COMITATO PER L'OMOLOGAZIONE
DELLE MACCHINE AGRICOLE

562
No. 531/O.E.C.D.

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

GOLDONI 828



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

Date of tests: March - May 1976

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

This bulletin is based on engineering tests in accordance with the O.E.C.D. STANDARD CODE for the Official Testing of Agricultural Tractors. It does not contain an evaluation of the performance of the tractor on practical work.

This report has been approved by the O.E.C.D. Coordinating Center (C.N.E.E.M.A., France) as being in accordance with the O.E.C.D. Standard Code.

Date of Approval: 25th August 1976

Serial No.: 531

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

Equivalences

Forces:	1 N	= 0.102 kp	or	1 kp	= 9.81	N
Powers:	1 kW	= 1.36 h.p.	or	1 h.p.	= 0.736	kW
Pressures:	1 bar	= 1.02 kp/cm^2	or	1 kp/cm^2	= 0.981	bar
Angular velocity:	1 rad/s	= 9.554 rev/min	or	1 rev/min	= 0.1047	rad/s

GOLDONI 828 TRACTOR

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Tractor manufacturer:	GOLDONI S.p.A. Migliarina di Carpi (Modena)
Submitted for test by:	Manufacturer
Selected by:	Manufacturer with the agreement of Istituto di Meccanica agraria - University of Bologna
Place of running-in:	GOLDONI S.p.A. workshop, Migliarina di Carpi
Duration of running-in:	80 hrs for engine, 30 hrs for the tractor

SPECIFICATION OF TRACTOR

Tractor

Make:	GOLDONI S.p.A.
Model:	828
Type:	Wheeled tractor, unit construction, rear wheel driven
Serial No:	113050

Engine

Make:	LOMBARDINI S.p.A. - Reggio Emilia
Model:	904
Type:	Four-stroke direct injection Diesel
Serial No:	1295796
Cylinders:	2 vertical, dry, in line; bore 90 mm, stroke 94 mm, total capacity 1196 cm^3; compression ratio 17.8; overhead valves
Fuel system:	Forced with diaphragm pump CORONA BCD 1772; FIAAM IN 4746 replaceable paper cartridge-type filter; recommanded filter change period 300 hrs BOSCH PFR 2 K 70 injection pump, manufacturer's production setting for injection pump 37 mm^3 for stroke at 314.1 rad/s (3000 rev/min) of engine; OMAP OLL 160 injection nozzles, injection pressure 196-206 bar (200-210 kp/cm^2); capacity of fuel tank 10 l
Governor:	LOMBARDINI mechanical type with centrifugal weights governed range of engine speeds 104.7 - 329.9 rad/s (1000-3150 rev/min); rated engine speed 314.1 rad/s (3000 rev/min)

Air cleaner:	LOMBARDINI-9043702-55 oil filter with cyclone pre-cleaner; flow 800 l/min
Lubrication system:	LOMBARDINI forced feed from lobe-type pump; sieve filter in suction and paper cartridge replaceable filter FIAAM FT 4756 at delivery; oil capacity 3 l; recommended oil: AGIP F 1 DIESEL SIGMA SAE 40 (summer) and SAE 20 or 10 (winter) or another conforming MIL L 2104 Supp.1; recommended oil change period 100 hrs; recommended filter change period 200 hrs
Cooling system:	Air forced with 10 blades flywheel axial impeller; flywheel diameter 189.5 mm; flow 1550 m^3/h at 314.1 rad/s (3000 rev/min) of engine
Starting system:	Solenoid engaged BOSCH CFO-0314, 12 V, 1.1 kW motor; low temperature starting aid: manual operated fuel supplementary ratio device on injection pump
Electrical equipement:	12 V; DUCATI 4035025100 alternator, 240 VA; one battery, capacity 92 Ah

Transmission

Clutch:	PITTERI and VIOLINI F 187.2; single dry plate type diameter 187 mm; pedal operated
Gear box:	Own make, mechanical; sliding gear countershaft change gear with 3 gear and one group gear with 2 forward and 1 reverse gear. Total: 6 forward and 3 reverse speeds selected by means of 2 hand levers
Rear axle and final transmission:	Own make model 800; differential operated by level gear (ratio 1:4.778) and bull gears final drives (ratio 1:3.385). Hand operated differential lock manual disengaging
Oil capacities:	Gear box and transmission 8.9 l; recommended oil change period: 1000 working hrs; recommended oil: ESSO GEAR OIL CZ 90 SAE 80/90 or amother conforming MIL L 2104 Supp. 1

Total ratios and speed

Gear	No of engine revolution for one revolution of driving wheels	Theoretical travelling speed for 314.1 rad/s rated speed of engine	
		m/s	km/h
1st lower	373.751	0.37	1.35
2nd lower	169.009	0.83	2.98
3rd lower	112.994	1.24	4.45
1st high	69.535	2.01	7.23
2nd high	31.443	4.44	15.99
3rd high	21.022	6.65	23.92
1st reverse	284.763	0.49	1.77
2nd reverse	128.769	1.08	3.91
3rd reverse	86.091	1.62	5.84

Calculated with the tyre rolling circumference of 2794 mm in accordance to tyre manufacturer's specification

Power take-off (All indipendents)

Main p.t.o.: Located at the rear of tractor, central position;
height above ground 510 mm;
dimensions 34.8x27.9x8.6 mm (1.3/8", ISO R 500), 6 splines;
hand lever engaged.

Speeds proportional at engine speed:
two, 58.4 or 92.0 rad/s (558 or 879 rev/min) at 314.1 rad/s (3000 rev/min) rated engine speed;
303.9 or 193.0 rad/s (2903 or 1843 rev/min) of engine at p.t.o. 56.5 rad/s (540 rev/min).
Direction of rotation, clockwise viewed from tractor rear.

Speeds proportional to travelling speed:
one, one p.t.o. revolution for 0.17 m;
16.2 p.t.o. rev/min for one revolution of driving wheels.
Direction of rotation, clockwise in forward speeds, anti-clockwise in reverse speed

Facultative p.t.o.: Located under the gear box, central position;
height above ground 385 mm;
dimensions 25x21x5 mm, 6 splines;
hand lever engaged.
Speeds proportional at engine speed:
two, 46.7 or 73.6 rad/s (446 or 703 rev/min) at 314.1 rad/s (3000 rev/min) rated engine speed.
Direction of rotation: anti-clockwise viewed from tractor front

Power lift:	Own make; hydraulic power line in disintegrated construction; floating position, no controls; two single acting rams, 45 mm bore, 145 mm stroke; SALAMI 2 PA 6.2/S hydraulic pump directly driven by engine; maximum pressure 100 bar (102 kp/cm^2); oil capacity 4.7 l (2 oil tapping for two remote ram optional, non fitted on tractor tested)
Three point linkage:	In special non unificated construction (cat 1N - proposal ISO, tab 730 II); balls of link acc. to ISO I cat. Lifting rods lenght: 515 mm; lift height above ground from 202 to 712 mm
Holed drawbar:	Fitted on clevis of lower links; lenght between the ball joints 415 mm; thickness of holed bar 25 mm, width 65 mm; 7 holes, diameter 20 mm. Height above ground level adjustable from 202 to 712 mm. Distance of centre hole: to rear axle centre 735 mm; to end of p.t.o. - shaft 315 mm
Hitch:	Own make; height above ground 260 or 340 mm; adjustable by shifting hitch; diameter of clevis hole 28 mm; distance to rear axle centre 455 mm; distance referred to the main p.t.o. - shaft: horizontal 45 mm, vertical 2 position, 165 or 245 mm (under)
Steering:	Own make; mechanical type worm and sector steering; operated by hand wheel
Brakes:	Own make. Foot brakes: mechanically operated internal shoe type brake acting on 2 brake drums in the rear wheels; pedal operated. Parking brake: mechanically operated internal shoe type brake acting the same brake drums in the rear wheels; operated by hand lever with ratchet. Steering brake: divided pedal of foot brake; for normal use locked together

Wheels

Steering: 2 in front 4.00-15, 4 p.r. diagonal pneumatic;
max. permissible weight on each tyre 300 kg at 3.2 bar internal air pressure;
track width 950 or 1050 mm; changeable by turning wheels

Driving: 2 at rear 9.5 R 20, 4 p.r. radial pneumatic;
max. permissible weight on each tyre 650 kg at 1.3 bar internal air pressure;
track width 840 or 1010 mm; changeable by turning wheels rims;
wheelbase 1400 mm

Masses: With full fuel tank, oil; ballast no fitted

No driver			With driver		
on front wheels (kg)	on rear wheels (kg)	total (kg)	on front wheels (kg)	on rear wheels (kg)	total (kg)
410	460	870	415	530	945

Seat: Own make;
elastic rubber mounting;
range of adjustement 50 mm, fore and aft in median plane of tractor

Number of grease points: (whole tractor) 4

Overall dimensions: Lenght 2.35 m (with three points linkage 2.62 m)
Width 1.08 or 1.25 m
Height 1.24 m (to top of steering wheel) 1.50 m (to top of exhaust pipe)
Maximum ground clearance 0.19 m (to hitch)

Lighting:

	Height above ground of centre cm	Diameter cm	Distance of centre from outside edge of tractor cm
Headlights	91	11.5x11.5	41 (1)
Side lights	88	5.5x 7.5	33.5 (1)
Rear lights	91	6 x 7	19 (1)
Reflectors	99.5	5 x 4	7.5 (1)

(1) With track width of 1.01

Fuel and lubricants used in test

Fuel:	Agricultural Diesel oil; density 15°C: 0.825 kg/l cetane number: 69
Engine oil:	AGIP F 1 DIESEL SIGMA SAE 20 viscosity index 95
Transmission oil:	ESSO GEAR OIL CZ 90 SAE 80/90 viscosity index: 95
Hydraulic fluid:	ESSO NUTO H 54 viscosity index: 95

COMPULSORY TEST

1) MAIN POWER TAKE-OFF PERFORMANCE

Date and location of test: 3rd March 1976 - Experimental Centre of Cadriano - University of Bologna

Type of dynamometer: Electrical, type I.M.A. Bo 65

Power kW (metric h.p.)	Speed: engine rad/s (rev/min)	Speed: p.t.o. rad/s (rev/min)	Fuel consumption: hourly l/h	Fuel consumption: hourly kg/h	Fuel consumption: specific g/kWh (g/h.p.h)	Fuel consumption: kWh for liter kWh/l (h.p.h/l)
At maximum power 2-hours test						
17.87 (24.30)	315.2 (3010)	58.6 (560)	6.00	4.95	277 (204)	2.98 (4.05)
At standard p.t.o. speed 56.5 ± 1 (540 ± 10 rev/min)						
17.84 (24.26)	302.8 (2892)	56.3 (538)	5.96	4.92	276 (203)	2.99 (4.07)
At the speed recommanded by the manufacturer for drawbar work						
17.87 (24.30)	315.2 (3010)	58.6 (560)	6.00	4.95	277 (204)	2.98 (4.05)
At part loads						
I) 15.38 (20.91)	318.1 (3037)	58.7 (565)	5.24	4.32	281 (207)	2.93 (3.98)
II) -	332.0 (3170)	61.8 (590)	1.96	1.62	-	-
III) 7.81 (10.62)	323.1 (3085)	60.1 (574)	3.35	2.76	354 (260)	2.33 (3.17)
IV) 17.87 (24.30)	315.2 (3010)	58.6 (560)	6.00	4.95	277 (204)	2.98 (4.05)
V) 4.02 (5.47)	324.2 (3096)	60.3 (576)	2.33	1.92	478 (351)	1.73 (2.35)
VI) 12.13 (16.50)	320.1 (3064)	59.7 (570)	4.29	3.54	292 (215)	2.83 (3.85)

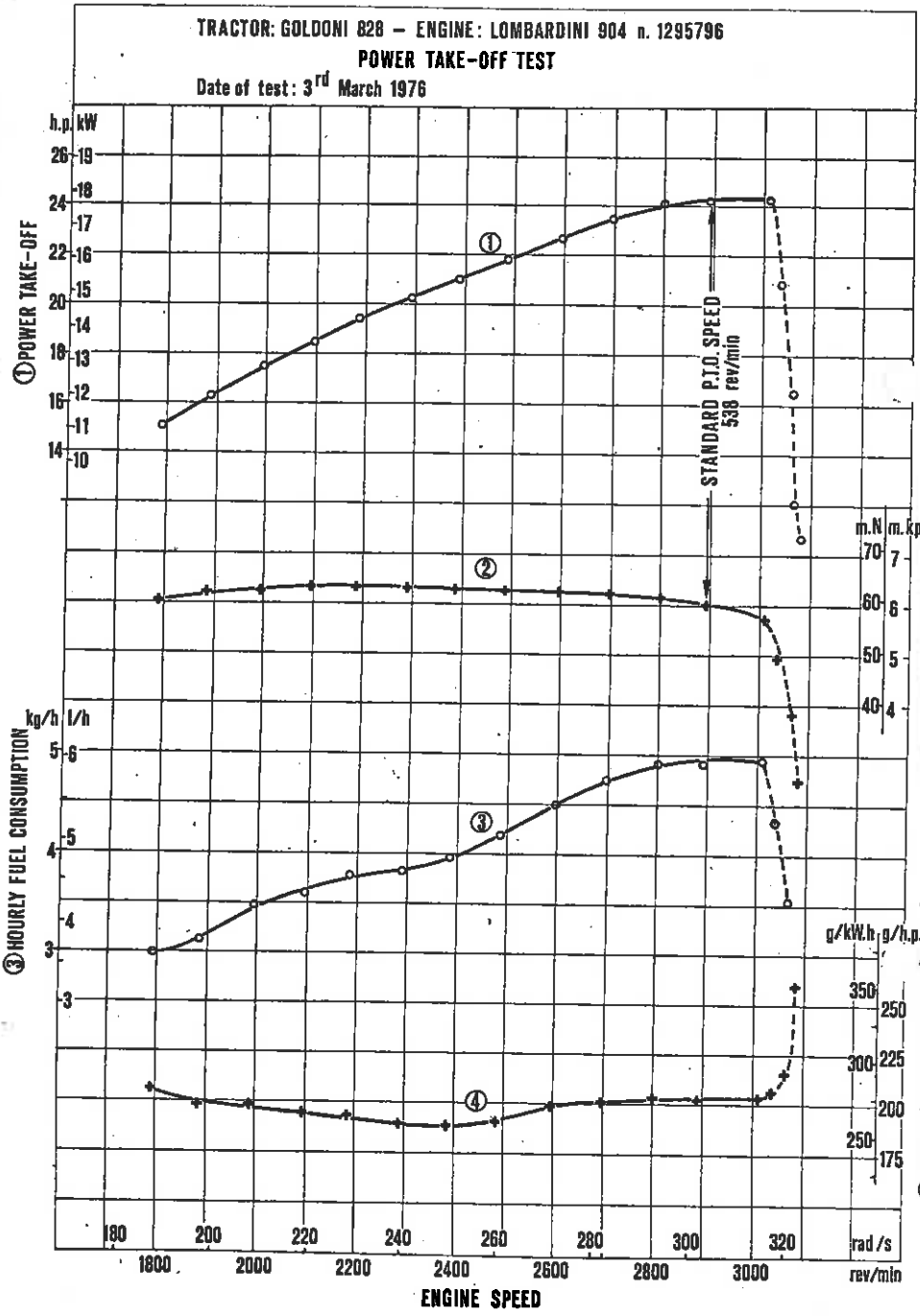
No load maximum engine speed: 332.0 rad/s (3170 rev/min)

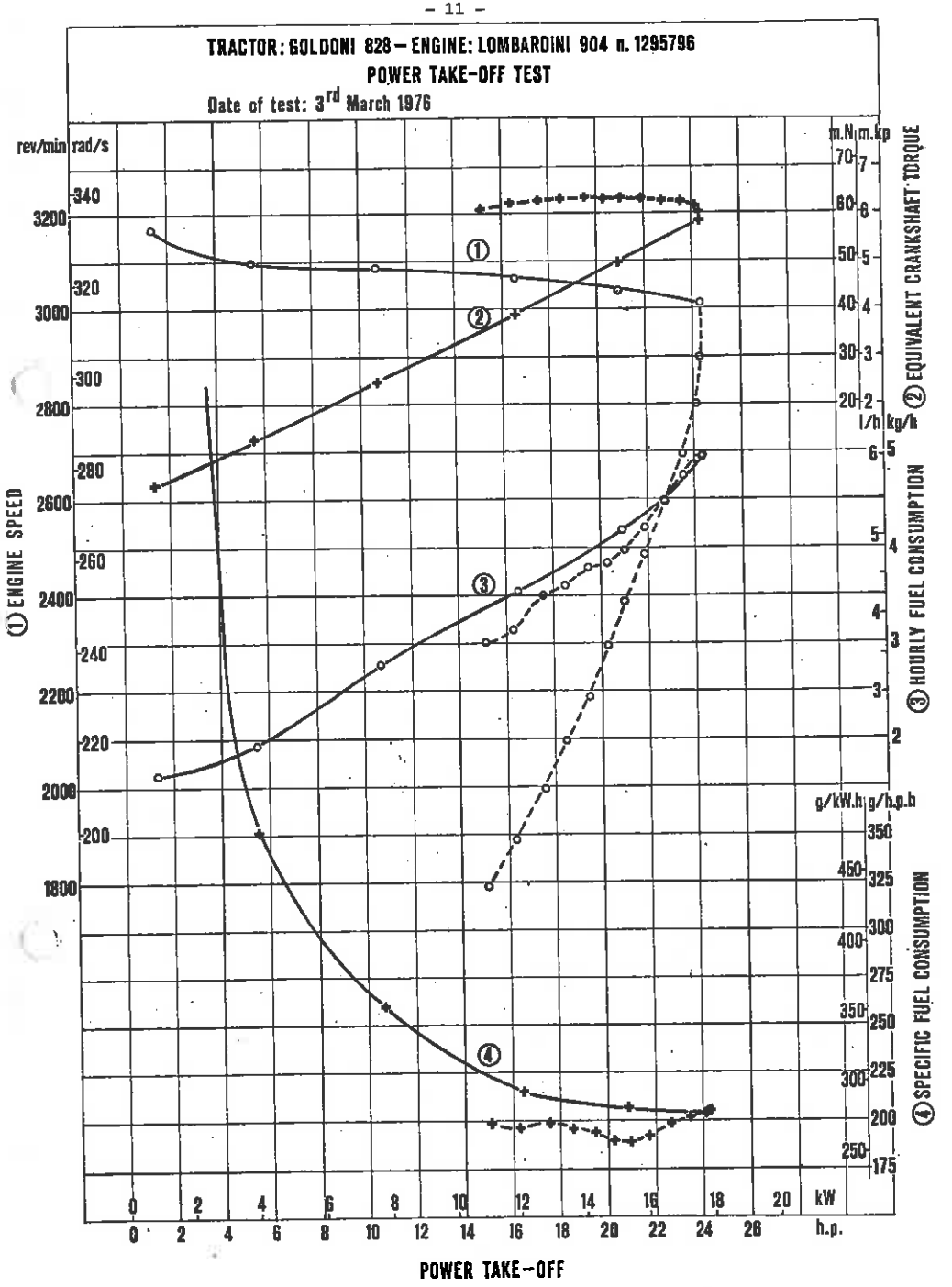
Equivalent crankshaft torque at maximum power: 56.7 mN (5.78 mkp)

Maximum equivalent crankshaft torque: 62.5 mN (6.37 mkp) at 229.1 rad/s (2188 rev/min) of the engine

Mean atmospheric conditions: temperature 17.8°C; pressure 1027 mbar; relative umidity 65%

Maximum temperature: coolant 74°C; engine oil 80°C; fuel 16°C


TRACTOR: GOLDONI 828 – ENGINE: LOMBARDINI 904 n. 1295796
POWER TAKE-OFF TEST
Date of test: 3rd March 1976
h.p. kW
①POWER TAKE-OFF
STANDARD P.T.O. SPEED 538 rev/min
m.N m.kp
②TORQUE
kg/h l/h
③HOURLY FUEL CONSUMPTION
g/kW.h g/h.p.h
④SPECIFIC FUEL CONSUMPTION
rad/s
rev/min
ENGINE SPEED


TRACTOR: GOLDONI 828 – ENGINE: LOMBARDINI 904 n. 1295796
POWER TAKE-OFF TEST
Date of test: 3rd March 1976
rev/min
rad/s
m.N
m.kp
① ENGINE SPEED
② EQUIVALENT CRANKSHAFT TORQUE
l/h
kg/h
③ HOURLY FUEL CONSUMPTION
g/kW.h
g/h.p.h
④ SPECIFIC FUEL CONSUMPTION
kW
h.p.
POWER TAKE-OFF

2) DRAWBAR PERFORMANCE

Date of test: 12th - 16th April 1976

Type of track: concrete

Gear	Speed km/h	Power kw (h.p.)	Drawbar pull N (kp)	Engine speed rad/s (rev/min)	Slip of wheels %	Drawbar fuel consumption kWh/l (h.p.h/l)
i) Maximum power						
1st l	1.20	2.2 (3.0)	6570 (670)	328.8 (3140)	15.0	0.98 (1.33)
2nd l	2.64	4.8 (6.5)	6570 (670)	322.5 (3080)	15.0	1.91 (2.60)
3rd l	3.92	7.2 (9.8)	6570 (670)	321.4 (3070)	15.0	2.16 (2.93)
1st h	6.39	11.5 (15.6)	6470 (660)	318.3 (3040)	14.2	2.28 (3.10)
2nd h	15.48	16.5 (22.4)	3830 (390)	316.2 (3020)	3.8	2.78 (3.77)
3rd h	23.48	15.3 (20.8)	2350 (240)	313.1 (2990)	1.4	2.58 (3.50)
ii) Five hour test at 75% of pull at maximum power (in the 1st h gear)						
1st h	6.95	9.5 (12.9)	4900 (500)	321.4 (3070)	6.5	2.49 (3.38)
iii) Five hour test at pull corresponding to 15% wheelslip in test i)						
1st h	6.95	12.7 (17.3)	6570 (670)	320.4 (3060)	6.8	2.72 (3.70)

Test iii) was carried out with additional ballast of 160 kg

Oil consumption during ten hours duration of test ii) and iii): 25 g/h

Height of drawbar above ground: 260 mm

Drawbar fuel consumption g/kWh (g/h.p.h)	Temperatures °C			Atmospheric conditions		
	Fuel	Coolant	Engine oil	Temperature °C	Relative umidity %	Pressure mbar
840 (618)	14	56	70	18	47	1020
432 (318)	14	58	72	18	47	1020
382 (281)	14	61	72	18	47	1020
362 (266)	15	66	74	19	45	1020
295 (217)	15	68	74	20	44	1020
314 (231)	15	68	74	20	44	1020
331 (244)	20	74	80	24	47	1009
303 (223)	21	77	82	25	45	1009

3) TURNING SPACE AND TURNING CIRCLE

Details of wheels equipement: Front 4.00–15, 4 p.r. pneumatic; rear 9.5 R 20, 4 p.r. pneumatic; track width, front axle 950 mm; rear axle 840 mm

	Without brakes		With brakes	
	right hand	left hand	right hand	left hand
Radius of turning space, m	3.25	3.60	2.70	3.20
Radius of turning circle, m	3.18	3.53	2.63	3.13

4) LOCATION OF CENTRE OF GRAVITY

– Height above ground	635 mm
– Distance forward from the vertical plane containing the axis of the rear wheels	615 mm
– Distance of the median plane of the tractor to the right hand side	0 mm

5) BRAKING PERFORMANCE

Date of tests: 30th March 1976
Type of track: Concrete
Type of decelerometer: Moto Meter, at maximum, recorder
Mass of tractor: 945 kg, with driver

A) Foot brake

Cold brakes

Travelling speed	24.5	km/h
Deceleration	4.6	m/s^2
Stopping distance	6.3	m
Force on pedal	540 (55)	N (kp)
Force on pedal for maximum deceleration of 2.5 m/s^2	118 (12)	N (kp)

Brake fade characteristics (hot tests)

Deceleration	hot/cold	97%
Stopping distance	cold/hot	91%
Force on pedal	hot/cold	101%

B) Park brake

Tractor facing up slope:
Pull on hand brake 167 N (17 kp), tractor does not roll

Tractor facing down slope:
Pull on hand brake 147 N (15 kp), tractor does not roll

6) AMBIENT NOISE EMITTED BY THE TRACTOR

Date of test:	24th May 1976
Type of track:	Concrete
Type of sound level meter:	Brüel and Kjaer, type 2203

Results of test

Gear:	3rd	h
Maximum travelling speed:	24.7	km/h
Travelling speed before acceleration:	18.5	km/h
Sound level:	91.5	dB(A)

7) NOISE AT THE DRIVER'S EAR LEVEL

Date of test:	24th May 1976
Type of track:	Concrete
Type of sound level meter:	Brüel and Kjaer, type 2203
Type of frequency analyser:	Brüel and Kjaer, type 1613

No cab or safety frame fitted on tractor

Results of test

Gear	Drawbar pull at which the tractor develops the maximum sound level N (kp)	Travelling speed km/h		Sound level	
		nominal	effective	dB(A)	Sones
1st h*	5890 (600)	7.23	6.70	101.5	155.7

* The 1st h gear corresponds to the travelling speed nearest to 7.25 km/h

8) POWER LIFT PERFORMANCE

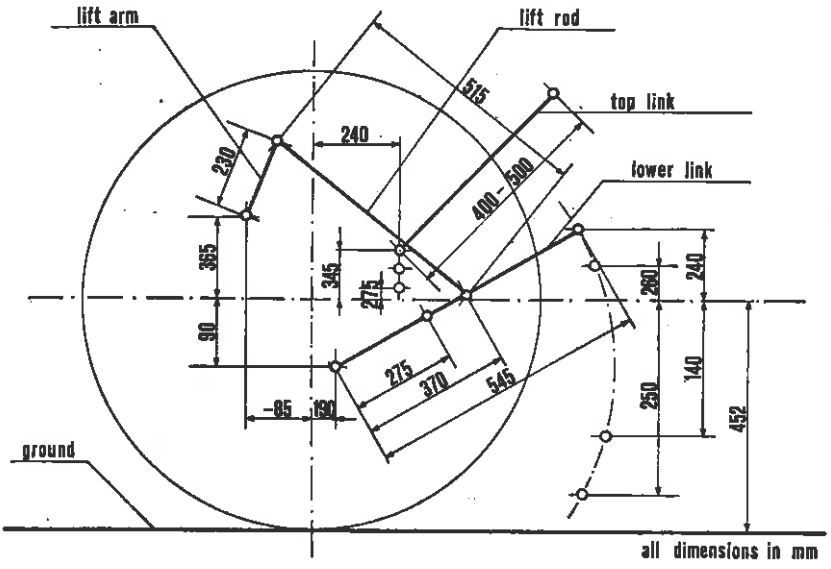
Date and location of test:	29th March 1976 - Experimental Centre of Cadriano
Hydraulic fluid:	Esso Nuto H 54 - Viscosity index: 95
Type of linkage lok for transport:	Hydraulic
Opening pressure of the cylinder over pressure relief valve:	100 bar (102 kp/cm^2)

Hydraulic pump

i)	Opening pressure of relief valve:	100 bar (102 kp/cm^2)
	Sustained pressure by open relief valve:	104 bar (106 kp/cm^2)
ii)	Pump delivery rate at minimum pressure and maximum engine speed:	15.1 l/min
iii)	Pump delivery rate:	14.0 l/min
	Delivery pressure:	98 bar (100 kp/cm^2)
	Hydraulic power:	2.3 kW (3.1 metric h.p.)

Power lift

Dimensions of implement linkage for the table on page 17



Linkage geometry (*)

		Maximum mechanical advantage	-Minimum mechanical advantage
Projected lenght in side view			
lower links,	mm	545	545
lift arms,	mm	230	230
lift rods,	mm	515	515
top link, (*)	mm	400–500	400–500
Distance of lift rod connection point from pivot point of lower link	mm	370	275
The following dimensions are given relative to the rear wheel centre line, situated 452 mm above the ground level			
Lower link pivot point	mm	190 behind, 90 below	190 behind, 90 below
Top link pivot point (*)	mm	240–250–260 behind, 345–310–275 above	240–250–260 behind, 345–310–275 above
Lift arm pivot point	mm	85 behind, 365 above	85 behind, 365 above
Maximum and minimum height of lower link hitch points	mm	240 above, 140 below	260 above, 250 below
Height of lower link hitch points when locked in transport position	mm	150 above	150 above

(*) The standard test frame cannot be fitted because of the special construction of the implement linkage (Cat 1N - Prop. ISO tab. 730/II)

Lifting forces

Lifting heights in relation to a horizontal line through the lower link pivoting point, cm		- 16	- 10	- 5	0	+ 5	+ 10	+ 15	+ 20	+ 25	+ 30	+ 33	+ 35
Lifting force at the hitch points N (kp) (Values for the pressure at maximum hydraulic horsepower, calculated from measurements made at maximum pressure)	max. mech. advantage	-	-	13190 (1345)	12450 (1270)	11760 (1200)	11230 (1145)	10830 (1105)	10390 (1060)	10000 (1020)	9560 (975)	2890 (295)	-
	min. mech. advantage	8630 (880)	8380 (855)	8340 (840)	8090 (825)	7940 (810)	7890 (805)	7790 (795)	7700 (785)	7500 (765)	7200 (735)	-	2550 (260)
	Maximum force exerted throughout whole range 2890 N (295 kp) Force at wich front of tractor is calculated to lift with maximum allowable front ballast 10440 N (1065 kp)												

The standard test frame cannot be fitted because of the special construction of the implement linkage (Cat. 1N - Prop. ISO Tab. 750/II)

Bologna, May 1976

TEST ENGINEER

Dott.Agr. A. Marocchi

HEAD OF TRACTOR TEST CENTER

Prof. Dott. G. Casini-Ropa

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MECCANICA AGRARIA
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Prof.Ing. E. Manfredi