIO injection nozzles model BLL-160 SL 100; 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 6183-3701-41 oil bath type with cyclone pre-cleaner Fispa 2071.01; oil capacity: 0.3 liters; flow: 1600 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 JD (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 from 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 . . .	503	250	753
With maximum ballast .	563	310	873

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	7 x 6.5	17 (1)
Rear lights	72	7 x 6.6	13 (1)
Reflectors	67	5 x 4.5	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, cetane 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: 4th 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					
15.6	3007	552	4.20	223	3.71
At standard p.t.o. speed (540 ± 10 rev/min)					
15.4	2952	542	4.07	218	3.78
At the speed recommended by the manufacturer for drawbar work.					
15.6	3007	552	4.20	223	3.71
At part loads.					
I 13.8	3137	576	3.64	217	3.79
II 1.5	3328	611	1.89	1020	0.79
III 7.2	3230	593	2.33	267	3.09
IV 15.6	3007	552	4.20	223	3.71
V 3.6	3268	600	2.18	503	1.65
VI 10.6	3181	584	2.98	231	3.56

No. load maximum engine speed: 3328 rev/min
Torque (*) at maximum power: 3.7 m Kg
Maximum torque (*): 4.4 m Kg at 1825 rev/min of the engine.

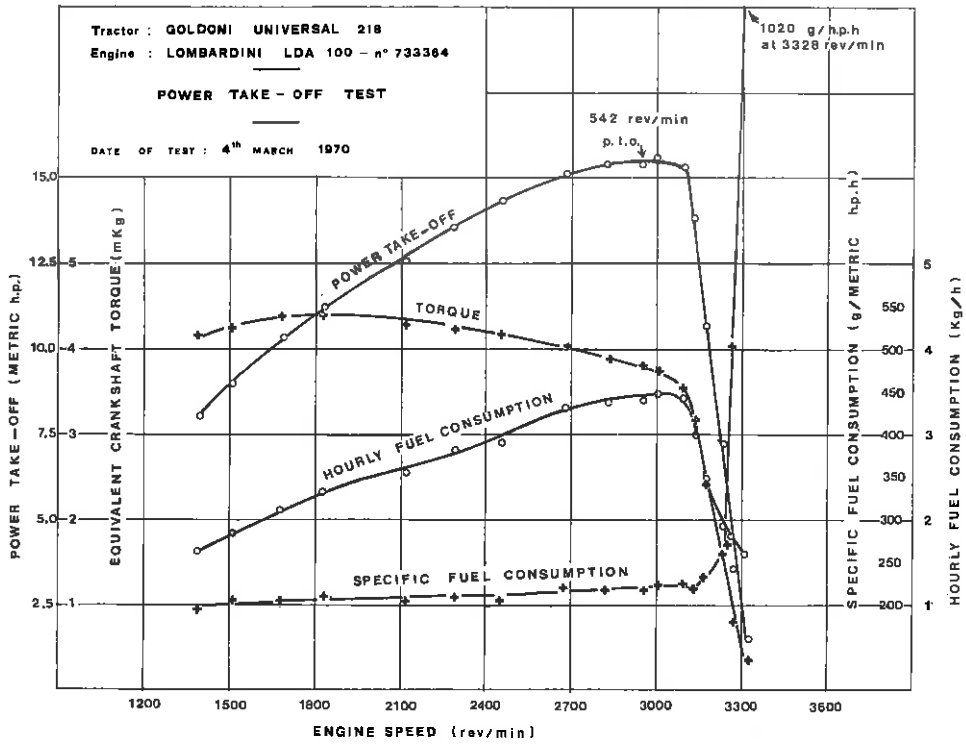
— **Mean atmospheric conditions:**

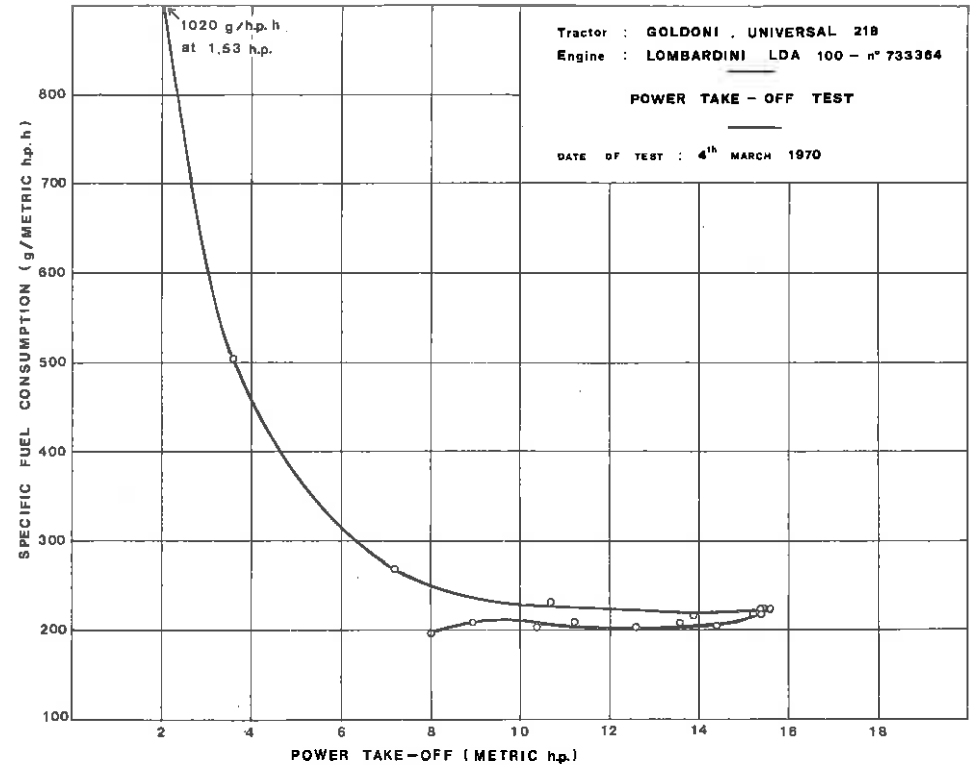
Temperature: 20.7°C
Pressure: 746 mm Hg
Relative humidity: 38%

— **Max. temperature of engine:**

Coolant: 85° C
Engine oil: 77° C
Fuel: 18° C

(*) The torque is the equivalent crankshaft torque


Tractor : GOLDONI UNIVERSAL 218
Engine : LOMBARDINI LDA 100 – n° 733364
POWER TAKE – OFF TEST
DATE OF TEST : 4th MARCH 1970
1020 g/h.p.h at 3328 rev/min
542 rev/min p.t.o.
POWER TAKE-OFF
TORQUE
HOURLY FUEL CONSUMPTION
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)


1020 g/h.p.h at 1,53 h.p.
Tractor : GOLDONI . UNIVERSAL 218
Engine : LOMBARDINI LDA 100 – n° 733364
POWER TAKE – OFF TEST
DATE OF TEST : 4th MARCH 1970
SPECIFIC FUEL CONSUMPTION (g/METRIC h.p.h)
POWER TAKE-OFF (METRIC h.p.)

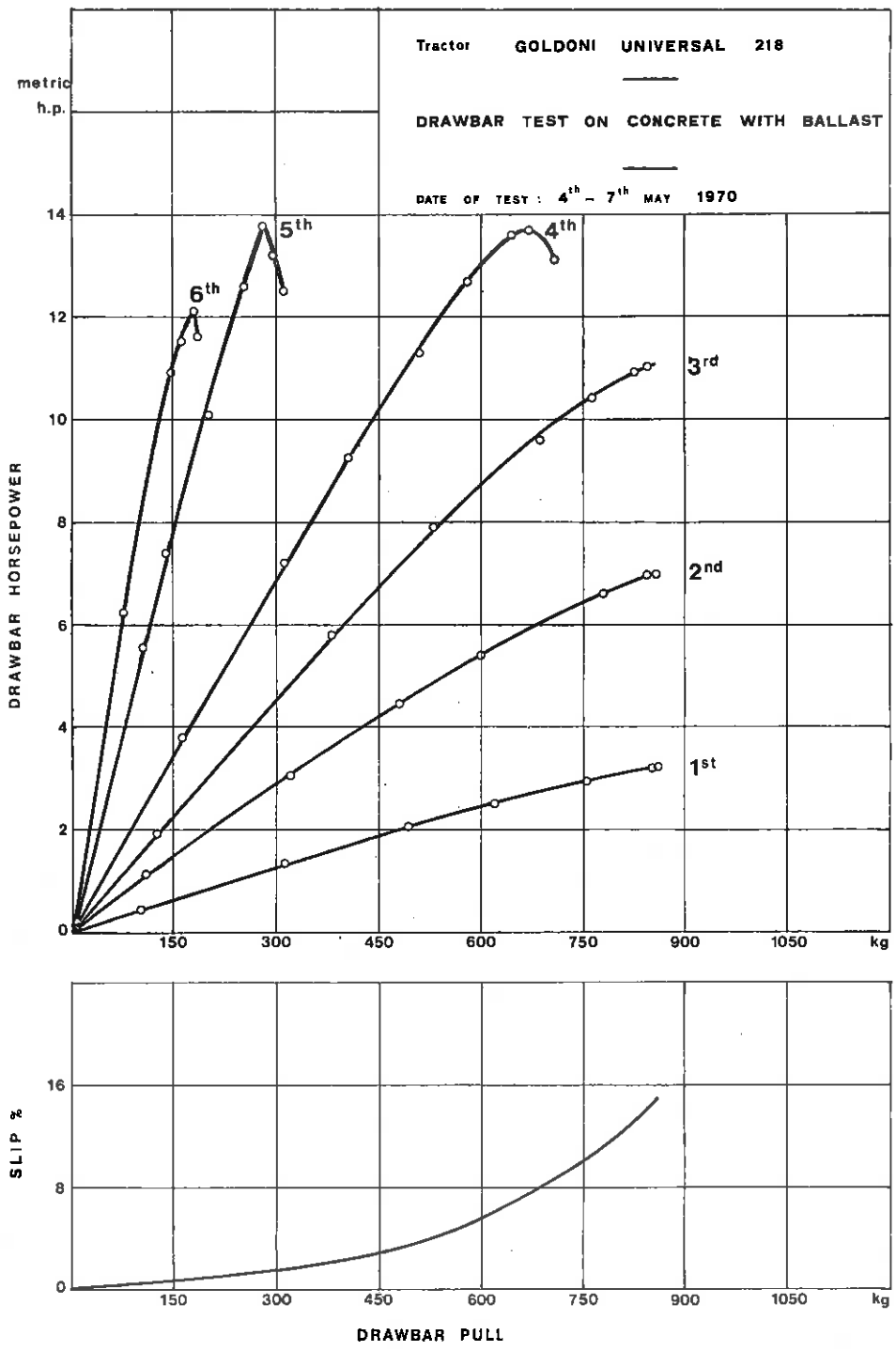
2) DRAWBAR PERFORMANCE

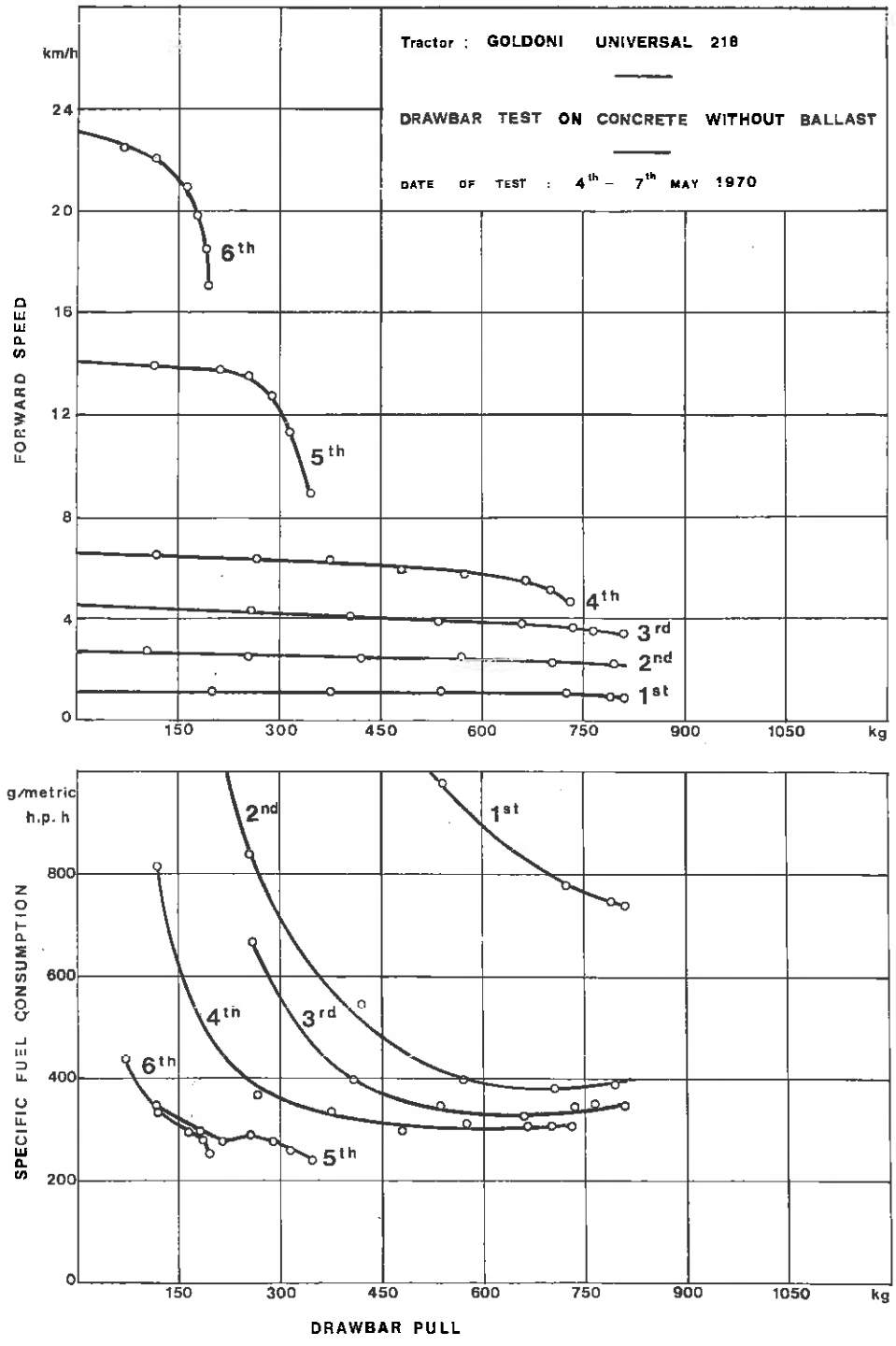
— Date of test: from 4th May to 7th May 1970
— Type of track: concrete.
— Height of drawbar above ground: 242 mm.

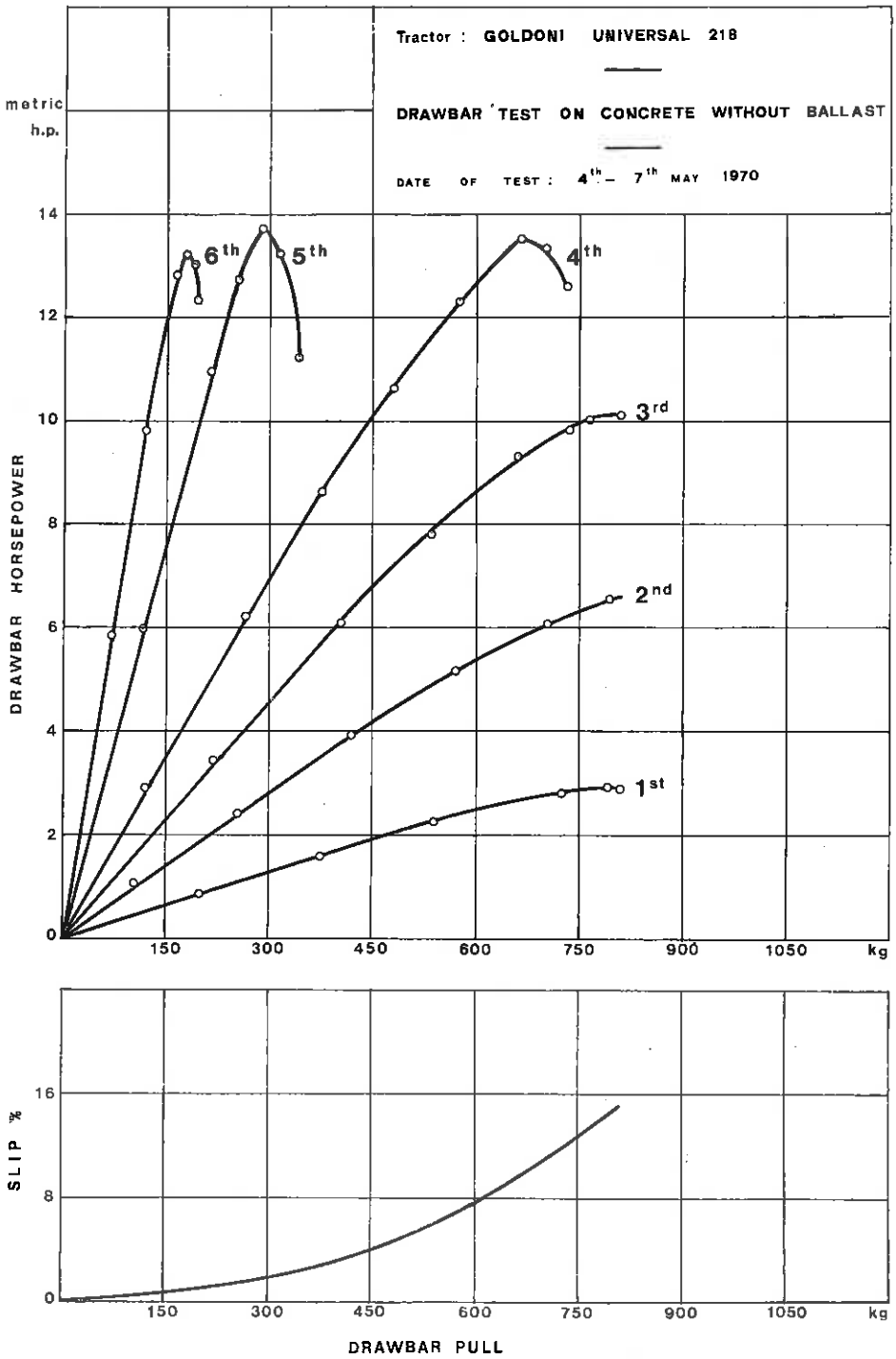
Gear	Power (metric h.p.)	Drawbar pull (Kg)	Engine speed (rev/min)	Wheel slip %	Fuel consumption		Temperature °C			Atmospheric conditions		
					h.p.h /l	Specific g/h.p.h	Fuel	Cooling air	Engine oil	Temperature °C	Relative humidity	Pressure mm Hg
I) Maximum power (with ballast)												
1st	3.2	860	3268	15.0	1.24	668	19	34	60	18	47	765
2nd	6.9	845	3248	14.9	2.12	389	19	45	63	18	47	765
3rd	11.0	845	3204	14.8	2.75	300	19	43	63	18	47	765
4th	13.7	670	3051	7.1	2.58	320	22	54	58	21	36	763
5th	13.8	280	3038	1.2	2.67	309	22	55	60	21	36	763
6th	12.1	180	2980	0.3	2.80	295	22	55	60	21	36	763
II) Five hour test at 75% of pull at maximum power												
4th	5.2	225	3251	0.9	1.79	462	23	52	55	21	46	764
III) Five hour test at pull corresponding to 15% wheelslip in test I (*)												
2nd	7.0	850	3260	14.4	2.18	378	20	48	64	19	46	764
IV) Maximum power (without ballast)												
1st	2.9	790	3286	14.7	1.10	749	23	36	54	22	36	760
2nd	6.5	795	3268	14.8	2.13	388	23	38	57	22	36	760
3rd	10.1	810	3221	15.0	2.38	347	17	40	60	16	48	758
4th	13.5	665	3088	9.4	2.67	309	17	40	60	16	48	758
5th	13.7	290	3037	1.8	3.00	275	17	40	60	16	48	758
6th	13.2	180	2970	0.5	2.79	296	17	40	60	16	48	758

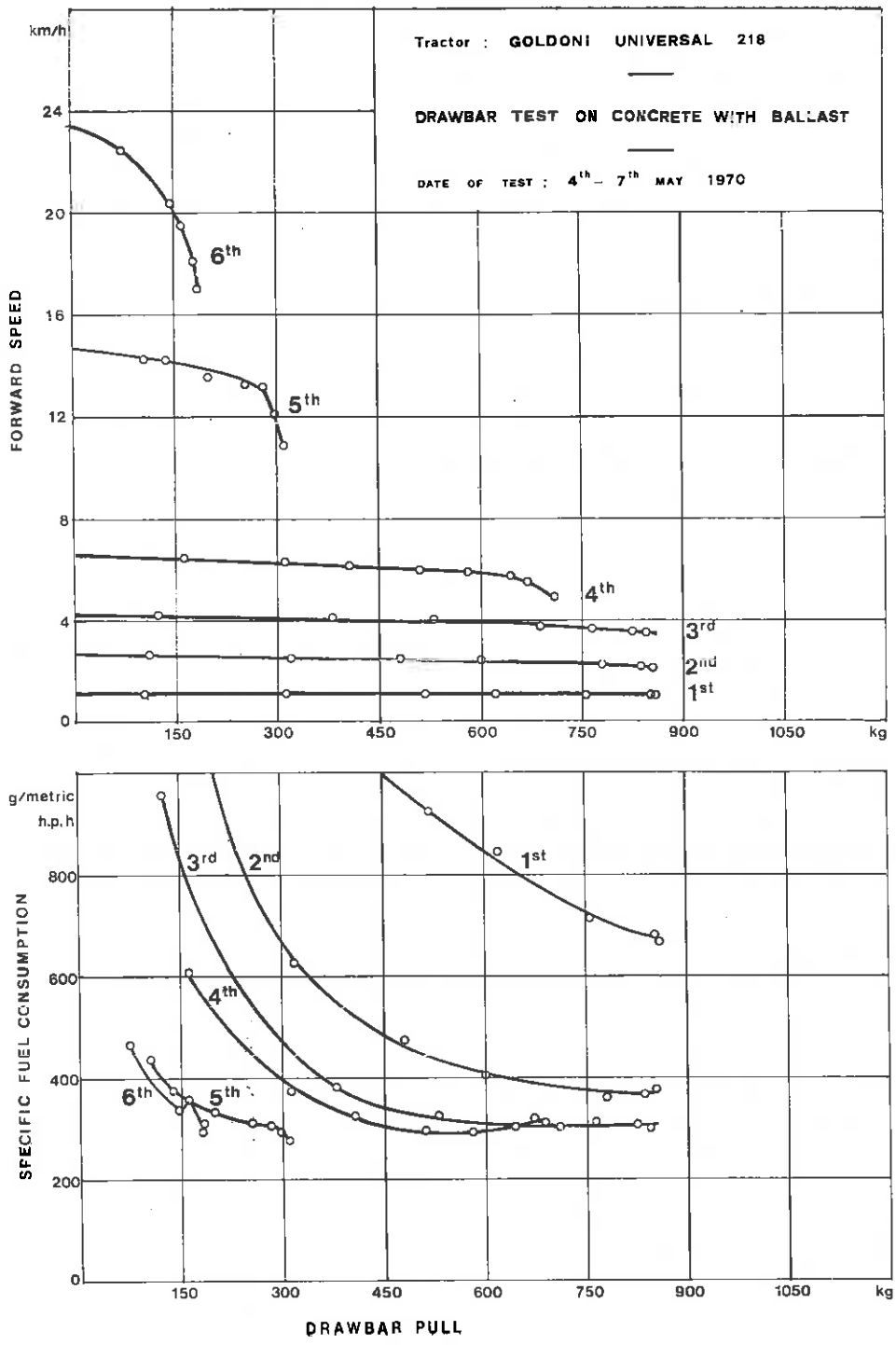
Oil consumption during ten hours duration of test II and III: 9.0 gr/h

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


Tractor GOLDONI UNIVERSAL 218
DRAWBAR TEST ON CONCRETE WITH BALLAST
DATE OF TEST : 4th – 7th MAY 1970
metric h.p.
DRAWBAR HORSEPOWER
6th
5th
4th
3rd
2nd
1st
0
2
4
6
8
10
12
14
150
300
450
600
750
900
1050
kg
SLIP %
0
8
16
150
300
450
600
750
900
1050
kg
DRAWBAR PULL


Tractor : GOLDONI UNIVERSAL 218
DRAWBAR TEST ON CONCRETE WITHOUT BALLAST
DATE OF TEST : 4th – 7th 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
2nd
1st
4th
3rd
6th
5th
DRAWBAR PULL


Tractor : GOLDONI UNIVERSAL 218
DRAWBAR TEST ON CONCRETE WITHOUT BALLAST
DATE OF TEST : 4th – 7th MAY 1970
metric h.p.
DRAWBAR HORSEPOWER
6th
5th
4th
3rd
2nd
1st
0
2
4
6
8
10
12
14
150
300
450
600
750
900
1050
kg
SLIP %
0
8
16
DRAWBAR PULL


Tractor : GOLDONI UNIVERSAL 218
DRAWBAR TEST ON CONCRETE WITH BALLAST
DATE OF TEST : 4th – 7th 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
3rd
2nd
1st
4th
6th
5th
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

	mm
Height above ground	439
Distance forward from the vertical plane containing the axis of the rear wheels	652
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: 95.4 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	5.7	184

(*) 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: 794 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, 13th July 1970

TIP.PEDRAZZINI•FABBRICO•TEL.95822