Comitato di Coordinamento per l'Omologazione
delle Macchine Agricole in Italia

REPORT No. 304/O.E.C.D.

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

FERRARI MC/60/RT 100 DIESEL TRACTOR

Manufactured by: **FERRARI S.p.A.**
LUZZARA (Reggio Emilia) - Italy



DATE OF TESTS: SEPTEMBER - NOVEMBER 1968

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. Tractor Test Code

Date of approval: 4th July 1969 Serial No.: 274

CONSIGLIO NAZIONALE DELLE RICERCHE
LABORATORIO
PER LA MECCANIZZAZIONE AGRICOLA
Torino - Italy

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

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OPTIONAL TESTS

- None

PERFORMANCE CURVES

Fig. No.

a) **Power take-off tests**

— Power take-off horsepower, equivalent crankshaft torque, hourly and specific fuel consumption / engine speed 1

— Specific fuel consumption / power take-off horsepower 2

b) **Drawbar tests**

— Power and percentual wheelslip / drawbar pull 3

— Travel speed and specific fuel consumption / drawbar pull 4

Manufacturer:	FERRARI S.p.A. LUZZARA (Reggio Emilia) - Italy.
Submitted for tests by:	The manufacturer.
Selection:	Selected jointly by the Manufacturer and the « LABORATORIO PER LA MECCANIZZAZIONE AGRICOLA ».
Place of running-in:	FERRARI S.p.A. workshop - LUZZARA - Italy.
Running-in duration:	Engine: 55 hrs; Power take-off: 25 hrs; transmission 30 hrs.

SPECIFICATION OF TRACTOR

TRACTOR

Make:	FERRARI.
Model:	MC/60/RT 100
Type:	Four whell drive and articulated steering frame. 60242.

ENGINE

Make:	LOMBARDINI.
Model:	LDA 100.
Type:	4 stroke, direct injection Diesel.
Serial number:	467753.
Cylinders:	One; vertical; 100 mm bore x 90 mm stroke; capacity 707 cm^3; compression ratio 17 : 1; over head valves; replaceable cylinder liner.
Fuel system:	Gravity feeding system: cartridge type paper filter, make Lombardini, model 273-3730-15; fuel tank capacity 7,4 liters. Injection pump, make BOSCH, model PFR 1 K 70/SM-315M, manufacturer's normal metting: 48÷52 mm per cycle at 1500 rev/min of the pump, fuel temperature 15°C. Injector, make BOSIO, model BLL 160 SL 100, injector pressure 180±5 kg/cm^2.

Governor: Make Lombardini; mechanical with centrifugal weights; separate from the injection pump; governed range of engine speed: 1000 to 3350 rev/min; nominal speed 3000 rev/min.

Air cleaner: Main cleaner: make Lombardini; oil bath type, oil capacity 0,300 liters; pre-cleaner: centrifugal type.

Lubrication system: Forced feed from gear type pump; centrifugal filter; oil sump capacity 2,600 liters; recommended oil change period 100 hrs.

Cooling system: Air circulation type activated by a bladed flywheel; diameter of flywheel 308 mm; number of blades 28.

Starting system: Electrical; BOSCH JD (R), 12 V, 1.8 HP motor.

Electrical system: Voltage 12 V; DUCATI model 26583/3 alternator; FIAMM model 6 AM45, 50 Ah capacity lead battery.

TRANSMISSION

Clutch: Make PITTERI-VIOLINI, model F 187.2 single dry platetype, diameter 185 mm; pedal operated.

Gearbox: Own make; model MC 60/3; mechanical type comprising constant mesh and sliding type gears; 8 forward speeds (2x2x2) and 4 reverse (2x2).

Front axle: Own make, model MC 60/3; two planetary differential, helical bevel gears, claw clutch lock operated by hand lever.

Rear axle: Own make, model RT 60/3; four planetary differential, helical bevel gears.

The front and rear axle are coupled by an universal joint.

Oil capacity: Gearbox and final front transmission: 10 liters; rear final transmission: 6 liters; recommended oil change period: 1200 working hours.

GEAR	NUMBER OF ENGINE REVOLUTIONS FOR ONE REVOLUTION OF DRIVING WHEELS	NOMINAL TRAVELLING SPEED AT 3000 rev/min ENGINE SPEED km/h
I	356.918	1.13
II	262.455	1.56
III	146.322	2.80
IV	107.591	3.81
V	69.474	5.91
VI	51.084	8.03
VII	28.481	14.41
VIII	20.940	19.60
I R.	188.932	2.17
II R.	138.948	2.95
III R.	77.450	5.30
IV R.	56.962	7.20

POWER TAKE-OFF: At the rear of the tractor, central position, hand lever operated.

Dimensions: 26x30x6 mm (26 UNI 220), 6 splines.

Height above ground: 280 mm.

Speeds of the p.t.o. proportional to an engine speed of 3000 rev/min, with clockwise direction viewed from tractor rear: 186, 253, 954, 1296 rev/min.

Speeds of the p.t.o. proportional to an engine speed of 3000 rev/min, with anticlockwise direction; 351, 477 rev/min.

Speeds proportional to travelling speed: 0.08 to 0.35 m for one revolution of the p.t.o.

Number of revolutions of the p.t.o. for one revolution of driving wheels: 6.67 to 30.42.

BELT PULLEY:

At rear of tractor, driven by the p.t.o. directly or by the intermediate of a bevel gear reduction (rate of reduction 14/15).
Dimensions: diameter 190 mm, width 70 mm.

SPEEDS OF PULLEY AT ENGINE OF 3000 rev/min

COUPLING			
Direct		Reduction gear	
Rotating speed rev/min	Linear speed m/sec	Rotating speed rev/min	Linear speed m/sec
Clockwise direction			
186	1.84	174	1.72
253	2.50	236	2.33
954	9.43	890	8.79
1296	12.80	1210	11.95
Anticlockwise direction			
351	3.47	328	3.24
477	4.22	445	4,40

When the bevel gear reduction is used the direction of rotation of the pulley may be changed by a rotation of 180° of the pulley assembly.

POWER LIFT:

Own make, model MC/60/RT.
Hydraulic system: a gear pump, coupled to the cranckshaft at the front end, supplies oil at a pressure of 70 kg/cm² to two external hydraulic cylinders. These cylinders move a rocker arm on which are attached the implements.
Oil capacity: 10 liters; the oil used is the same oil contained in the transmission sump.
Vertical displacement of the hitch points of the rocker arm: 240 mm starting from 175 mm above ground level.

HITCH:

Clevis type, adjustable by mean of a drilled sliding guide. Height above ground of the center of the clevis: two position, 280 mm and 620 mm.
Hitch connecting hole: diameter 28 mm; distance from the rear axle 365 mm, position referred to the power take-off: vertical distance (above p.t.o.): 0 to 340 mm, horizontal distance (backwards): 60 mm.

STEERING: Own make; mechanical type working on the center, pivot of the tractor by mean of: steering wheel, worm gear box, connecting rod.

BRAKES: Mechanical type with drums and expanding shoes, mounted on rear axle; operated by a single pedal for normal braking action and by a hand lever with ratched for parking.

DRIVE WHEELS: Two front and two rear; « Tractor Agricolo » 7.50 - 16 tyres, 2 ply rating, 5.50 F rim, maximum permissible weight on each tyre 360 kg at 0,8 kg/cm² internal air pressure.
Track width: 680 to 810 mm, changed by reversing inner and outer wheel centers.
Wheel base: 1100 mm.

TRACTOR WEIGHTS:
(without driver, with tanks full)

- front 440 kg
- rear 220 kg
- total 660 kg.

SEAT: Own make; mounted on flat spring support; upholstered rubber cushion.

NUMBER OF GREASE POINTS: Eleven.

GENERAL DIMENSIONS

- overall lenght: 2.27 mm
- width: minimum 0.87 m, maximum 1.00 m
- overall height (to the top of steering wheel): 1.10 m
- minimum ground clearance (to underside of gearbox): 0.21 m.

LIGHTING

	HEIGHT ABOVE GROUND OF CENTER	DIAMETER	DISTANCE OF CENTRE FROM OUTSIDE EDGE OF TRACTOR
	cm	cm	cm
Headlights	83	10	41
Side lights	83	10	41
Rear lights	87	4	22
Reflectors	82	6	22

SPECIAL EQUIPMENT: The tractor may be equipped (optional) with a special device which permits the rotation of the seat of an angle of 180° and its positioning on the tractor hood. This arrangement allows the use of the 4 reverse gears for travelling and the frontal operation of the working implements coupled to the power take-off.

FUELS AND LUBRICANTS USED IN TESTS

LABORATORY TESTS

Fuel: Diesel oil, density 0.831 kg/l at 15°C, cetane number not recorded.

Engine oil: BP TRACTOR OIL UNIVERSAL S1, SAE 20W-40.

Transmission oil: BP TRACTOR OIL UNIVERSAL S1, SAE 20W-40.

TESTS ON ARTIFICIAL TRACK

Fuel: Diesel oil, density 0.831 kg/l at 15°C, cetane number not recorded.

Engine oil: BP TRACTOR OIL UNIVERSAL S1, SAE 20W-40.

Transmission oil: BP TRACTOR OIL UNIVERSAL S1, SAE 20W-40.

COMPULSORY TESTS

1 POWER TAKE-OFF PERFORMANCE

Date and location of tests: **4th September** 1968 - L.M.A. - TURIN (Italy)
Type of dynamometer: Electric, dynamo **type brake** with swinging frame

POWER	SPEEDS		FUEL CONSUMPTION		
	ENGINE	POWER TAKE-OFF	HOURLY	SPECIFIC	HPh/UNIT VOLUME
HP	rev/min	rev/min	l/h	g/HPh	HPh/l
A - MAXIMUM POWER - 2 hrs					
15.60	3000	954	4.30	229	3.63
B - STANDARD P.T.O. SPEED (540 rev/min)					
9.65	1698	540	3.03	261	3.18
C - SPEED RECOMMENDED BY MANUFACTURER FOR DRAWBAR WORK					
15.60	3000	954	4.30	229	3.63
D - PARTS LOADS					
13.95	3152	1003	3.61	215	3.86
—	3345	—	1.35	—	—
7.21	3260	1037	2.32	266	3.11
15.60	3000	954	4.30	229	3.63
3.66	3312	1054	1.73	393	2.12
10.69	3223	1025	2.90	225	3.69

No load maximum engine speed: 3345 rev/min

Crankshaft torque at maximum power: 3.72 mkg

Maximum crankshaft torque: 4.18 mkg at 2000 rev/min

Mean atmospheric conditions:
— temperature 24.5°C
— pressure 741.0 mmHg
— humidity 63%

Maximum working temperatures:
— coolant 70°C
— fuel 30°C
— engine oil 120°C

2 DRAWBAR PERFORMANCE

Date of tests: 11-12 and 13th November 1968
Type of track: cement
Height of drawbar above ground: 220 mm

GEAR	POWER	DRAWBAR PULL	TRAVELLING SPEED	ENGINE SPEED	WHEEL SLIP	FUEL CONSUMPTION		TEMPERATURE			ATMOSPHERIC CONDITIONS		
						HPh/UNIT VOLUME	SPECIFIC	FUEL	COOLING AIR	ENGINE OIL	TEMPE-RATURE	RELATIVE HUMIDITY	PRESSURE
No.	HP	kg	km/h	rev/min	%	HPh/l	g/HPh	°C	°C	°C	°C	%	mmHg
1 - MAXIMUM POWER													
I	2.82	693	1.10	3327	15.0	—	—	—	54	106	11.4	86	743.0
II	3.96	703	1.52	3320	15.0	—	—	—	54	106	11.4	86	743.0
III	7.02	703	2.70	3272	14.4	2.72	305	25	56	108	11.2	88	743.1
IV	9.45	693	3.68	3250	13.5	3.19	260	25	60	110	11.2	88	743.1
V	13.85	676	5.53	3097	12.0	3.31	251	25	60	110	11.0	88	743.4
VI	14.90	521	7.72	3000	6.8	3.32	250	25	65	115	11.0	88	743.4
VII	14.32	275	14.06	2921	2.3	3.23	258	25	65	118	11.0	88	743.4
2 - FIVE HOUR TEST AT 75% OF PULL AT MAXIMUM POWER													
VI	11.91	386	8.33	3165	4.7	3.62	275	20	60	108	8.5	88	740.8
3 - FIVE HOUR TEST AT PULL CORRESPONDING TO 15% WHEELSLIP IN TEST I (*)													
IV	10.25	706	3.92	3237	7.3	3.08	269	20	58	106	10.0	81	739.9

OIL CONSUMPTION DURING TEN HOURS DURATION OF TESTS 2 and 3: 14 g/h

(*) Test n. 3 was carried out with 300 kg ballast.

3-4 TURNING SPACE AND TURNING CIRCLE

Details of wheel equipment: as in specification without ballast front and rear 810 mm
Track of wheels:

		WITHOUT BRAKES	
		Right Hand	Left Hand
Radius of turning space	m	2.58	2.54
Radius of turning circle	m	2.48	2.44

No « with brake » tests has been carried out since tractor is not provided with auxiliary steering brakes.

5 LOCATION OF CENTER OF GRAVITY

	mm
Height above ground	510
Distance forward from the vertical plane containing the axis of the rear wheels	690
Distance from the median plane of tractor	0

6 BRAKING

Date of test: 7th November 1968
Type of track: cement

Cold brakes:

Travelling speed of tractor		km/h	19.50
Deceleration	m/s	~~km/h~~	5.00
Stopping distance	m	~~km/h~~	5.30
Force on brake pedal	kg	~~km/h~~	18

Brake fade characteristics (hot tests):

Deceleration hot / deceleration cold x 100 = 106%

Stopping distance cold / stopping distance hot x 100 = 108%

Force on pedal cold / force on pedal hot x 100 = 90%

Efficiency of hand brake:

No rotation of the wheels is observed when the tractor is pulled forward or backward with hand brake locked

Pull on hand brake: cold 40 kg; hot 40 kg

7 MEASUREMENT OF AMBIENT NOISE EMITTED BY THE TRACTOR

Date of tests: 7th November 1968

Type of sound level meter: ELIT Mod. 905

Type of track: cement

Results of tests:

— gear VIII

— travelling speed 11.8 km/h

— sound level 98 dBA

8 NOISE MEASUREMENT AT THE DRIVER'S EAR LEVEL

Date of tests: 7th November 1968

Type of sound level meter and octave filter: ELIT Mod. 905 and ELIT Mod. 955

Type of track: cement

Type of frequency analyzer: octave type, with 10 frequency bands 31.5 to 16.000 Hz

RESULTS OF TESTS

GEAR	TRAVELLING SPEED km/h	LOUDNESS sones
IV	3.90	159
V	6.05	169
VI	8.25	176

9 POWER LIFT AND HYDRAULIC PUMP PERFORMANCE

Date and location of tests: 5th November 1968 - L.M.A. - Turin (Italy)

Hydraulic fluid: BP TRACTOR OIL UNIVERSAL S1, SAE 20W-40
Viscosity index 115

	VERTICAL MOVEMENT	MAXIMUM FORCE EXERTED THROUGH FULL RANGE	PRESSURE	LINKAGE LOAD AT WHICH UNBALLASTED FRONT END OF TRACTOR LIFTS OFF THE GROUND
	mm	kg	kg/cm²	kg
Linkage giving maximum mechanical advantage				
— At lower hitch points (height above ground in down position 175 mm)	240	750	75	—

Opening pressure of relief valve: 70 kg/cm²

PUMP CHARACTERISTICS:

1) — **opening pressure of relief valve:** 70 kg/cm²
— **sustained pressure of the open relief valve:** 75 kg/cm²

2) — **pump delivery rate at 3000 rev/min and maximum pressure:** 16 l/min

3) — **maximum hydraulic power at 3000 rev/min:** 4.2 HP
— **at delivery rate:** 15.07 l/min
— **pressure:** 100 kg/cm²

OFFICER IN CHARGE
(Ing. R. Gioia)

HEAD OF L.M.A.
(Dott. L. Lisa)

Turin, 28th January 1969

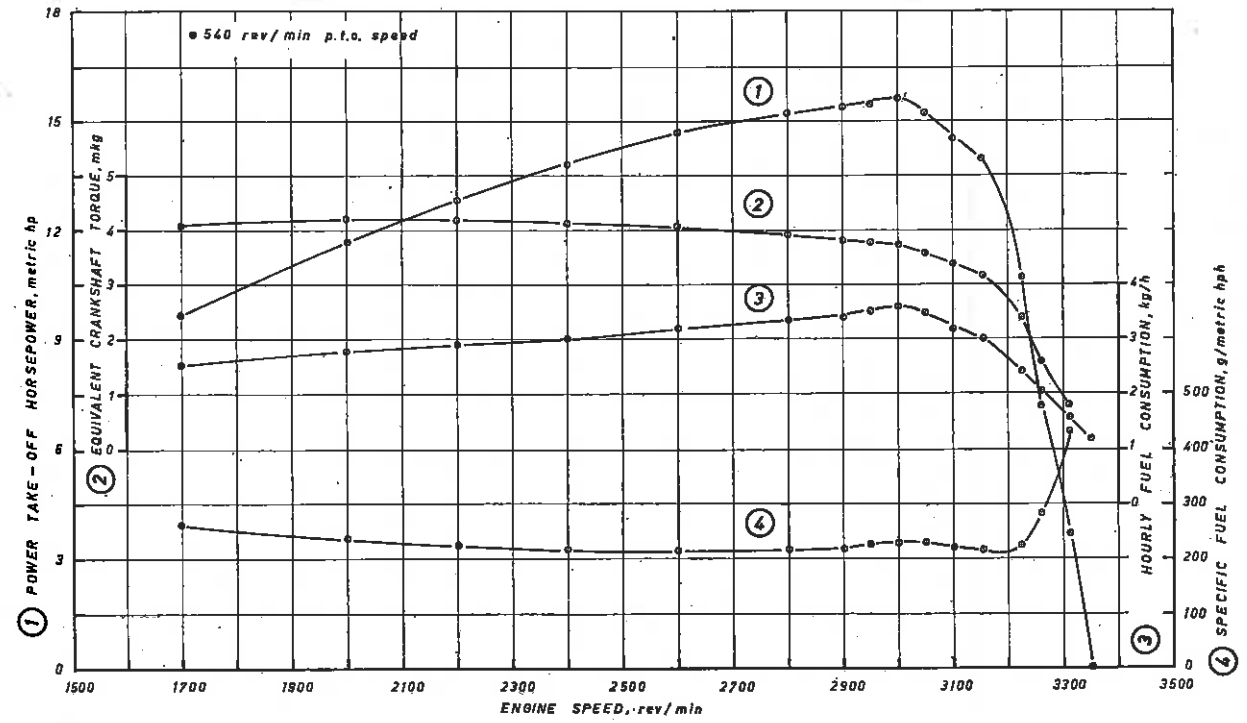
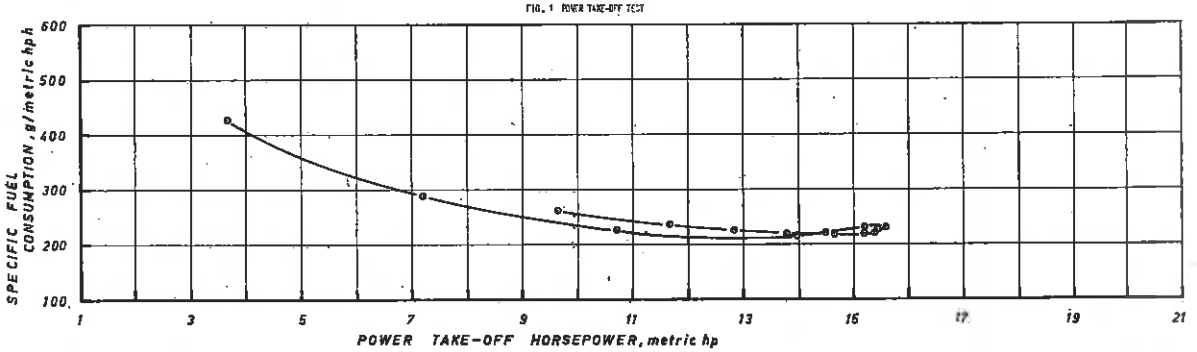
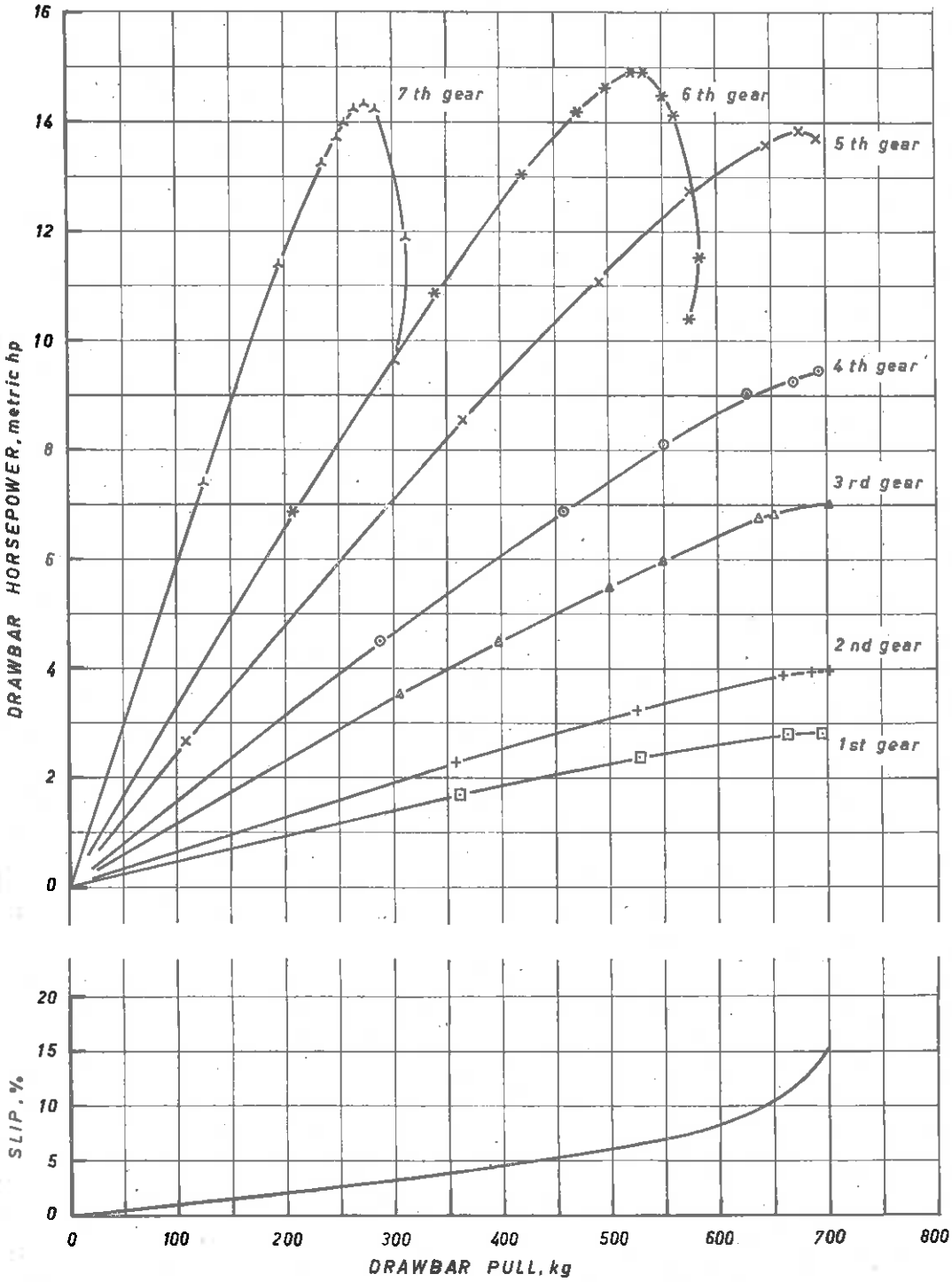
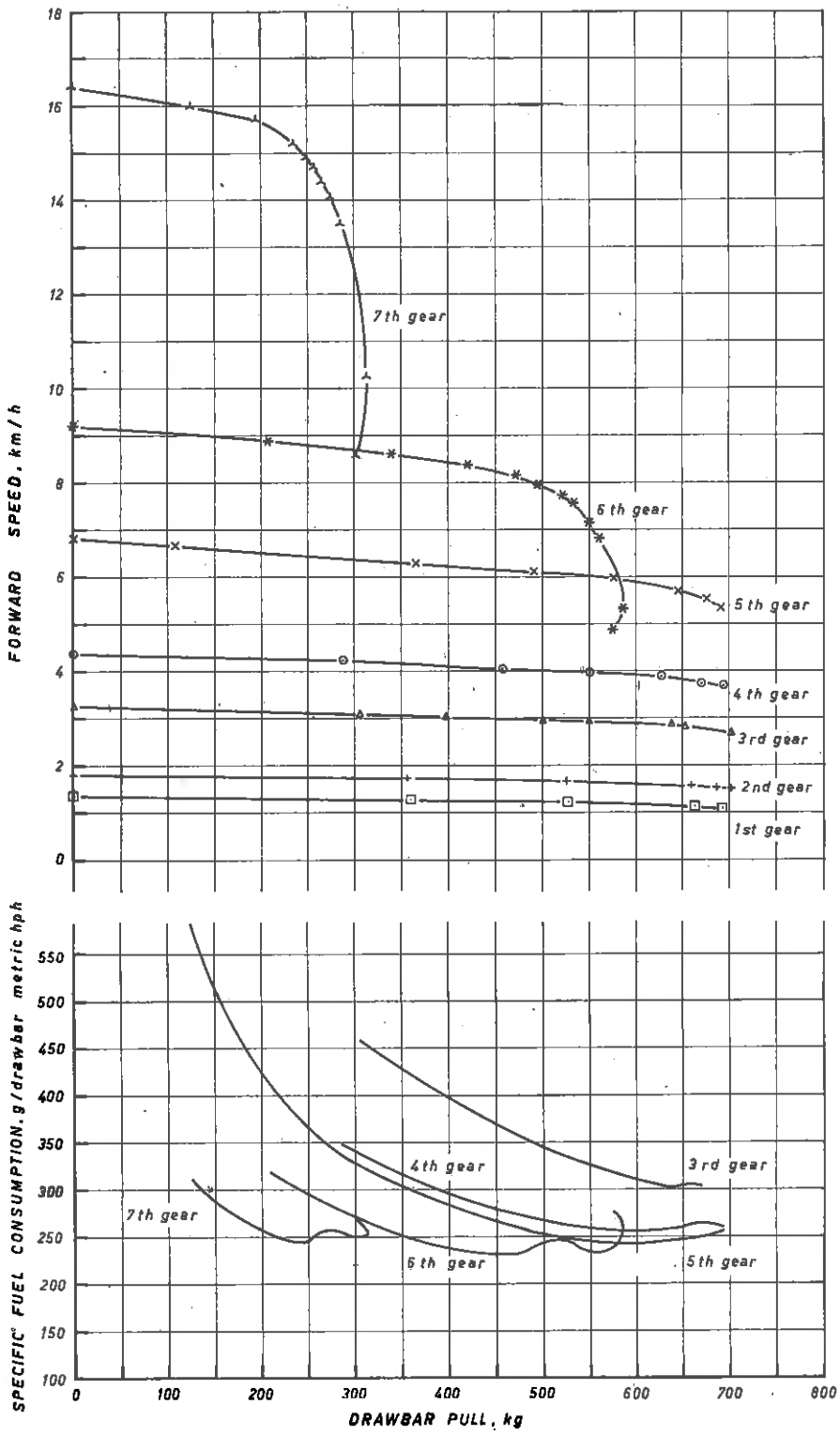


FIG. 1 POWER TAKE-OFF TEST




DRAWBAR HORSEPOWER, metric hp
16
14
12
10
8
6
4
2
0
7 th gear
6 th gear
5 th gear
4 th gear
3 rd gear
2 nd gear
1st gear
SLIP, %
20
15
10
5
0
0
100
200
300
400
500
600
700
800
DRAWBAR PULL, kg


FORWARD SPEED, km/h
18
16
14
12
10
8
6
4
2
0
7th gear
6th gear
5th gear
4th gear
3rd gear
2nd gear
1st gear
SPECIFIC FUEL CONSUMPTION, g/drawbar metric hph
550
500
450
400
350
300
250
200
150
100
4th gear
3rd gear
7th gear
6th gear
5th gear
0
100
200
300
400
500
600
700
800
DRAWBAR PULL, kg