COMITATO PER L'OMOLOGAZIONE
DELLE MACCHINE AGRICOLE

O.E.C.D. No. 1051
RESTRICTED CODE

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

GOLDONI U–238 (ARTICULATED 4 WD)



Manufactured by: GOLDONI S.p.A.
Migliarina di Carpi - Modena - Italy

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

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

Duration of tests: October 1986
IMAUBo – Istituto di Meccanica agraria dell'Università degli Studi di Bologna – Via Filippo Re n° 4 – Bologna – Italy

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. RESTRICTED STANDARD CODE

Date of Approval: 30th March 1987

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

The reference to the former used Technical System of Units is given by the following relations:

Forces	1 daN	10 N	= 1,02 kp	or 1 kp	= 0,981 daN	
Powers		1 kW	= 1,36 HPmetric	or 1 HPmetric	= 0,736 kW	
Pressures		1 bar	= 1,02 kp/cm^2	or 1 km/cm^2	= 0,981 bar	
		1000 mbar	= 750,1 mm Hg			

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Tractor manufacturer:	GOLDONI S.p.A. - Migliarina di Carpi - Modena - Italy
Submitted for test by:	Manufacturer
Selected by:	Manufacturer with agreement of Istituto di Meccanica agraria - Università degli Studi di Bologna
Place running-in:	GOLDONI S.p.A. workshop - Migliarina di Carpi
Duration of running-in:	Engine and tractor appr. 50 hours

SPECIFICATION OF TRACTOR

TRACTOR

Make: GOLDONI S.p.A.
Trade name: GOLDONI U-238
Model: U-238 (ARTICULATED 4 WD)
Type: four wheels drive, articulated-frame steering
Serial N°: D 322829
1st serial N°: D 322829

ENGINE

Make: LOMBARDINI F.I.M. S.p.A.
Model: 832
Type: 4-stroke Diesel engine, naturally aspirated direct injection, air cooled
Serial N°: 2759656

Cylinders: 2, in line, bore 100 mm, stroke 105 mm, capacity 1648 cm^3, compression ratio 17.5/1, valves overhead, none cylinder liners, monobloc construction

Fuel system: forced with FISPA model SUP 75 pump; one wire-mesh filter on pump suction side and one filter with replaceable paper cartridges FIAMM FNA 32/01;
LOMBARDINI 276.6590.034 - OPFR 2K70A 1382 (optionally BOSCH PFR 2K70/534/2);
injection timing 27° before TDC;
manufacturer's production setting 48 $\pm$ 3 mm^3/stroke (in total 8.64 $\pm$ 0.54 l/h) at rated engine speed and full load;
BOSCH multihole injection nozzles model KBL 89S 132/4 (optionally OMAP OLL 160 S or CONDIESEL CDLL 160 S or FB BLL 160 S);
injection pressure: 21.0 $\pm$ 0.5 MPa;
capacity of fuel tank: 16 l

Governor: LOMBARDINI centrifugal variable speed governor;
governed range of engine speed from 1200 to 3250 rev/min

Rated engine speed: 3000 rev/min

Air cleaner: FISPA, model 2132
oil bath air filter with cyclone precleaner, under engine cover;
oil change every 100 operating hours, no maintenance indicator;
oil capacity; 0.5 l;
air intake below bonnet

Lubrication system: LOMBARDINI
forced feed from gear pump;
sieve filter in suction and one paper cartridge replaceable filter FIAMM FOL 542-030;
total oil capacity including filter: 4.3 l;
oil change period: 100 hrs;
recommended filter change period: 400 hrs;
recommended oil: (see end of chapter "Test conditions")

Cooling system: air cooling with axial blower;
blower with 10 blades, 221 mm diameter

Starting system: safety device: none;
BOSCH solenoid pre-engaged drive starting, model JF(R) 12 V, CL 2.5 kW (optionally MARELLI, model MT 71 G);
cold starting aid: none

Electrical system: 12 V, negative earth;
SAPRISA three phase alternator model 14 A (0.2 kW), (optionally DUCATI 14 A);
one lead acid battery, 92 Ah at 20 hrs rating

Exaust system: own make;
multichamber-expansion type silencer;
146 x 80 mm section, 300 mm long;
on the left hand side of bonnet, lateral discharged;
height of outlet abowe ground: 430 mm

TRANSMISSION

Clutch: (travel and power take-off)
PITTERI & VIOLINI make, model F 215.2, single-acting clutch with one dry plate;
plate diameter: 215 mm;
pedal operated

Gear box: own make model Universal, mechanical sliding gears;
6 forward speeds with high/low and reverse range selector two hand levers operated;
totally 6 forward and 3 reverse speeds selected by mean of 2 hand levers

Rear axle and final drives: own make mechanical type with crownwheel, pinion and differential;
bevel gear drive (ratio 1:4.778);
spur gear final drive (ratio 1:3.167);
mechanical differential lock, pedal operated with hydraulic transmission, self disengaged

Front axle and final drives: own make;
bevel gear drive (ratio 1:4.778);
spur gear final drive (ratio 1:3.167);
mechanical differential lock: pedal operated with hydraulic transmission, self disengaged;

Transmission oils: capacity gear box, front axle, and final drives: 10 l;
recommended oil change period: 800 hrs;
capacity rear axle and final drives: 6.0 l;
recommended oil change period: 800 hrs;
(see end of chapter "Test conditions")

Total ratios and speed (tyres 8.25-16 - 4 ply)

Group	Gear No.	No.of engine revolutions for one revolution of the driving wheels	Nominal travelling speed at rated engine speed 3000 rev/min km/h
Forward	1	349.73	1.26
Low	2	167.45	2.63
L	3	111.29	3.96
Forward	1	65.07	6.78
High	2	31.16	14.15
H	3	20.70	21.30
Reverse	1	266.46	1.66
	2	127.58	3.46
R	3	84.80	5.20

Radius index: 390 mm

POWER TAKE-OFF

Main p.t.o.: not indipendent, hand lever operated;
changing of p.t.o. speeds, hand operated by lever;
one shaft at rear tractor in median plane, 450 mm above ground;
(with tyres size: 8.25-16)

p.t.o. proportional to engine speed:
540 rev/min
dimensions 35 mm diameter (1.3/8" in conformity with ISO R 500), 6 splines;
distance behind rear axle 347 mm;
p.t.o. speed at rated engine speed (3000 rev/min) 577 rev/min;
engine speed at standard p.t.o. speed (540 rev/min) 2807 rev/min;
ratio at rotation speed: 5.196;
power restriction: 23.9 kW; maximum torque: 90 N.m;
direction of rotation clockwise, viewed from tractor rear
800 rev/min (not in conformity with ISO R 500)
dimensions 35 mm diameter (1.3/8" in conformity with ISO R 500), 6 splines;
distance behind rear axle 347 mm;
p.t.o. speed at rated engine speed (3000 rev/min) 879 rev/min;
engine speed at p.t.o. speed (800 rev/min) 2730 rev/min;
ratio at rotation speed: 3.413;
direction of rotation clockwise, viewed from tractor rear

p.t.o. proportional to ground speed:
for size of tyres: 8.25-16, radius index 390 mm;
travelling distance for one revolution of p.t.o. shaft 0.162 m;
No. of p.t.o. shaft revolution for one revolution of the rear wheels: 15.13;
direction of rotation clockwise, viewed from tractor rear

Auxiliary p.t.o.:
not indipendent, hand lever operated;
changing of p.t.o. speeds hand operated by lever;
one shaft at rear tractor in median plane, 370 mm above ground
(with tyres size: 8.25-16)

p.t.o. proportional to engine speed:
540 rev/min
dimensions 30 mm diameter: (30x26x6 mm not in conformity with ISO R 500), 6 splines;
distance behind rear axle 290 mm;
p.t.o. speed at rated engine speed (3000 rev/min) 577 rev/min;
engine speed at standard p.t.o. speed (540 rev/min) 2807 rev/min;
ratio at rotation speed: 5.196;
power restriction: 23.9 kW; maximum torque: 90 N.m;

direction of rotation: counterclockwise, viewed from tractor rear
800 rev/min (not in conformity with ISO R 500)
dimensions 30 mm diameter (30x26x6 mm not in conformity with ISO R 500), 6 splines;
distance behind rear axle 290 mm;
p.t.o. speed at rated engine speed (3000 rev/min) 879 rev/min;
engine speed at p.t.o. speed (800 rev/min) 2730 rev/min;
ratio at rotation speed: 3.413;
direction of rotation counterclockwise, viewed from tractor rear

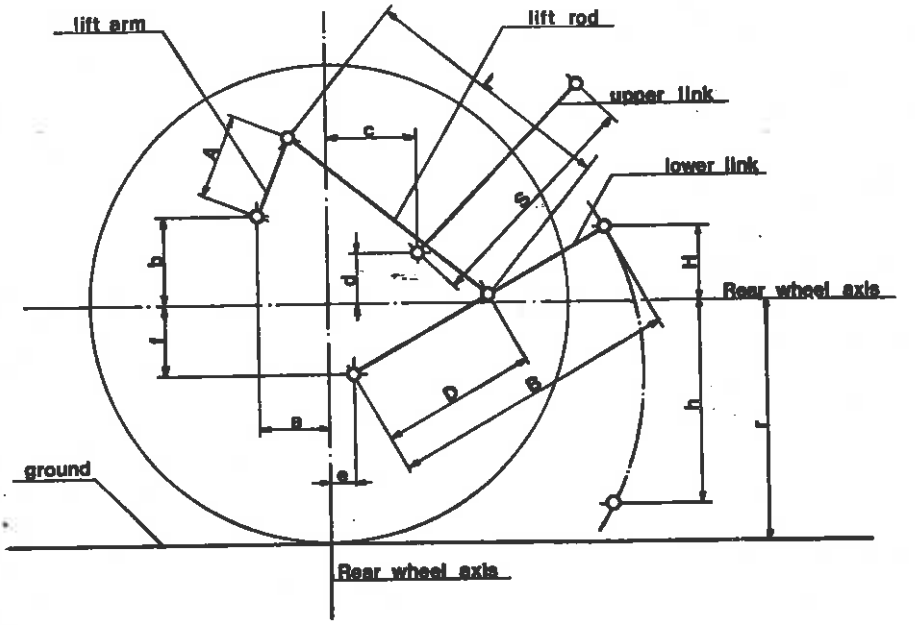
p.t.o. proportional to ground speed:
for size of tyres: 8.25-16, radius index 390 mm;
travelling distance for one revolution of p.t.o. shaft 0.162 m;
No. of p.t.o. shaft revolution for one revolution of the rear wheels: 15.13;
direction of rotation counterclockwise, viewed from tractor rear

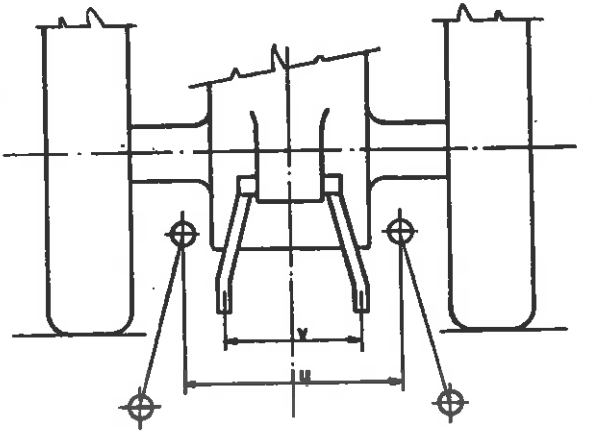
POWER LIFT

Own make;
hydraulic power lift in unit construction;
HYDROIRMA type AP 2/11D 218 gear pump (optionally SALAMI 2 PA/11.3 D);
driven by crankshaft with gear connection;
one sieve filter AIAS model 19024;
one single acting cylinder with bore 54 mm and stroke 145 mm;
over pressure (safety) valve setting 14.0 ± 0.5 MPa;
hydraulic linkage lock for transport;
one valve with oil tapping at rear of tractor, available;
site of oil reservoir: over rear axle under the seat;
oil capacity: 6.5 l;
maximum volume of oil available to external cylinders: 4 l;
recommended oil change: 800 hrs;
recommended filter control and clear period: 800 hrs;
recommended oil: (see end of chapter "Test conditions")

THREE-POINT LINKAGE

Own make;
three-point linkage acc. to ISO 730/II, cat. 1 N





Dimensions of rear implement linkage (projected lehgths in mm)
Underlined dimensions are valid for power lift test page 18

Rear tyres (size 8.25-16)	radius index	(r)	390
Front tyres (size 8.25-16)	radius index	(r')	390
Length of lift arms		(A)	230
Length of lower links		(B)	545
Distance of lift arm pivot point from rear wheel centre line	horizontally	(a)	80
	vertically	(b)	285
Horizontal distance between the 2 lower link points		(u)	335
Horizontal distance between the 2 lift arm end points		(v)	301
Length of upper link		(S)	400 to 540 480
Distance of upper link pivot point from rear wheel centre line	horizontally	(c)	236 or 230-224
	vertically	(d)	197 or 232-267
Distance of lower link pivot point from rear wheel centre line	horizontally	(e)	172
	vertically	(f)	109
Distance of lower link pivot points to lift rod pivot points on lower links		(D)	310
Length of lift rods		(L)	450
Heigth of lower link hitch points relative to rear exle centre line (situated 390 mm above ground)	in low position	(h)	209
	in high position	(H)	221

Heigth of lower hitch points when locked in transport position:
any heigth within lift range

SWINGING DRAWBAR - None

TRAILER HITCH

Cat. B (in accordance with italian regulation);
height above ground, 3 positions: 285 - 335 and 550 mm;
distance of hitch point from rear axle axis horizontally at rear: 395 mm;
distance of hitch point from p.t.o. shaft end:
vertically, below 165 - 115 above 100 mm
horizontally, rear 48 mm
maximum vertical permissible load: 4.9 kN;
diameter pin hole: 28 mm

HOLED DRAWBAR - None

STEERING

Own make;
mechanical with hydraulic servosteering type, working on centre pivot of the tractor by means of: steering wheels, worm gear box, connecting rod and hydraulic cylinder;
CINOTTO model CHS-1224, servo-steering with one double acting cylinder;
hydraulic power sistem motor powered by engine, oil derived by means of a priority valve from the power lift circuit;
working pressure 10.0 MPa;
oil capacity (power lift reservoir) 6.5 l;
recommended oil: (see end of the chapter "Test conditions");

BRAKES

Service brake: own make; model Universal;
foot brakes mechanically operated internal shoe type, acting with one only pedal (no steering brake) on the rear wheels;
trailer braking take-off: none

Parking brake: with indipendent mechanic system;
hand operated muscle power with mechanical transmission;
acting internal shoes on the front wheels;
lever with ratchet operated

Steering brake: None

DRIVING WHEELS In front and rear
4 diagonal pneumatics 8.25-16, 4 ply;
max permissible load on each tyre 5.9 kN at 120 kPa;
track width 685 - 865 or 940 mm, adjustable by turning lugs and rims;
rims 5.50 F - 16"

WHEELBASE 1057 mm

PROTECTIVE STRUCTURE - None

DRIVER'S SEAT

Own make;
spring mounted seat;
rubber cushion;
longitudinal adjustement 40 mm;
vertical adjustement 0 mm

NUMBER OF GREASE POINTS 5

LIGHTING: angle of light in accordance with italian regulation

	Height above ground of centre with tyres 8.25-16 mm	Size mm	Distance from outside edge of tractor to center at 865 mm track width mm
Head lights	730	ø 125	410
Side lights	650	70 x 20	220
Rear lights	840	70 x 60	220
Reflectors	775	40 x 50	175

TEST CONDITIONS

Dimensions (with tyres 8.25-16, 4 ply)

Total lenght:	2500 mm	without lower link
	2840 mm	with lower link
Total max width:	1150 mm	
Total height:	1125 mm	to bonnet
Ground clearance:	215 mm	below trailer hitch in lowest position

Track of wheels

at front	865 mm
at rear	865 mm

Tractor mass

as used for drawbar performance test

	without driver	with driver
front	765 kg	780 kg
rear	320 kg	380 kg
total	1085 kg	1160 kg

Fuel and lubricants recommended and used in tests

Fuel: agricultural Diesel oil (in accordance with italian standard)
density at 15°C: 0,835 g/cm^3

Engine oil: ESSO TRACTOR LUBE UNIVERSAL SAE 20 W-40, or another in conformity with MIL L 2104 B supp. 1

Gear box, rear and front axle, final drives: ESSO GEAR OIL GX 80 W-90, or another in conformity with MIL L 2105 C

Power lift and steering: ESSO NUTO H 68

Grease: ESSO GP

Remarks and repairs: None

COMPULSORY TESTS

(1) MAIN POWER TAKE-OFF PERFORMANCE

Date of tests: 8th October 1986
Location of tests: Istituto di Meccanica agraria - Università di Bologna (IMAUBo) - Cadriano
Type of dynamometer: SCHENCK hydraulic dynamometer U-40

Power	Speed		Fuel consumption			Specific energy
	engine	p.t.o.	hourly		specific	
kW	rev/min	rev/min	l/h	kg/h	g/MJ (g/kWh)	kW.h/l
Maximum power						
At 2-hour test						
23.9	3000	577	8.24	6.88	80.0 (288)	2.90
At rated engine speed						
23.9	3000	577	8.24	6.88	80.0 (288)	2.90
At standard p.t.o. speed						
23.6	2806	540	7.90	6.60	77.7 (280)	2.98
Part loads, the governor hand lever in the position corresponding to the maximum power at full load (curve A)						
(i) The torque corresponding to maximum power at rated engine speed						
23.9	3000	577	8.24	6.88	80.0 (288)	2.90
(ii) 85% of torque obtained in (i)						
21.0	3090	595	7.62	6.36	84.1 (303)	2.76
(iii) 75% of torque defined in (i)						
16.0	3135	603	6.19	5.17	89.6 (323)	2.59
(iv) 50% of torque defined in (i)						
10.7	3170	610	4.67	3.90	101.4 (365)	2.29
(v) 25% of torque defined in (i)						
5.4	3205	617	3.52	2.94	150.1 (540)	1.55
(vi) Unloaded						
--	3235	622	2.66	2.22	--	--

Power kW	Speed		Fuel consumption			Specific energy kW.h/l
	engine rev/min	p.t.o. rev/min	hourly l/h	hourly kg/h	specific g/MJ (g/kWh)	
Part loads, the governor hand lever in the position corresponding to the standard p.t.o. speed at full load (curve B)						
(i) The torque corresponding to maximum power available						
23.6	2806	540	7.90	6.60	77.7 (280)	2.98
(ii) 85% of torque obtained at maximum power						
20.7	2910	560	6.97	5.82	78.2 (281)	2.97
(iii) 75% of torque defined in (i)						
15.6	2940	566	5.53	4.62	82.2 (296)	2.82
(iv) 50% of torque defined in (i)						
10.7	2970	571	4.38	3.66	95.2 (343)	2.44
(v) 25% of torque defined in (i)						
5.3	3010	580	3.23	2.70	141.8 (510)	1.64
(iv) Unloaded						
--	3033	584	2.37	1.98	--	--

Standard specific fuel consumption: 84.1 - 101.4 - 78.2 - 95.2 g/MJ
(303 - 365 - 281 - 343 g/kWh)

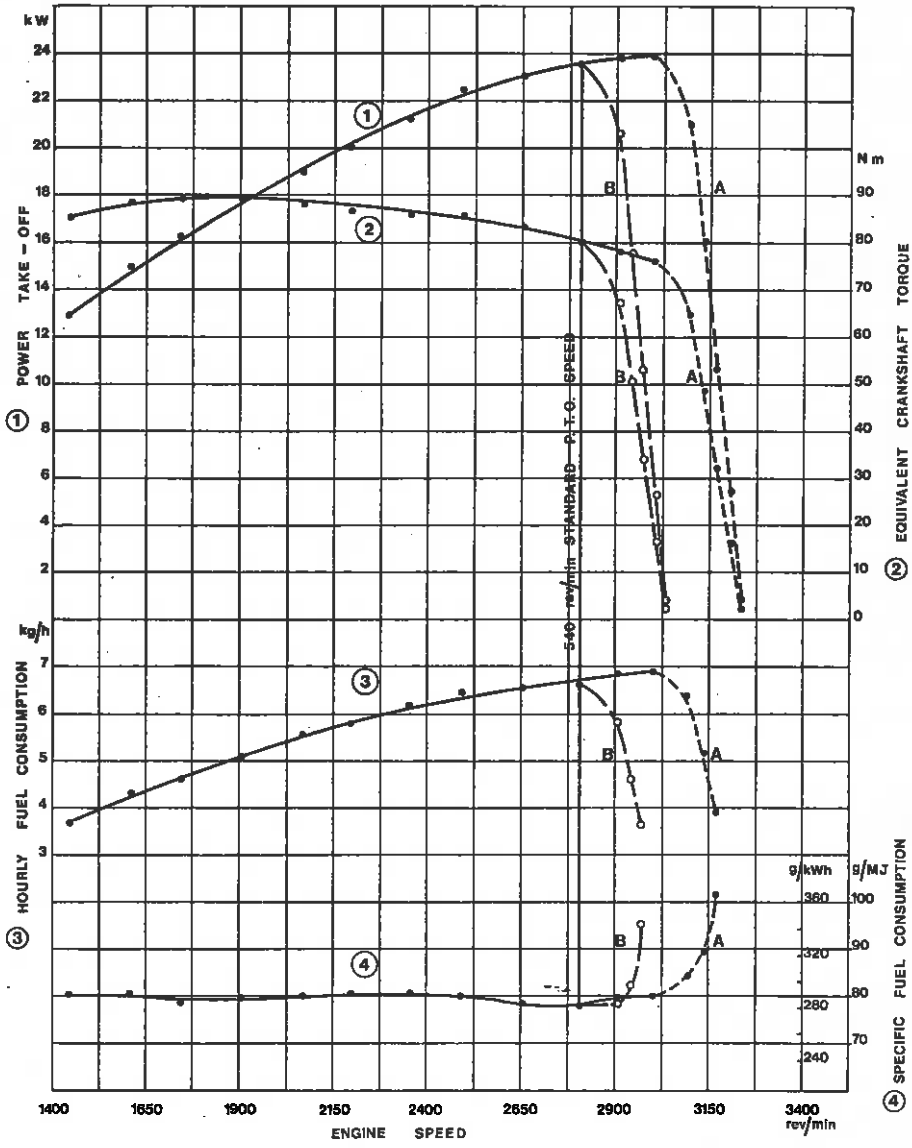
No load maximum engine speed: 3250 rev/min
Equivalent crankshaft torque at maximum power (2 hours): 76.0 N.m
Maximum equivalent crankshaft torque: 89.6 N.m at 1900 rev/min of the engine

Mean atmospheric conditions:	temperature	24 °C
	pressure	102.0 kPa
	relative humidity	57 %
Maximum temperatures:	coolant	68 °C
	engine oil	125 °C
	fuel	28 °C
	engine air intake	35 °C

POWER TAKE-OFF TEST

Date and location of test: 8th October 1986
Istituto di Meccanica agraria - Università di Bologna (IMAUBo) - Cadriano

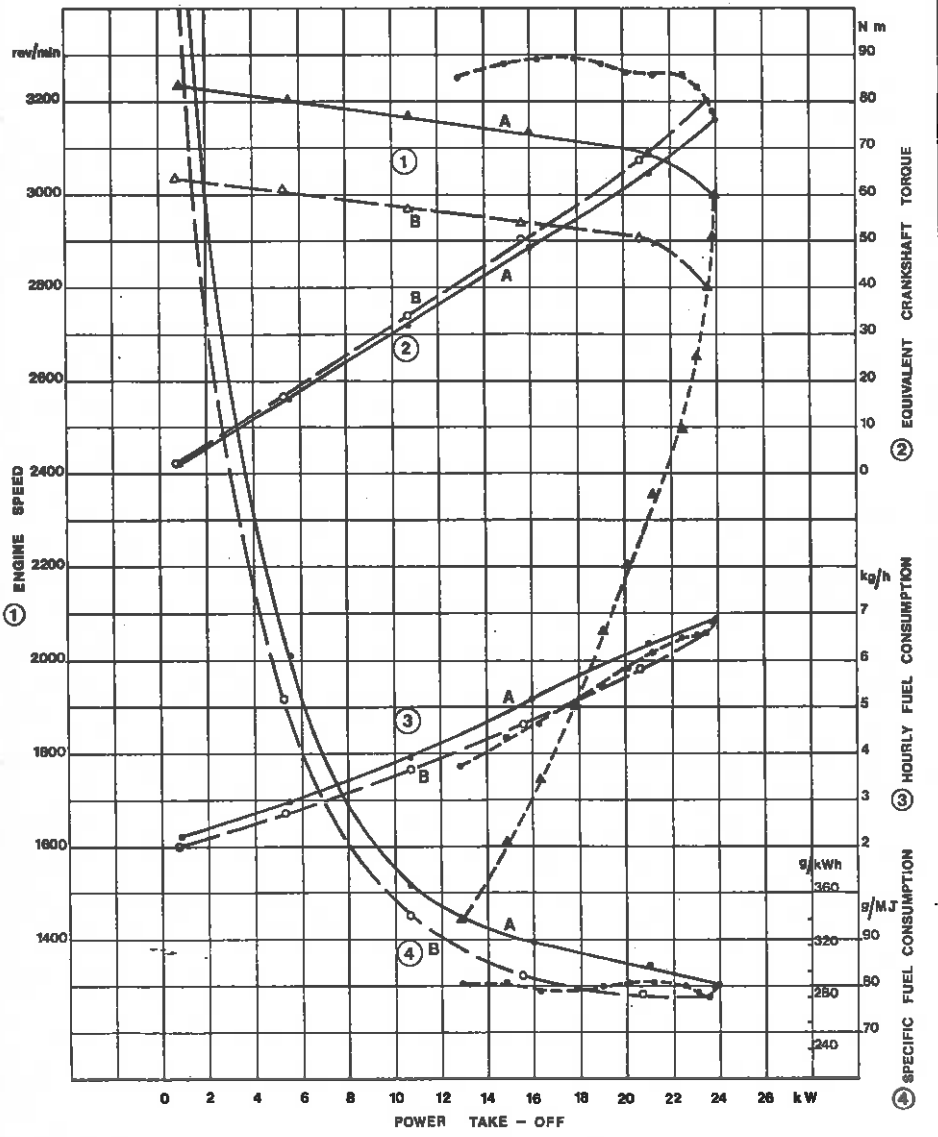
Motor: LOMBARDINI 832



POWER TAKE-OFF TEST

Date and location of test: 8th October 1986
Istituto di Meccanica agraria - Università di Bologna (IMAUBo) - Cadriano

Motor: LOMBARDINI 832



(2) **DRAWBAR PERFORMANCE**

Date of tests: 14th October 1986
Type of track: concrete
Type and size of tyres: front: PIRELLI 8.25-16 (4 ply)
rear: PIRELLI 8.25-16 (4 ply)

Gear no.and group	Power	Drawbar pull	Speed	Engine speed	Slip of wheels
	kW	kN	km/h	rev/min	%
(1) MAXIMUM DRAWBAR POWER IN TESTED GEARS					
1 L	3.0	9.20	1.16	3240	14.8
2 L	6.1	9.25	2.40	3210	15.1
3 L	9.3	9.35	3.58	3175	14.7
1 H	15.7	9.40	6.01	3130	15.0
2 H	21.9	5.95	13.25	3000	6.4
3 H	21.2	3.75	20.37	3000	3.7
(2) TRANSMISSION AND FUEL CONSUMPTION CHARACTERISTICS					
i) Selected gear 2 H (highest maximum available power)					
2 H	21.9	5.95	13.25	3000	6.4
ii) 75% of pull at maximum power					
2 H	17.5	4.45	14.13	3130	4.3
iii) 50% of pull at maximum power					
2 H	12.1	3.00	14.57	3170	2.5
iv) Highest gear 3 H same pull as in ii), reduced engine speed					
3 H	17.7	4.50	14.19	2090	4.5
v) Highest gear 3 H same pull as in iii), reduced engine speed					
3 H	12.1	3.00	14.51	2100	2.6

Height of drawbar above ground: 335 mm
Tyre inflation pressure: front: 102 kPa
rear: 100 kPa

Specific energy	Specific consumption	Temperatures			Atmospheric conditions		
		Fuel	Coolant	Engine oil	Temperature	Relative humidity	Pressure
kW.h/l	g/MJ (g/kWh)	°C	°C	°C	°C	%	kPa
0.92	251.5 (905)	24	48	89	22	58	102.4
1.49	156.3 (562)	26	52	92	24	56	102.4
1.94	119.8 (431)	27	61	95	24	56	102.4
2.31	100.2 (361)	30	64	100	25	54	102.4
2.68	86.5 (311)	32	76	111	25	54	102.4
2.61	89.0 (320)	32	70	105	24	54	102.4
2.68	86.5 (311)	32	76	111	25	54	102.4
2.58	89.8 (323)	34	72	106	23	55	102.4
2.31	100.0 (360)	34	70	102	23	55	102.4
3.08	75.2 (271)	32	68	99	23	55	102.4
3.04	76.3 (274)	32	64	96	23	55	102.4

(3) LIFTING FORCE AND HYDRAULIC POWER

Date and location of tests: 22nd October 1986 - Istituto di Meccanica agraria Università di Bologna (IMAUBo) - Cadriano

Hydraulic fluid

Make and type: ESSO NUTO H 68
Type of hydraulic system: open centre system, draft and position control, top link sensing
Hydraulic fluid temperature at beginning of test: 60 - 70 °C

Power lift test

	Height of lower hitch point above ground in down pos. mm	Vertical movement mm	Max. force exerted through full range daN	Corresp. pressure of hydraul. fluid MPa	Moment about rear axle kN.m	Max. tilt angle of mast over range of lift degrees
At hitch points	280	430	810	14.0	5.80	—
On the frame	270	500	490	14.0	6.50	12°

Main linkage dimensions: see drawings and table on page 7 and 8

Lifting heights relative to the horizontal plane including the lower link pivot points

cm	- 10	- 5	0	+ 10	+ 15	+ 20	+ 25	+ 30	+ 33	+ 35	+ 40

Lifting forces at hitch points (corresponding pressure 14.0 MPa)

daN	1150	1115	1070	1030	1005	975	935	895	810	—	—

Lifting forces at test frame (corresponding pressure 14.0 MPa)

daN	895	870	835	760	725	685	640	600	—	550	490

Hydraulic power test

Sustained pressure with relief valve open		15.5	MPa
Pump delivery rate at minimum pressure		28.3	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	17.3	l/min
	Pressure	14.0	MPa
	Power	4.0	kW
Flow rate and hydraulic pressure corresponding to maximum hydraulic power:			
	Flow rate	18.5	l/min
	Pressure	13.5	MPa
	Power	4.2	kW

Tapping point used for test: derivation next of the distributor valve

REMARKS AND REPAIR None

Bologna, January 1987

TEST ENGINEER
Prof.Dr. G. Canelli

HEAD OF TRACTOR TEST CENTRE
Prof. Dr. G. Cavini-Ropa

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