COMITATO PER L'OMOLOGAZIONE
DELLE MACCHINE AGRICOLE

OECD Approval No. 1068
Restricted Code

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

GOLDONI 933 ARTICULATED (4 W.D.)



Manufactured by: GOLDONI S.p.A. - Via Canale, 3
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: 17th June 1987

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

COMITATO PER L'OMOLOGAZIONE
DELLE MACCHINE AGRICOLE

OECD Approval No. 1068
Restricted Code

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

GOLDONI 933 ARTICULATED (4 W.D.)



Manufactured by: GOLDONI S.p.A. - Via Canale, 3
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: 17th June 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

TABLE 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:	933 ARTICULATED
Type:	four wheel drive tractor, articulated construction
Serial No.:	A 285897
Ist serial No.:	156698

ENGINE:

Make:	LOMBARDINI
Model:	914
Type:	4-stroke Diesel engine, direct injection, air cooled
Serial No.:	2761497
Cylinders:	2 cylinders, vertical, in-line, 95 mm bore x 94 mm stroke, capacity 1332 cm^3, compression ratio 17,8:1, overhead in-line valves, replaceable cast-iron dry cylinder liners
Fuel system:	forced with CORONA or SAVARA pump; one FIAAM filter drawing 273.2175.009 with replaceable cartridge in the fuel tank; one standard fuel tank capacity 10 l; BOSCH PFR 2K70 alternate injection pump (optionally CIPA CPFR 2K 70 alternate injection pump or CONDIESEL CPF 2R 70 alternate injection pump); manufacturer's production setting 42 mm^3/stroke at

rated engine speed and full load; injection timing 25°±27° before TDC; BOSCH multihole injectors drawing 710.6531.033 (optionally OMAP or CIPA, drawing 710.6531.033); injection pressure 206÷216 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: METAL make, oil bath air filter, drawing 904.3701.099
Oil capacity: 0,38 l.
Air intake under bonnet in front of engine.
Maintencance indicator: none

Lubrication system: Forced-feed lubrication 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 3 l; recommended oil ESSO TRACTOR LUBE UNIVERSAL SAE classification 20 W/40, satisfied MIL-L-2104 C specifications; oil change period every 100 operating hours.

Cooling system: Air cooled through axial turbo bowler; 189 mm dia, 10 blades, belt driven fan;

Starting system: Electrical BOSCH GF 12 V CL. 1,10 KW; optionally MARELLI 50245750 1,10 KW; starting motor pinion coupling solenoid operated.
Cold starting aid: optional, by means of glow plugs.
Safety device: operable only when clutch pedal is fully depressed.

Electrical system: 12 V, negative earth. Alternator SAPRISA type 12V 21A, 6381 model or DUCATI type 12V 21A, 435045400 model.
Battery: one lead acid type; FIAMM 6B 6P; capacity 80 Ah at 20 hours rating.

Exhaust system: LOMBARDINI drawing 6493.5461.86, DGM-SA 676 italian approval sigle, interferance type with internal perforated pipe; rectangular shape 110 x 70 mm, 360 mm length; vertical on left side of engine; maximum height above ground 1100 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 transmission 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 cylindrical 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 filter. 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 ISO 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 ISO 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 wheel 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.

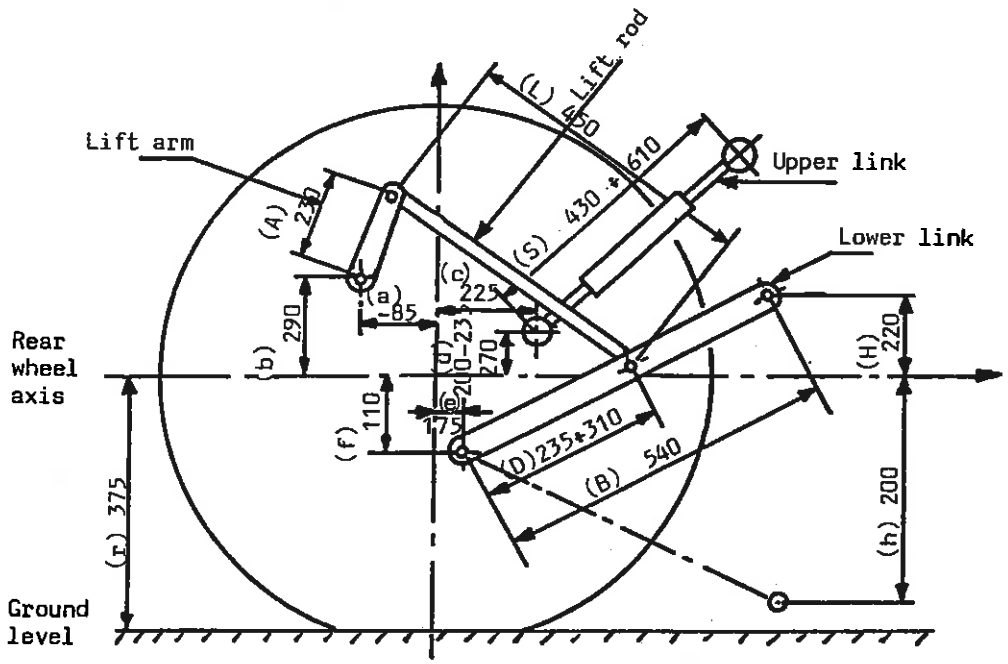
Hydraulic system:

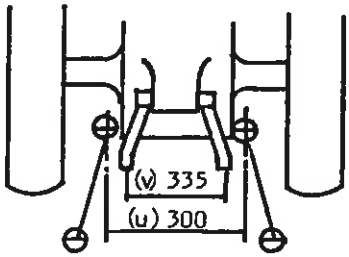
open centre system; Hidroirma gear pump AP2/6, 5S218, directly driven by engine; delivery 16 l/min at rated engine speed; one hydraulic oil filter AIAS 19024 metallic cartridge. Filter changing period: 800-1000 operating hours.
Maximum working pressure 140 bar. Two single acting cylinder with 54 mm bore and 145 mm stroke, relief valve pressure setting: 135 ÷ 145 bar, there are not cylinder safety valves. Type of linkage lock for transport: mechanical.
Oil capacity: 6.8 l.
Site of oil reservoir: inside of hydraulic system.
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 510 dN (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 16 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 trasmission, 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 trasmission 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 and 815, rotating the wheels on hub.
Optional:

Tyre size	
at front	at rear
6.00 - 16	6.00 - 16
6 ply	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
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 x110	370
Side lights	695	110 x110	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
540	270	810

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 FA300-30SP

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						
21.92	3000	577	7.53	6.36	290	2.91
POWER AT RATED ENGINE SPEED						
21.92	3000	577	7.53	6.36	290	2.91
STANDARD POWER TAKE OFF SPEED (540±10 rev/min)						
21.07	2806	540	6.91	5.84	277	3.61
PART LOADS						
(1) The torque corresponding to maximum power at rated engine speed						
21.92	3000	577	7.53	6.36	290	2.91
(2) 85% of the torque obtained in (1)						
19.39	3118	600	6.04	5.10	263	3.21
(3) 75% of the torque defined in (2)						
14.72	3159	608	4.62	3.90	265	3.19
(4) 50% of the torque defined in (2)						
9.89	3180	612	3.61	3.05	308	2.74
(5) 25% of the torque defined in (2)						
4.97	3206	617	2.72	2.30	463	1.83
(6) unloaded						
-	3253	626	-	-	-	-

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 corresponding to maximum power available						
21.07	2806	540	6.91	5.84	277	3.61
(2) 85% of the torque obtained at maximum power in (1)						
18.44	2889	556	5.74	4.85	263	3.21
(3) 75% of the torque defined in (2)						
14.03	2931	564	4.37	3.69	263	3.21
(4) 50% of the torque defined in (2)						
9.47	2967	571	3.31	2.80	296	2.86
(5) 25% of the torque defined in (2)						
9.47	3008	579	2.32	1.96	408	2.07
(6) unloaded						
-	3025	582	-	-	-	-

Standard specific fuel consumption: 263/308/263/296 (g/kWh)
No load maximum engine speed: 3253 rev/min
Torque equivalent crankshaft at maximum power (2 hours): 69.8 Nm
Maximum torque equivalent crankshaft: 74.7 Nm at 2200 rev/min of the engine

Mean atmospheric conditions: temperature 21.0 °C
pressure 989.3 mbar
relative humidity 75%

Maximum temperature: coolant 90 °C
engine oil 130 °C
fuel 26 °C
engine air intake 25 °C

DRAWBAR PERFORMANCE

Date of tests: 1st 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 wheel %	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	2.47	800	3224	15.0	-	-	24	88	107	14.0	85	1000.0
II Low	2.31	5.06	790	3204	15.0	514	1.63	24	90	110	14.5	79	1000.0
III Low	3.46	7.68	800	3187	14.9	410	2.05	25	91	120	15.0	74	1000.0
I High	5.81	12.92	800	3134	14.9	349	2.41	25	91	120	16.0	70	1000.0
II High	13.21	18.72	510	3003	3.4	335	2.51	26	92	123	17.0	65	1000.0
(2a) - TRANSMISSION AND FUEL CONSUMPTION CHARACTERISTICS													
1) SELECTED GEAR													
I High	5.81	12.92	800	3134	14.9	349	2.41	25	90	119	21.5	48	1000.0
2) - 75% of pull at maximum power													
I High	6.34	10.57	600	3163	8.0	347	2.42	25	90	122	22.0	44	1000.0
3) - 50% of pull at maximum power													
I High	6.61	7.34	400	3168	4.4	398	2.11	26	91	125	22.0	42	1000.0
(2b) - TRANSMISSION AND FUEL CONSUMPTION CHARACTERISTICS													
1) SELECTED GEAR (maximum power)													
II High	13.21	18.72	510	3003	3.4	335	2.51	26	90	125	22.0	43	1000.0
2) - 75% of pull at maximum power													
II High	13.64	14.58	385	3060	2.1	333	3.00	26	91	126	22.5	40	1000.0
3) - 50% of pull at maximum power													
II High	14.17	10.04	255	3160	1.4	363	2.32	27	91	127	22.5	42	1000.0

It hasn't been possible to realize the measurements of II High and III 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 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 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:	19,5
- Hydraulic pressure corresponding to 90% of the minimum setting of the opening pressure of the relief valve:	126 bar
- Delivery:	18.8 l/min
- Power:	3.87 kW
- Flow rate and hydraulic pressure corresponding to maximum hydraulic power:	
- Pressure:	135 bar
- Delivery:	18.75 l/min
- Power:	4.14 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. Giangualano

HEAD OF I.M.A.
TEST DEPARTMENT

R. Gioia

DIRECTOR OF I.M.A.

L. Lisa

Turin, 10th November 1986

GOLDONI 933 ARTICULATED 4 WD

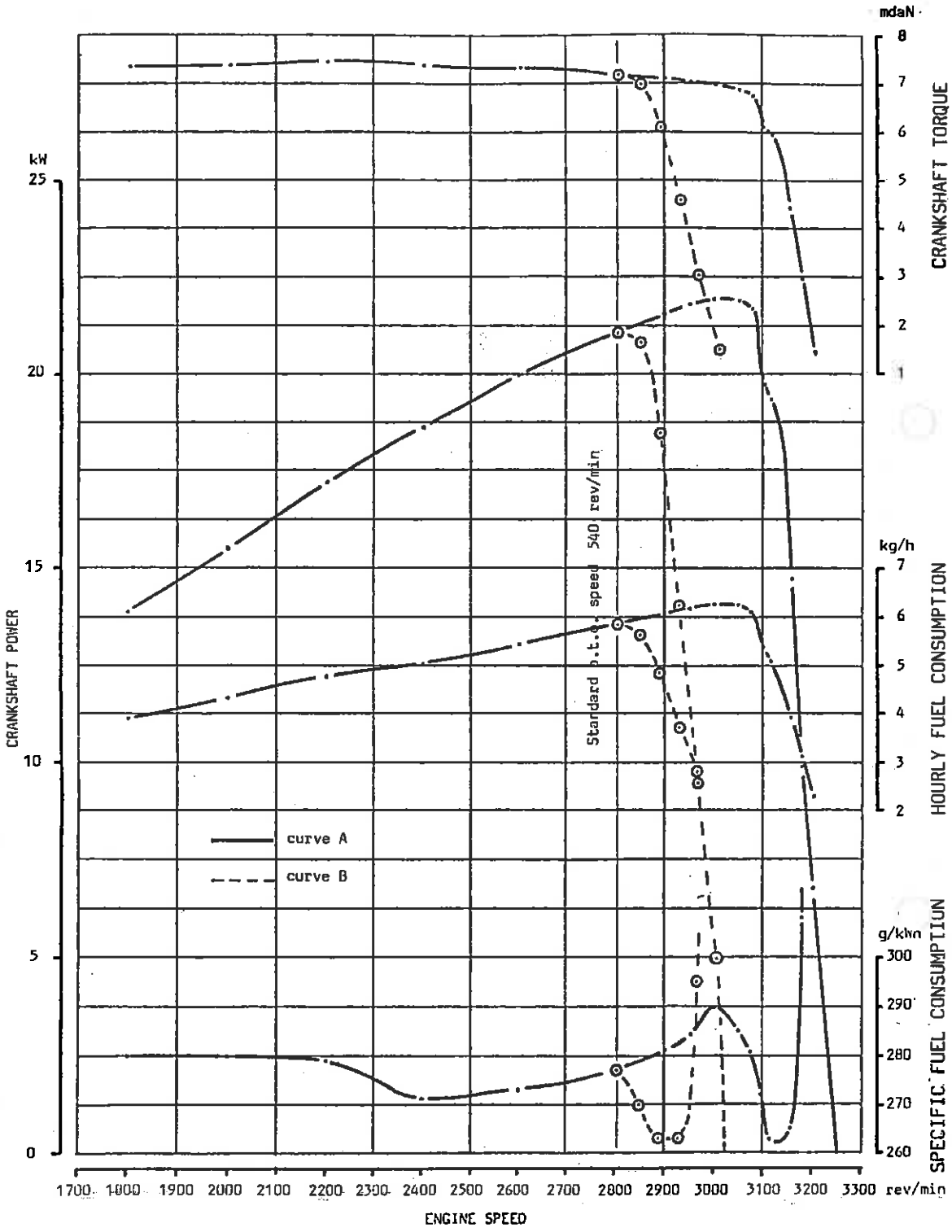


Fig. 1 - POWER TAKE-OFF TEST

GOLDONI 933 ARTICULATED 4 WD

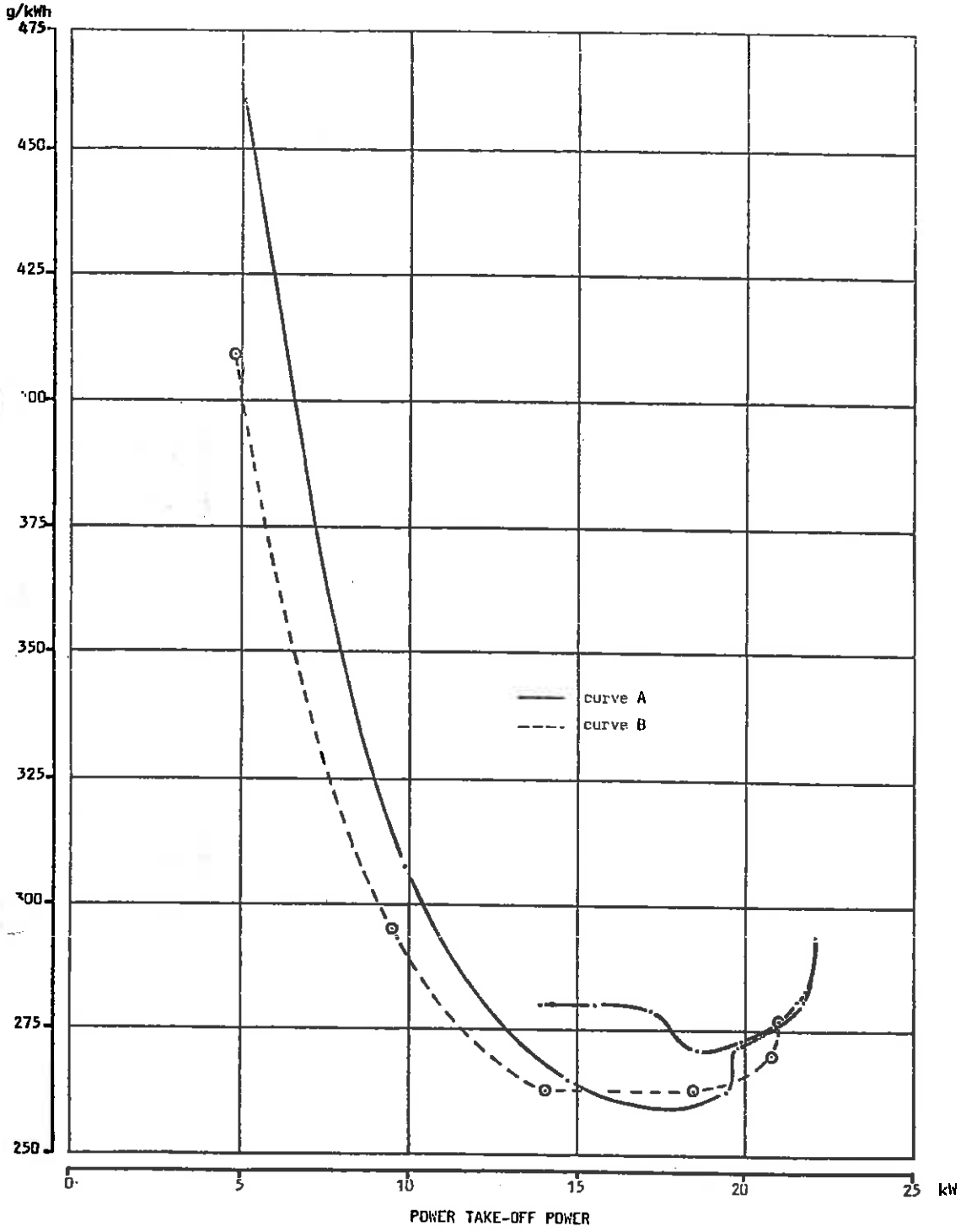


Fig. 2 - POWER TAKE-OFF TEST