COMITATO PER L'OMOLOGAZIONE
DELLE MACCHINE AGRICOLE

OECD Approval No. 1050
Restricted code

TEST IN ACCORDANCE WITH THE OECD RESTRICTED STANDARD
CODE FOR THE OFFICIAL TESTING OF AGRICULTURAL TRACTORS

GOLDONI 921 ARTICULATED (4 W.D.)



Manufactured by: GOLDONI S.p.A. - Via Canale, 3
41012 MIGLIARINA DI CARPI - MODENA - Italy

Date and location of tests: September-October 1986 - Turin (Italy)

This report has been approved by the O.E.C.D. Coordinating Center (CEMAGREF, France) as being in accordance with the O.E.C.D. Tractor Test Code.

Date of approval: 20th March 1987

CONSIGLIO NAZIONALE DELLE RICERCHE
ISTITUTO PER LA MECCANIZZAZIONE AGRICOLA
TORINO - ITALY

COMITATO PER L'OMOLOGAZIONE
DELLE MACCHINE AGRICOLE

OECD Approval No. 1050
Restricted code

TEST IN ACCORDANCE WITH THE OECD RESTRICTED STANDARD
CODE FOR THE OFFICIAL TESTING OF AGRICULTURAL TRACTORS

GOLDONI 921 ARTICULATED (4 W.D.)



Manufactured by: GOLDONI S.p.A. - Via Canale, 3
41012 MIGLIARINA DI CARPI - MODENA - Italy

Date and location of tests: September-October 1986 - Turin (Italy)

This report has been approved by the O.E.C.D. Coordinating Center (CEMAGREF, France) as being in accordance with the O.E.C.D. Tractor Test Code.

Date of approval: 20th March 1987

CONSIGLIO NAZIONALE DELLE RICERCHE
ISTITUTO PER LA MECCANIZZAZIONE AGRICOLA
TORINO - ITALY

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

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 N	= 0.10197 kg	or 1 kg	= 9.80665	N
Powers:	1 kW	= 1.35962 metric hp	or 1 metric hp	= 0.73550	kW
Pressures:	1 bar	= 1.01972 kg/cm2	or 1 kg/cm2	= 0.980665	bar
Torques:	1 mN	= 0.10196 mkg	or 1 mkg	= 9.80665	mN

TABLES OF CONTENTS

Page

Specification of tractor 3

Fuel and lubricants used in test 11

Compulsory tests

1 - Power take-off performance. 12

2 - Drawbar performance on a concrete track 14

3 - Power lift and hydraulic pump performance 15

4 - Repairs and adjustments during test 16

5 - Remarks 16

PERFORMANCE CURVES

Fig. No.

Power take-off test

Curves of power, torque, hourly and specific fuel consumption/ crankshaft speed 1

Curves of specific fuel consumption/cranksharf power p.t.o. . . 2

Tractor manufacturer:	GOLDONI S.p.A. Via Canale, 3 MIGLIARINA DI CARPI - MODENA - Italy
Submitted for test by:	Manufacturer
Selected by:	Manufacturer with agreement by Istituto per la Meccanizzazione Agricola - Torino (Italy)
Place of running-in:	Istituto per la Meccanizzazione Agricola - Torino
Duration of running-in:	Engine and tractor appr. 70 hours

SPECIFICATION OF TRACTOR:

TRACTOR:

Make:	GOLDONI
Model:	921 ARTICULATED
Type:	Four-wheel-drive tractor, articulated construction
Serial No.:	A 319633
Ist serial No.:	156698

ENGINE:

Make:	LOMBARDINI
Model:	LDA 820
Type:	4-stroke Diesel engine, direct injection, air cooled
Serial No.:	2701657
Cylinders:	1 cylinders, vertical, in-line, 102 mm bore x 100 mm stroke, capacity 817 cm3, compression ratio 17 : 1, overhead in-line valves, replaceable cast-iron dry cylinder liners
Fuel system:	gravity feed; one wire-mesh LOMBARDINI filter drawing 273.3730.15 on the exit of the fuel tank; one standard fuel tank capacity 7 l; BOSCH PFR 1K70/302 alternate injection pump; manufacturer's production setting 49 mm3/stroke at rated engine speed and full

load; injection timing 31°30' before TDC; OMAP multihole injector drawing 292.6531.13; injection pressure 176÷177 bar
- Serial no of injection pump: none

Governor: LOMBARDINI centrifugal variable speed governor mechanical type, governed range of engine speed from 1000 to 3300 rev/min; rated engine speed 3000 rev/min

Air cleaner: LOMBARDINI make, oil bath air filter, drawing 291.3701.28
Oil capacity: 0,30 l
Air intake under bonnet on left side of engine
Maintenance indicator: none

Lubrification system: Forced-feed lubrification with gear pump; one replaceable cartridge type filter drawing 904.3740.043 on pressure side pump of oil to the engine; cartridge change every 300 operating hours; oil capacity including filter 2.6 l; recommended oil ESSO TRACTOR LUBE UNIVERSAL SAE classification 20W/40, satisfied MIL-L-2104 C specifications; oil change period every 100 operating hours.

Cooling system: Air forced-feed cooled with one conveyor-distributor on the cylinder; belt fan, 308 mm dia, 28 blades incorporated into flywheel.
There aren't means for temperature's adjustment and temperature's control.

Starting system: Safety device: not present.
Electrical BOSCH JF (L) 12 V CL. 2.5 1.84 KW; optionally Marelli MT 71 H 12 V CL. 2.5 1.84 KW; starting motor pinion coupling solenoid operated.
Cold starting aid: Optional, by means of glow plugs.

Electrical system: 12 V, negative earth. Alternator SAPRISA, type 12,5 V 14A, 6266 model or DUCATI type 12.5 V 14A, 435544900 model.
Battery: one lead acid type; FIAMM 6B 6P; capacity 80 Ah at 20 hours rating.

Exhaust system: LOMBARDINI, drawing S 21.5461.47, DGM-SA 642 italian approval sigle, interference type with internal perforated pipe; oval shape 110 x 80 mm, 285 mm length; vertical on right side of engine; maximum height above ground 340 mm.

TRANSMISSION:

Clutch: PITTERI and VIOLINI make; F187.2 type dry, single disc clutch; disc 187 mm dia; pedal operated for gear box drive and for P.T.O. drive.

Gearbox: Own make, mechanical type, sliding gear. The trasmission consists of three ratios with two forward and one reverse reduction gear, with total 6 forward and 3 reverse speeds, manually selected by two levers.

Rear axle and final drive: Own make, mechanical type with straight teeth cylindrical gears; bevel gear type differential, hand lever operated and self-disengaging lock.

Front axle and final drive: Own make, mechanical type with straight teeth cilyndrical gears; bevel gear type differential, hand lever operated having a position of engaging lock.

Gear lubrication: Capacity final rear drives: 5.5 l; capacity gear box and final front drives: 9 l; change period 800 operating hours; no filters. Recommended oil ESSO GEAR OIL GX 80 W-90 or any oil conforming MIL L 2104 supplement 1.

Total ratios and speeds (tyres 7.50-16 and pressure 1.2 bar)

Gear	Group	Number of engine revolutions for one revolution of the driving wheel	Nominal travelling speed (*) from rated engine speed (3000 rev/min) km/h
I	Low	349.684	1.21
II		167.427	2.53
III		111.282	3.81
I	High	65.057	6.52
II		31.149	13.61
III		20.704	20.47
I	Reverse	266.426	1.59
II		127.564	3.32
III		84.787	5.00

(*) Calculated with the radius index of 375 mm

POWER TAKE OFF

Main:

Not indipendent, p.t.o. driven by single disc clutch; one shaft, hand lever operated.
Position: rear of tractor, in median plane; height above ground 450 mm (with tyre 7.50-16).

Proportional engine speed p.t.o.:
- 540 rev/min p.t.o.: distance behind rear axle 347 mm; diameter of p.t.o. shaft end 34.8 mm; 6 splines, according to I.S.O. 500; no power restriction; 577 rev/min and 879 rev/min at rated engine speed; standard p.t.o. speed 540 rev/min at engine speed 1843 rev/min and 2806 rev/min; p.t.o. shaft rotates clockwisely, viewed from tractor rear.

Ratio of rotation speed: $\frac{\text{engine speed}}{\text{p.t.o. speed}} = \frac{3000}{577} = 5.199$

Proportional ground speed p.t.o.:
- 540 rev/min p.t.o.: travelling distance for one revolution of p.t.o. shaft 156 mm with tyre 7.50-16; number of p.t.o. shaft revolutions for one revolution of rear wheels 15.1 rev.; p.t.o. shaft rotates clockwisely viewed from tractor rear.

Optional:

Not indipendent, p.t.o. driven by single disc clutch; one shaft, hand lever operated.
Position: rear of tractor, in median plane, under main power take off;
height above ground 370 mm (with tyre 7.50-16).

Proportional engine speed p.t.o.:
- 540 rev/min p.t.o.: distance behind rear axle 287 mm; diameter of p.t.o. shaft end 30 mm; 6 splines; not in conformity with I.S.O. 500; no power restriction; 577 rev/min and 879 rev/min at rated engine speed; standard p.t.o. speed 540 rev/min at engine speed 1843 rev/min and 2806 rev/min; p.t.o. shaft rotates counter-clockwisely, viewed from tractor rear.

Ratio of rotation speed: $\frac{\text{engine speed}}{\text{p.t.o. speed}} = \frac{3000}{577} = 5.199$

Proportional ground speed p.t.o.:
- 540 rev/min p.t.o.: travelling distance for one revolution of p.t.o. shaft 156 mm with tyre 7.50-16; number of p.t.o. shaft revolutions for one revolution of rear wheels 15.1 rev.; p.t.o. shaft rotates counter-clockwisely, viewed from tractor rear.

POWER LIFT:

Own make; hydraulic power lift in unit construction, operated by one lever.

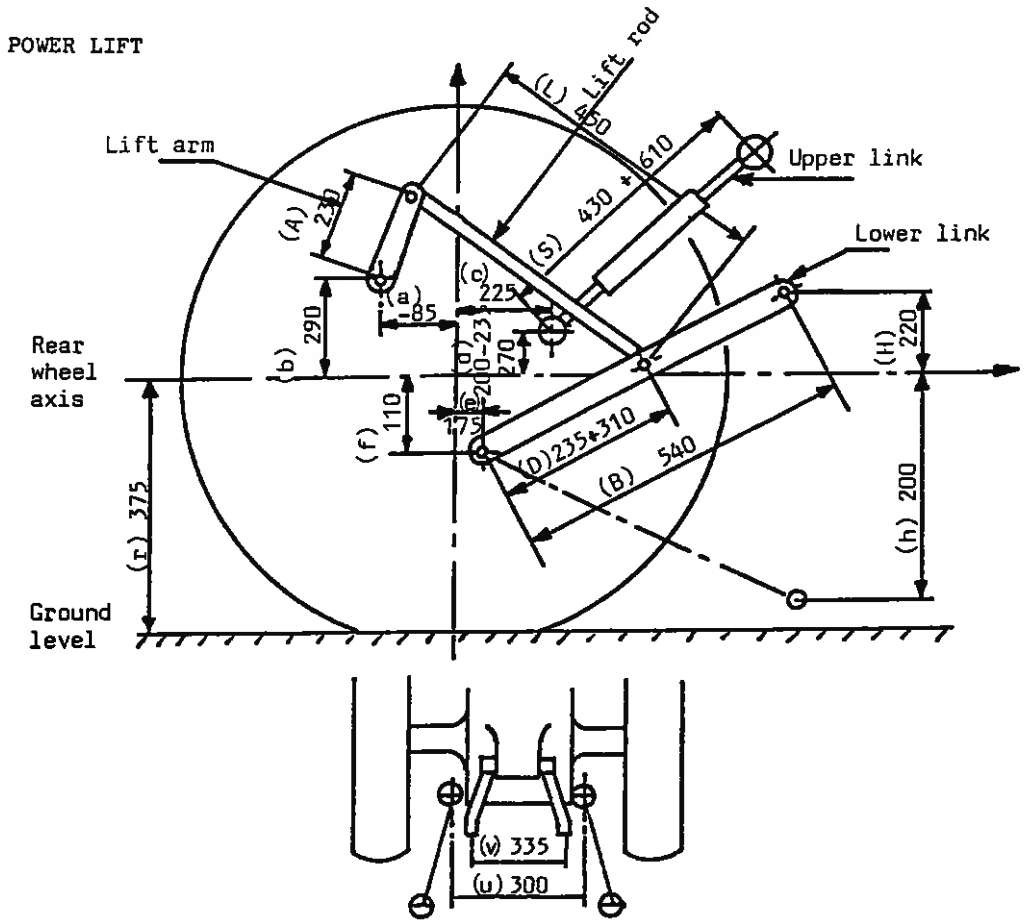
Hydraulic system:

open centre system; Hidroirma gear pump AM/1.5/14, directly driven by engine; delivery 12 l/min at rated engine speed; one hydraulic oil filter AIAS 19024 metallic cartridge.
Filter changing period: 800-1000 operating hours.
Maximum working pressure 140 bar. Two single acting cylinders with 54 mm bore and 145 mm stroke; relief valve pressure setting: 135÷145 bar. Type of linkage lock for transport: mechanical.
Oil capacity: 6.8 l.
One oil tapping point for an additional external ram is available but it is not fitted on tested tractor.
Maximum volume of oil available to external cylinders: 4 l. Recommended oil: ESSO NUTO H 68, or ESSO LUBE HD 10W. Oil change period 800-1000 operating hours.

Implement linkage:

three point linkage, joint balls category 1N according to I.S.O. STANDARD 730/II; dimensions see on pag 8.

POWER LIFT



State setting of hydraulic power lift for test

- Rear tyres (size 7.50-16) radius index (r) : 375 mm
- Front tyres (size 7.50-16) radius index (r'): 375 mm
- Length of lift arms (A) : 230 mm
- Length of lower links (B) : 540 mm
- Distance of lift arm pivot point from rear wheel centre line:
  - horizontally (a) : -85 mm
  - vertically (b) : 290 mm
- Horizontal distance between the 2 lower link points (u) : 300 mm
- Horizontal distance between the 2 lift arm end points (v) : 335 mm
- Length of upper link (S) : from 430 to 610 mm
- Distance of upper link pivot point from rear wheel centre line:
  - horizontally (c) : 225 mm
  - vertically (d) : 200-235-270 mm
- Distance of lower link pivot point from rear wheel centre:
  - horizontally (e) : 175 mm
  - vertically (f) : 110 mm
- Distance of lower lift pivot points to lift rod pivot points on lower links (D) : 235 and 310 mm
- Length of lift rods (L) : 450 mm
- Height of lower hitch points:
  - in low position (h) : 200 mm
  - in high position relative to the rear wheel centre line, situated 375 mm above the ground level (H) : 220 mm
- Height of lower link hitch points when locked in transport position : 595 mm

PULL ATTACHMENT:

Trailer hitch:
own make, clevis type; height above ground with tyres 7.50-16, 515 mm max and 250 mm min; distance of hitch point from rear axle 395 mm horizontally; distance of hitch point from main p.t.o. shaft end: vertically from 200 mm below to 65 mm above, horizontally 48 mm behind; distance of hitch point from optional p.t.o. shaft end: vertically from 120 mm below to 145 mm above, horizontally 108 mm behind; max vertical load 500 daN (with tyres 7.50-16; 4 ply) according to Italian legislation; one hitch pin hole: 28.5 mm dia.

STEERING:

Own make, mechanical type, worm gear box with ratio 1:24, working on center tractor pivot, operated by steering-wheel. Optionally hydrostatic control; DANFOSS make, OSPC 50 LS; gear pump delivery 12 l/min, one double acting cylinder directly acting on center tractor pivot, axially mounted, bore 48 mm, stroke 125 mm, piston rod 22 mm dia; working pressure 90±5 bar; hydrostatic system uses the same oil of hydraulic system; oil filter: none.
Recommended oil: see hydraulic oil.

BRAKES:

Service brakes:
own make, dry disc brake type with drums and expanding shoes, 243 mm dia, 44.5 mm thickness, with mechanical transmission, acting on rear axle, operated by pedal. Trailer braking take-off not available.
Parking brake:
own make, dry disc brake type with drums and expanding shoes, 243 mm dia, 44.5 mm thickness, with mechanical transmission, acting on front axle, operated by hand-lever.

WHEELS:

Driving wheels:
two at front and two at rear; diagonal type tyres PIRELLI AG10 7.50-16, 4 ply; maximum permissible load per tyre 525 kg at 1.2 bar inflation pressure and max 25 km/h speed; track width adjustment: 660 mm and 815 mm, rotating the wheels on hub.
Optional:

Tyre size	
at front	at rear
6.00 - 16 6 ply	6.00 - 16 6 ply

Wheelbase: 1055 mm

SEAT:

Driver's seat:
own make, upholstered seat with back rest; height of unloaded seat above driver's platform 510 mm longitudinal adjustment 20 mm.

Passenger seat: not available.

Number of grease points: 4.

OVERALL DIMENSIONS (tyres size 7.50 - 16 front and 7.50 - 16 rear)

Length	Width		Height to top of steering-wheel
	mini	maxi	
m	m	m	m
2.76	0.87	1.02	1.14

Ground clearance: 225 mm below front axle's drums.

Lighting equipment: Electrical 12 V, in accordance with Italian legislation.

	Height above ground of centre with tyres: 7.50 - 16 front 7.50 - 16 rear	Size	Distance from outside edge of tractor to centre (°)
	mm	mm	mm
Headlights	695	110 x 110	370
Side lights	695	110 x 110	370
Rear lights	785	55 x 50	180
Reflectors: 1st pair	658	45 x 55	150

(°) Track setting: 815 mm at front
815 mm at rear

TEST CONDITIONS

Track setting: 815 mm at front
815 mm at rear

Weights: Tractor (with tank fuel, without driver).

Front kg	Rear kg	Total kg
510	280	790

Fuel and lubricants used in tests

Fuel: Esso Diesel oil; specific gravity: 0.845 kg/l at 15 °C; cetane number: not recorded; the fuel is in conformity with our National Standard.

Engine oil: ESSO TRACTOR LUBE UNIVERSAL SAE 20 W/40

Transmission oil: ESSO GEAR OIL GX 80 W-90

Hydraulic oil, steering oil: ESSO NUTO H68 or ESSO LUBE HD 10W

Grease: ESSO GP GREASE

COMPULSORY TESTS

(1) MAIN POWER TAKE-OFF PERFORMANCE

Date and location of tests: 25th September 1986 - I.M.A. - Torino (Italy)

Type of dinamometer: parasitic currents, BORGHI SAVERI FA 300-30SP

Power	Speed		Fuel consumption			Specific
	engine	p.t.o.	hourly		specific	energy
kW	rev/min	rev/min	l/h	kg/h	g/kWh	kWh/l
MAXIMUM POWER - 2 HOUR TEST						
13.29	3000	577	4.46	3.75	282	2.98
POWER AT RATED ENGINE SPEED						
13.29	3000	577	4.46	3.75	282	2.98
STANDARD POWER TAKE OFF SPEED (540±10 rev/min)						
13.04	2806	540	4.29	3.60	276	3.04
PART LOADS						
(1) The torque corresponding to maximum power at rated engine speed						
13.29	3000	577	4.46	3.75	282	2.98
(2) 85% of the torque obtained in (1)						
11.85	3092	595	3.90	3.28	277	3.04
(3) 75% of the torque defined in (2)						
8.82	3118	600	3.05	2.56	290	2.89
(4) 50% of the torque defined in (2)						
6.07	3170	610	2.50	2.10	346	2.43
(5) 25% of the torque defined in (2)						
3.10	3216	619	1.90	1.60	516	1.63
(6) unloaded						
-	3250	625	-	-	-	-

Power	Speed		Fuel consumption			Specific
	engine	p.t.o.	hourly		specific	energy
kW	rev/min	rev/min	l/h	kg/h	g/kWh	kWh/l

PART LOADS AT STANDARD POWER TAKE OFF SPEED (540 rev/min)

(1) The torque corrisponding to maximum power available						
13.04	2806	540	4.29	3.60	276	3.04
(2) 85% of the torque obtained at maximum power in (1)						
11.45	2884	555	3.56	2.99	261	3.22
(3) 75% of the torque defined in (2)						
8.72	2931	564	2.85	2.39	274	3.06
(4) 50% of the torque defined in (2)						
5.90	2983	574	2.26	1.90	322	2.61
(5) 25% of the torque defined in (2)						
3.02	3034	584	1.67	1.40	464	1.81
(6) unloaded						
-	3075	592	-	-	-	-

STANDARD SPECIFIC FUEL CONSUMPTION: 277/346/261/322 (g/kWh)
No load maximum engine speed: 3250 rev/min
Torque equivalent crankshaft at maximum power (2 hours): 42.3 Nm
Maximum torque equivalent crankshaft: 48.3 Nm at 2100 rev/min of the engine

Mean atmospheric conditions: temperature 20.5 °C
pressure 1004.8 mbar
relative humidity 67%

Maximum temperature: coolant 74 °C
engine oil 131 °C
fuel 25 °C
engine air intake 32 °C

DRAWBAR PERFORMANCE

Date of tests: 3rd October 1986 Tyre size: - front: 7.50 - 16; 4 ply; inflation pressure: 1.2 bar
Type of track: concrete - rear: 7.50 - 16; 4 ply; inflation pressure: 1.2 bar
Height of drawbar above ground: 350 mm

Gear no. and group	Driving speed km/h	Power kW	Drawbar pull daN	Engine speed rev/min	Slip of wheels %	Specific fuel consumption g/kWh	Specific energy kWh/l	Temperatures			Atmospheric conditions		
								Fuel °C	Coolant °C	Engine oil °C	Temperature °C	Relative humidity %	Pressure mbar
(1) - MAXIMUM POWER IN TESTED GEARS													
I Low	1.11	2.38	770	3226	14.9	-	-	23.0	77	120	9.0	97	996
II Low	2.30	4.92	770	3198	15.0	396	2.12	23.5	76	120	10.0	97	996
III Low	3.40	7.27	770	3140	15.0	323	2.60	24.0	75	122	11.0	97	996
I High	5.72	11.59	730	3001	12.7	324	2.59	24.0	76	123	12.0	87	996
II High	13.28	11.44	310	3000	2.6	330	2.55	25.0	75	125	13.0	83	996
(2a) - TRASMISSION AND FUEL CONSUMPTION CHARACTERISTICS													
1) - SELECTED GEAR													
III Low	3.40	7.27	770	3140	15.0	323	2.60	24.0	74	120	11.0	97	996
2) - 75% of pull at maximum power													
III Low	3.73	6.01	580	3175	7.7	349	2.40	24.5	74	120	13.0	81	996
3) - 50% of pull at maximum power													
III Low	3.91	4.13	380	3216	4.4	412	2.04	25.0	75	119	13.0	78	996
4) - Highest gear same pull as in 2), reduced engine speed													
I High	3.71	5.98	580	1849	7.7	278	3.02	25.0	75	119	14.0	76	996
5) - Highest gear same pull as in 3), reduced engine speed													
I High	3.96	4.18	380	1916	5.0	244	3.45	26.0	75	120	14.0	74	996
(2b) - TRASMISSION AND FUEL CONSUMPTION CHARACTERISTICS													
1) - SELECTED GEAR (maximum power)													
I High	5.72	11.59	730	3001	12.7	324	2.59	25.0	74	121	12.0	87	996
2) - 75% of pull at maximum power													
I High	6.40	9.78	550	3120	5.7	226	3.15	25.5	74	121	20.0	60	996
3) - 50% of pull at maximum power													
I High	6.68	6.77	365	3180	3.5	303	2.77	26.0	75	123	21.0	58	996

It hasn't been possible to realize the measurements of II High with reduced engine speed

(3) POWER LIFT AND HYDRAULIC PUMP PERFORMANCE:

Date and location of tests: 10th October 1986 - I.M.A. - Torino (Italy)

POWER LIFT

	Height of lower hitch point above ground in down position	Vertical movement	Maximum force exerted through full range	Corresponding pressure of hydraulic fluid	Moment about rear axle	Maximum tilt angle of mast over range of lift (*)
	mm	mm	daN	bar	daNm	degrees
At the hitch points	175	420	1085	126	-	-
On the frame	165	520	670	126	888	13°

Temperature of hydraulic fluid at start of test: 65°C

(*) Measurements have been carried out with mast height 360 mm and vertical distance of upper link pivot point from rear wheel centre line 200 mm

Lifting heights relative to horizontal links

mm	-100	-90	-50	0	+ 50	+100	+200	+250	+330	+420

Lifting forces at hitch points

mm	-	1490	1440	1400	1340	1270	1160	1120	1085	-

Lifting forces at test frame

mm **	1160	1145	1115	1060	1010	960	840	780	720	670

** The same values could be obtained with mast height 460 mm and vertical distance of upper link pivot point from rear centre line 270 mm.

HYDRAULIC PUMP PERFORMANCE:

- Sustained pressure with relief valve open:	140 bar
- Pump delivery rate at minimum pressure:	15 l/min
- Hydraulic pressure corresponding to 90% of the minimum setting of the opening pressure of the relief valve:	126 bar
- Delivery:	10.2 l/min
- Power:	2.1 kW
- Flow rate and hydraulic pressure corresponding to maximum hydraulic power:	
- Pressure:	140 bar
- Delivery:	9.6 l/min
- Power:	2.2 kW
- Temperature of hydraulic fluid:	65 °C

- Tapping point used for test: auxiliary service connection

(4) REPAIRS AND ADJUSTMENTS DURING TEST: none

(5) REMARKS: none

TEST CARRIED OUT BY:

W. Faccio

M. Gianguzzano

HEAD OF I.M.A.
TEST DEPARTMENT

R. Gioia

DIRECTOR OF I.M.A.

L. Lisa

Turin, 10th November 1986

GOLDONI 921 ARTICULATED (4 W.D.)

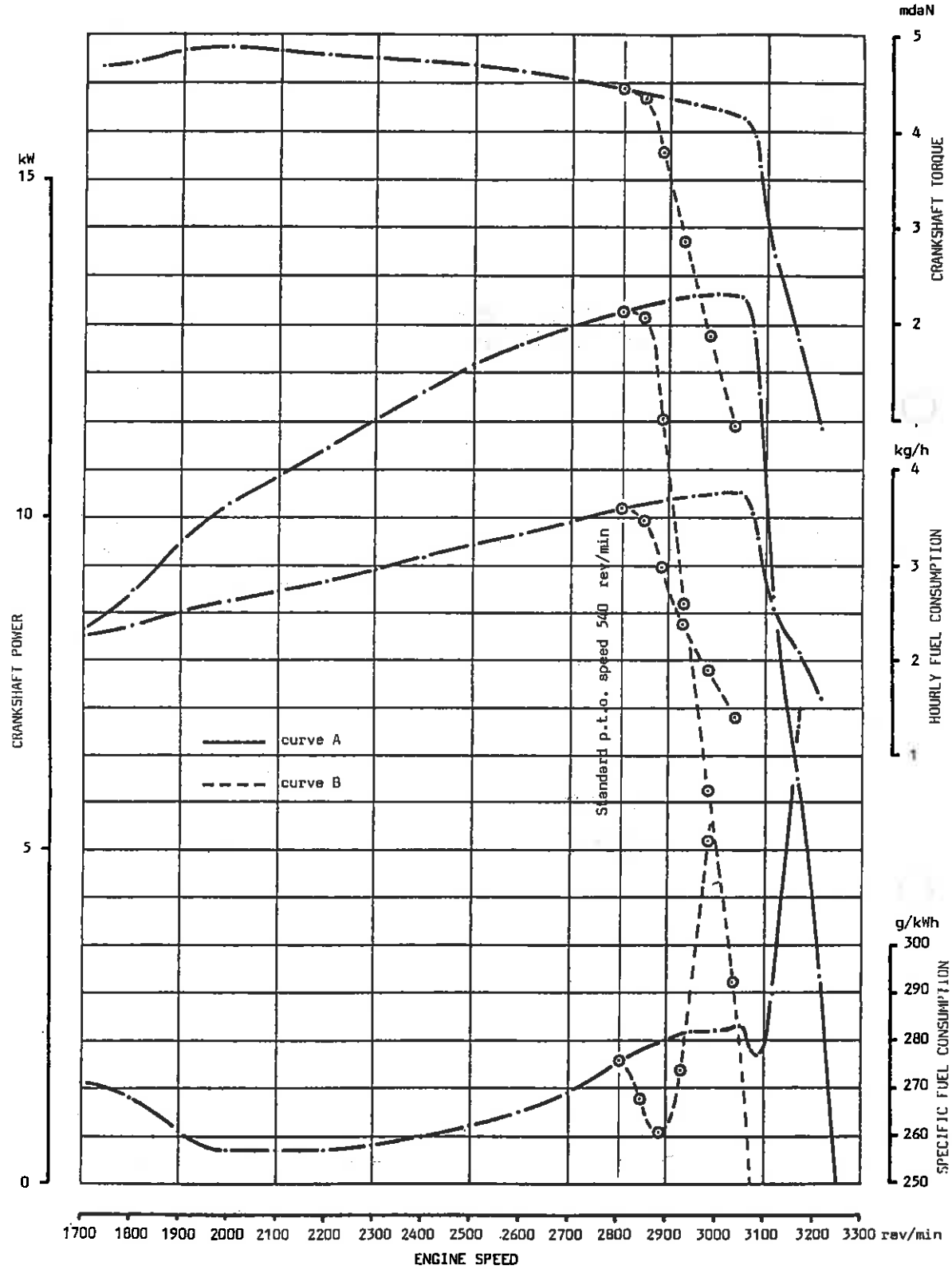


Fig. 1 - POWER TAKE-OFF TEST

GOLDONI 921 ARTICULATED (4 W.D.)

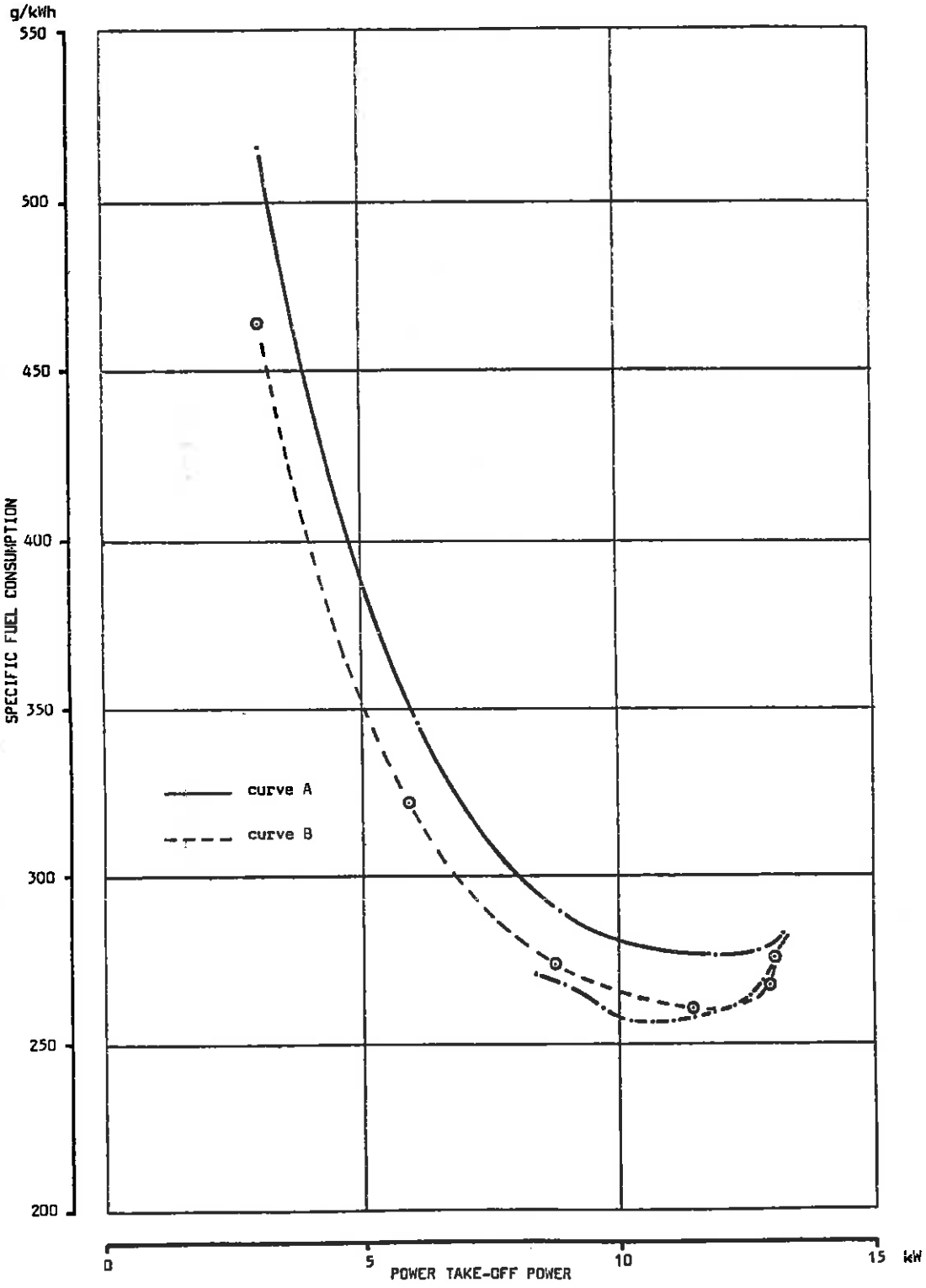


Fig. 2 - POWER TAKE-OFF TEST