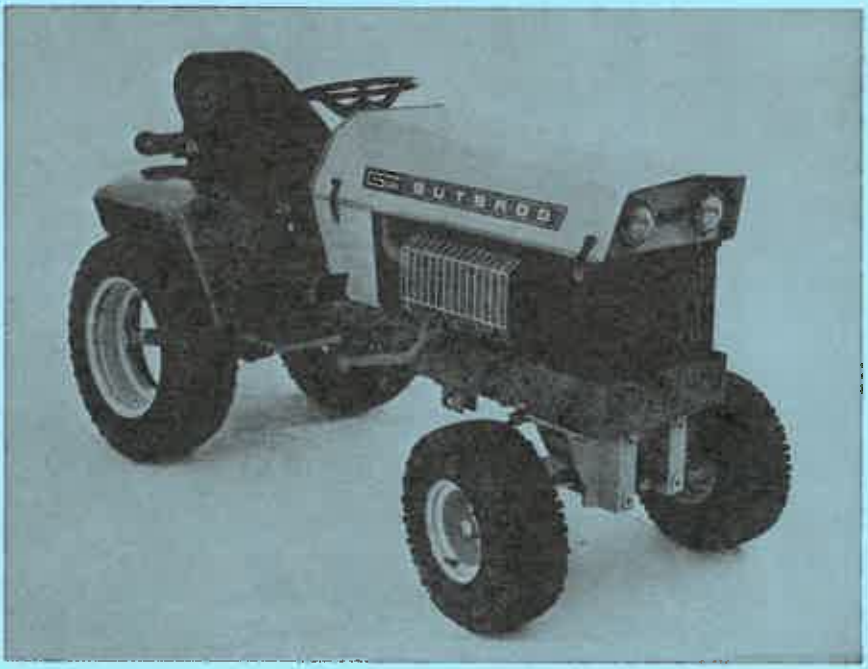
DLG	Report on test in accordance with O.E.C.D. STANDARD CODE	O.E.C.D. No. 573



Agricultural Tractor GUTBROD 2400

Manufacturer

Gutbrod-Werke GmbH, D-6601 Saarbrücken-Bübingen

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

Execution of tests:

November 1976 till June 1977

DLG-Testing-Station for Agricultural Machinery, Max-Eyth-Weg 1, D-6114 Groß Umstadt

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

Date of Approval: 24th November 1977 O.E.C.D. No. 573

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 = 0,102 kp	or 1 kp = 9,81 N
Powers	1 kW = 1,36 PS	or 1 PS = 0,736 kW
Pressures	1 bar = 1,02 kp/cm²	or 1 kp/cm² = 0,981 bar
	1000 mbar = 750,1 mm Hg	

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December 1977; DLG-No. 108

PRÜFUNGS-ABTEILUNG
GUTBROD 2400

Test No. 76-80

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PRÜFUNGS-ABTEILUNG
GUTBROD 2400

Test No. 76-80

Tractor manufacturer:	GUTBROD WERKE GMBH D-6601 Saarbrücken-Bübingen
Submitted for test by:	Manufacturer
Selected by:	Manufacturer with agreement by DLG
Place of running-in:	Saarbrücken and Groß-Umstadt
Duration of running-in:	Engine and tractor appr. 100 hours

SPECIFICATION OF TRACTOR

Tractor

Make:	GUTBROD WERKE GMBH
Model:	2400
Type:	Wheeled tractor, chassis construction, rear wheel driven
Serial No:	637 057

Engine

Make:	RENAULT FRANCE
Model:	839-06
Type:	4-stroke OTTO engine, watercooled
Serial No:	0606 398 48
Cylinders:	4 in-line, bore 55,8 mm, stroke 80 mm; displacement 782 cm³, compression ratio 8,5:1 replaceable wet cylinder liners
Valves:	Overhead
Fuel system:	GUIOT fuel feed pump model U, ZENITH carburetor 28 IF main jet 92, idling jet 35, KARCOMA screen filter, optionally AMFG; replaceable cartridge, capacity of fuel tank 14 l
Engine speed control:	Throttle flap in venturi of carburetor; GUTBROD centrifugal maximum speed type governor; rated engine speed 2800 rev/min no load minimum engine speed 1000 rev/min

PRÜFUNGS-ABTEILUNG
GUTBROD 2400

Test No. 76-80

Ignition system:	Electrical, radio-screened; firing order 1-3-4-2; BOSCH spark plugs W 175/T1; optionally BERU W 175/T1 or AC 44 F or MARCHAL 36 or AUTOLITE AE 32 or CHAMPION L 87 Y; firing point 5° before TDC; distributor with automatically acting speed governed ignition timing device
Air cleaner:	PROUST oil bath air cleaner, capacity o,3 l; recommended oil same as engine oil; replaceable cartridge; cyclonic precleaner
Exhaust silencer:	ROTH multi-chamber expansion type silencer; 100 x 190 mm oval, 330 mm long; on the right hand side of engine; mouth showing rearward
Lubrication system:	Forced-feed from gear type pump; strainer in sump; RENAULT oil filter in full flow with by-pass and replaceable cartridge; cartridge change at all oil changes; oil capacity 2,5 l; oil changing interval 100 hours; recommended oil viscosity: winter HD SAE 5W/20 summer HD SAE 10W/30 tropics HD SAE 20W/40
Cooling system:	Liquid cooling impeller assisted; special cooling fluid RENAULT 806 835/09; frost resistant to -35°C or water mixed with glysantine or similar product; thermostat without by-pass; overpressure relief valve set to 0,5 bar; fan with 6 blades, 300 mm diameter; cooling fluid capacity 5,5 l
Starting system:	Electrical: DUCELLIER, optional PARIS-RHONE; screw-push-starter motor 12 V, 0,88 kW; choke as starting aid

Electrical equipment:	12 Volt, negative earth; BOSCH 3-phase generator G1 14V 28A 22; 1 lead acid battery 18 Ah at 20 hours rating

Transmission

Clutch:	FERODO dry single disc clutch; diameter 160 mm; for travelling and main p.t.o. drive; pedal operated
Gear box:	Own make; speed change gear with 4 forward speeds and 1 reverse speed; 1st and 4th speed collar shifted; 2nd, 3rd and reverse speed sliding gear shifted; It is not allowed to use the tractor for long uninterrupted high drawbar pull because of high temperature raise of the transmission lubricant
Rear axle:	Worm drive; bevel gear type differential with lock; hand lever operated; not self-disengaging
Oil capacity:	4 l SAE 140 hypoid-oil
Oil changing interval:	200 hours

Power take-off

Main p.t.o.	Dependent p.t.o. (proportional engine speed p.t.o.); at rear of tractor, 400 mm above ground, in tractor's median plane; 23,5 X 28,5 x 7 mm = 1 1/8in, 6 splines; 1004 rev/min at rated engine speed standard p.t.o. speed 1000 rev/min at 2790 rev/min engine speed; direction of rotation anticlockwise, viewed from tractor rear

Total ratios and speeds

Gear	Total ratio engine : driving wheel	Theoretical travelling speed at rated engine speed *) km/h
forward		
1	204,4	1,62
2	80,2	4,13
3	42,6	7,78
4	20,0	16,57
reverse		
R	80,2	4,13

*) calculated with the rolling radius 314 mm

Secondary p.t.o.: Independent p.t.o. (live p.t.o.)
at front of tractor, 290 mm above ground,
in tractor's median plane;
mounted in the front axle case;
V-belt driven from crankshaft front end;
engageable and disengageable under load
mechanically by stretching and releasing
V-belt;
2 p.t.o. stub shafts, one showing forward,
one showing rearward;
23,5 x 28,5 x 7 mm = 1 1/8in, 6 splines;
1400 rev/min at rated engine speed

direction of rotation clockwise,
viewed from tractor rear,
no tractormeter fitted

Power lift	Disintegrated construction; BOSCH hydraulic pump 0542 507/301 assembled with control valve and hydraulic oil tank; pump delivery 2 cm³/rev or 6 l/min at rated engine speed; V-belt driven by engine; control valve for upward and downward motion and floating position; maximum pressure 150 bar; 1 single acting ram, 25 mm bore, 140 mm stroke; no overpressure relief valve in ram; hydraulic oil tank with 1,5 l capacity; additional hydraulic oil tank with 1,5 l capacity too; 1 l may be taken off through oil tapping when tractor is working driving or stationary; up to 4 oil tappings at front and 1 oil tapping at rear of tractor available; recommended oil quality: engine oil HD SAE 10W; oil changing interval 600 hours or once a year
Implement linkage: (at rear)	Three point linkage of own construction; the ram is acting with pull rods on the lower links; lower link pivot point 140 mm behind rear axle centre line, on level of rear axle; projected length of lower links 500 mm; pull rods length adjustable from 620 to 690 mm; lifting range above ground with long pull rods from 121 to 491 mm short pull rods from 421 to 696 mm
Implement linkage: (at front)	Optionally an implement quick coupling system at front of tractor is available; not fitted on tractor tested; the rams of this quick coupling system are connected to the hydraulic system through the front end oil tappings

Holed drawbar	Long bar, constructed in U-section; fitted on the clevis of lower links of the implement linkage; total length 650 mm; length between the ball joints of the hitch points 330 mm; height of the bar 86 mm, width 68 mm; centre hole and 6 holes on either side with 50 mm distance each; all holes 17 mm diameter; height above ground adjustable from 250 to 825 mm, depending on pull rods length, measured at the surface of the bar; mechanically fixable in 775 mm height above ground; with lower links in horizontal position distance of centre hole to rear axle centre 645 mm to p.t.o. shaft end 430 mm
Trailer hitch	WESTFALIA model 339 001 not automatical; height above ground 520 mm; hitch hole 25 mm diameter; distance from hitch hole to rear axle centre 230 mm; permissible vertical load 200 kg permissible trailer weight 1550 kg
Towing lug	Height above ground 460 mm
Steering	CAM-GEARS model 14 : 1/1 TD ST 62; one finger worm gear steering; mechanically acting on front wheels
Brakes	
Parking brake:	Oil immersed disc type brake; mechanically acting on 1 disc with 87 mm diameter on the worm gear shaft; operated by hand lever with ratchet

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GUTBROD 2400

Test No. 76-80

Brakes (Continuation)

Service brake:	KNOTT band brake, mechanically acting on 2 brake drums with 135 mm diameter on the rear wheels; pedal operated
Steering brake:	Not available

Wheels

Steered wheels:	2 pneumatics at front 4,00-10 AM 2 ply; maximum permissible load 185 kg per tyre at 1,5 bar inflation pressure and 20 km/h; track width 735 mm, not adjustable; rims 3,00 B x 10
Driving wheels:	2 pneumatics at rear 6,5-15 AS 2 ply; diagonal type tyre casing; maximum permissible load per tyre 280 kg at 0,8 bar inflation pressure and 20 km/h; track width 760 mm, not adjustable; rims 5 J x 15
Wheel base:	1400 mm

Seat	Own make (optionally GRAMMER) upholstered seat with back rest; not adjustable spring without shock absorber; height of driver's platform above ground 440 mm; height of seat above platform 450 mm, seat not compressed; not adjustable up and down; for and aft adjustable 45 mm steplessly

Number of grease points 5

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GUTBROD 2400

Test No. 76-80

Weights — Ready for use as tested

		Without driver	with driver
Without ballast:	front	227 kg	232 kg
	rear	298 kg	368 kg
	total	525 kg	600 kg
Front ballast:	None		
Rear ballast:	1 weight per wheel	36 kg each	72 kg
With ballast:	front	227 kg	232 kg
	rear	370 kg	440 kg
	total	597 kg	672 kg

Dimensions

Total length:	2270 mm	with implement linkage
Total width:	930 mm	
Total height:	1180 mm	to top of back rest
Ground clearence:	190 mm	below front axle

Lighting equipment — Electric 12 V
acc. to German legislation

	Dimensions mm	Height above ground of centre mm	Distance from outside edge of tractor to centre mm
Head lights	88 ø	900	355
Rear lights	70 ø	850	265
Reflectors	50 ø	685	65

PRÜFUNGS-ABTEILUNG
Gutbrod 2400

Test No. 76-80

Permissible axle loads and total weights

for all available wheel equipment

Wheel equipment front	Wheel equipment rear	Permissible front axle load kg	Permissible rear axle load kg	Permissible total weight kg
4,00-10 AM	6,5-15 *)	350	550	900
18x7,00-8	27x8,50-15			
18x8,50-8	27x8,50-15			

all tyres 2 ply

*) Production of DUNLOP FRANCE

FUELS AND LUBRICANTS USED IN TESTS

Fuel: ARAL-OTTO-fuel (DIN 51600)

specific gravity at 15°C

at engine tests	0,740 kg/l
at p.t.o. tests	0,748 kg/l
at drawbar tests	0,748 kg/l

Engine oil: FUCHS HD SAE 10W/30

Transmission oil: VALVOLINE hypoid oil SAE 140

Hydraulic oil: FUCHS engine oil HD SAE 10

PRÜFUNGS-ABTEILUNG
GUTBROD 2400

Test No. 76-80

COMPULSORY TESTS

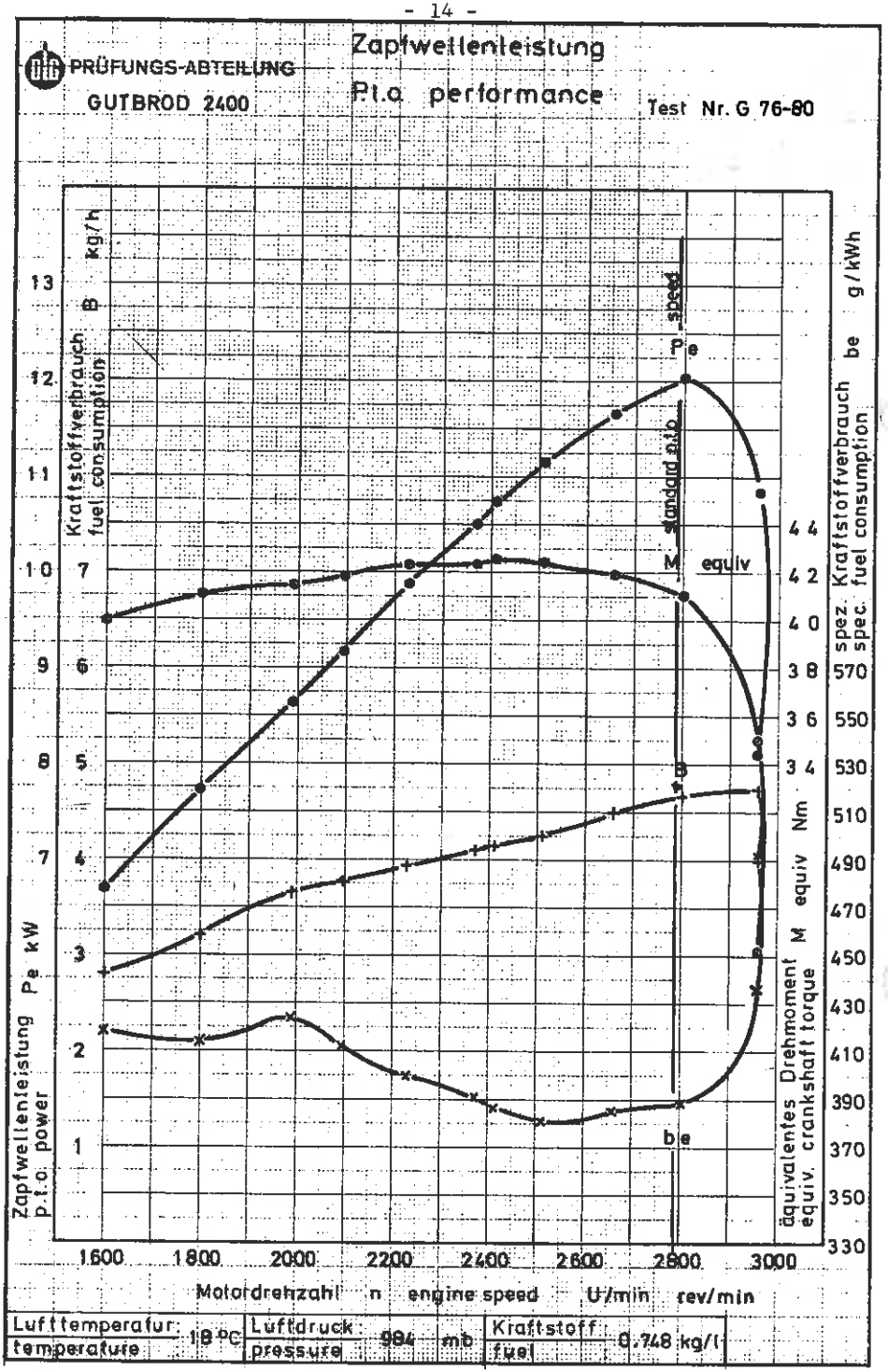
(1) MAIN POWER TAKE-OFF PERFORMANCE

Date of tests: 26th July 1977
Type of dynamometer: SCHENCK eddy-current dynamometer W 150

Power kW	Speed engine rev/min	Speed p.t.o. rev/min	Fuel consumption total l/h	Fuel consumption total kg/h	Fuel consumption specific g/kWh	Specific energy kWh/l
Maximum power						
At 2-hour test						
12.0	2800	1004	6.22	4.67	388	1.93
At standard p.t.o. speed and at speed for drawbar-work						
12.0	2800	1004	6.22	4.67	388	1.93
Part loads						
(i) 85% of the torque at maximum power at 2-hour test						
10.8	2957	1060	6.30	4.72	436	1.72
(ii) unloaded						
-	3458	1239	2.93	2.20	-	-
(iii) 50% of the load defined in (i)						
5.7	3144	1127	4.61	3.46	605	1.24
(iv) maximum power						
12.0	2800	1004	6.22	4.67	388	1.93
(v) 25% of the load defined in (i)						
3.1	3308	1186	3.83	2.87	941	.80
(vi) 75% of the load defined in (i)						
8.1	2957	1060	5.32	3.99	492	1.52

No load maximum engine speed: 3458 rev/min
Equivalent crankshaft torque at maximum power (2 hours): 41 Nm
Maximum equivalent crankshaft torque: 43 Nm at 2408 rev/min of the engine

Mean atmospheric conditions:	temperature	18 °C
	pressure	984 mbar
	relative humidity	89 %
Maximum temperatures:	coolant	85 °C
	engine oil	75 °C
	fuel	18 °C
	engine air intake	20 °C


PRÜFUNGS-ABTEILUNG
GUTBROD 2400
Zapfwellenleistung
P.t.o. performance
Test Nr. G 76-80
Kraftstoffverbrauch B kg/h
fuel consumption
Zapfwellenleistung Pe kW
p.t.o. power
spez. Kraftstoffverbrauch be g/kWh
spec. fuel consumption
äquivalentes Drehmoment M equiv Nm
equiv. crankshaft torque
Pe
M equiv
B
be
standard p.t.o. speed
Motordrehzahl n engine speed U/min rev/min
1600 1800 2000 2200 2400 2600 2800 3000
Lufttemperatur: temperature 18 °C
Luftdruck: pressure 984 mb
Kraftstoff: fuel 0.748 kg/l

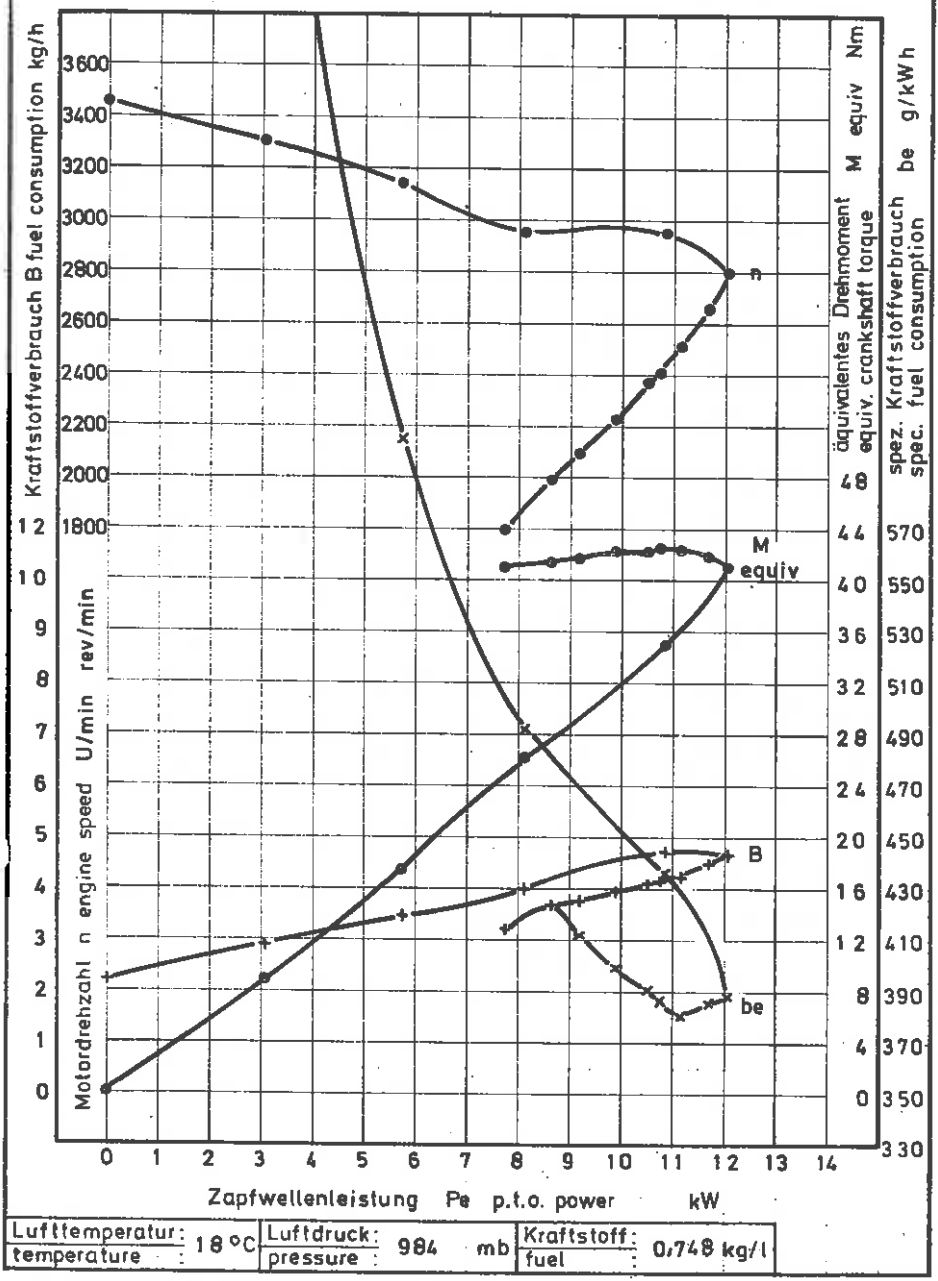
PRÜFUNGS-ABTEILUNG

GÜTBROD 2400

Zapfwellenleistung

P.t.o. performance

Test Nr. G 76-80



Lufttemperatur: temperature :	18 °C	Luftdruck: pressure :	984 mb	Kraftstoff: fuel :	0,748 kg/l

PRÜFUNGS-ABTEILUNG
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(2) DRAWBAR PERFORMANCE

Date of tests: 2nd May till 22nd June 1977
Type of track: Concrete

Gear No.	Speed km/h	Power kW	Drawbar pull N	Engine speed rev/min	Slip of wheels %	Specific energy kWh/l
(i) MAXIMUM POWER with ballast height of drawbar above ground 350 mm						
1	1,64	2,2	4820	3315	15,0	0,59
2	3,76	5,1	4880	2980	15,0	0,92
3	7,01	7,1	3630	2804	9,9	1,08
(ii) FIVE-HOUR-TEST at 50% of pull at maximum power in 2nd gear *)						
2	4,56	3,1	2440	3250	6,1	0,70
(iii) FIVE-HOUR-TEST at pull corresponding to 15% wheel slip in test (i) *)						
1	-	-	4880	-	-	-
(iv) MAXIMUM POWER without ballast height of drawbar above ground 350 mm						
1	1,60	2,0	4600	3234	15,0	0,56
2	3,84	4,6	4300	3016	14,9	0,89
3	6,91	7,6	3940	2810	11,3	1,13

Total oil consumption during ten hours duration of tests (ii) and (iii): 14 g/h

*) at test (ii) drawbar pull reduced and at test (iii) choise of a lower gear because of high temperature raise of transmission lubricant; see note on page 6

PRÜFUNGS-ABTEILUNG

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Tyres make and size front: DUNLOP 4,00-10 AM 2 ply
rear: DUNLOP 6,5 -15 AS 2 ply

Tread bar height at the beginning of drawbar tests
92% of the value when new

Specific fuel consumpt. g/kWh	Temperatures Fuel °C	Coolant °C	Engine-oil °C	Atmospheric conditions Temperature °C	Relative humidity %	Pressure mbar
tyre inflation pressure 0,8 bar rolling radius of tyres under static load 319 mm						
1273	20	72	70	20	66	998
812	21	72	72	20	66	997
690	21	72	74	20	66	997
1058	24	72	75	24	85	998
-	25	72	75	24	82	998
tyre inflation pressure 0,8 bar rolling radius of tyres under static load 322 mm						
1328	20	71	70	19	77	999
839	20	71	71	18	70	998
659	21	71	71	18	70	998

Test (iii) was carried out with additional ballast,
the figures not quoted are therefore irrelevant

PRÜFUNGS-ABTEILUNG
GUTBROD 2400

Test No. 76-80

(3) TURNING SPACE AND TURNING CIRCLE

Wheel equipment front: 4,00-10 AM 2 ply
rear: 6,5 -15 AS 2 ply

Track of wheels front: 735 mm
rear: 760 mm

	Left-hand m	right-hand m
Radius of turning space	2,91	2,86
Radius of turning circle	2,78	2,73

(4) LOCATION OF CENTRE OF GRAVITY

Height above ground	569 mm
Distance forward from rear axle centre	541 mm
Distance from tractor's median plane	0 mm

(5) BRAKING PERFORMANCE

A) SERVICE BRAKE

Date of tests: 3rd Mai 1977
Type of track: Concrete
Type of decelerometer: MOTO-METER-Bremsverzögerungs- und Pedalkraftschreiber

Weight of ballasted tractor: 672 kg with driver

Cold brakes

		With ballast	Without ballast
Travelling speed	km/h	19,6	19,6
Deceleration	m/s^2	4,2	4,0
Stopping distance	m	3,8	4,0
Force on pedal	N	360	270
Force on pedal to achieve a deceleration of 2,5 m/s^2	N	170	130

Brake fade characteristics (hot tests)

Deceleration	hot/cold	%	98	100
Stopping distance	cold/hot	%	100	100
Force on pedal	cold/hot	%	100	96

B) PARKING BRAKE

Tractor facing up 16%-slope:
Pull on hand brake 40 N, tractor does not roll

Tractor facing down 16%-slope:
Pull on hand brake 60 N, tractor does not roll

(6) AMBIENT NOISE EMITTED BY THE TRACTOR

Date of test:	4th May 1977
Type of track:	Concrete
Type of sound level meter:	BRÜEL AND KJAER model 2203

Results of test

Gear:	4th
Travelling speed before acceleration:	15,4 km/h
Sound level:	79,5 dB(A)

(7) NOISE AT THE DRIVER'S EAR LEVEL

Date of tests:	5th May 1977
Type of track:	Concrete
Type of sound level meter:	BRÜEL AND KJAER model 2607
Type of frequency analyzer: (fitted with octave filter)	BÜREL AND KJAER model 1614

No safety cab or safety frame was fitted on tractor

Results of tests

Gear	Drawbar pull at which the tractor develops the maximum sound level N	Travelling speed nominal km/h	Travelling speed effective km/h	Sound level dB(A)
1st	4390	1,62	1,71	89
2nd	4360	4,13	3,90	88
3rd *)	3940	7,78	7,25	90
4th	light load	16,57	20,55	88

*) the 3rd gear corresponds to the travelling speed nearest to 7,25 km/h

PRÜFUNGS-ABTEILUNG
GUTBROD 2400

Test No. 76-80

(8) POWER LIFT AND HYDRAULIC PUMP PERFORMANCE

Date of tests: 6th May 1977

HYDRAULIC PUMP

(1) Opening pressure of relief valve in remote circuit — 121 bar

Sustained pressure by open relief valve — 150 bar

(2) Pump delivery rate at minimum pressure and maximum engine speed — 5,9 l/min

(3) Pump delivery rate — 5,6 l/min

Delivery pressure — 129 bar

Hydraulic power — 1,2 kW

POWER LIFT

Lifting forces at hitch points
(no measurements carried out at the test frame, because no standard implement linkage)

Lifting heights relative to horizontal lower links

mm	-193	-100	0	+100	+107	+177	+200	+300	+382
maximum mechanical advantage, pull rods 620 mm									
N					2570		2500	2390	2260
minimum mechanical advantage, pull rods 690 mm									
N	1670	1860	2020	1980		1880			

Max. force exerted throughout the whole range 2260 N

Front of tractor does not lift.
All values of forces for pressure at max. hydraulic power 129 bar, calculated from measurements at max. oil pressure 150 bar

PRÜFUNGS-ABTEILUNG
GUTBROD 2400

Test No. 76-80

OPTIONAL TESTS

(1) ENGINE PERFORMANCE

Date of tests: 25th November 1976
Type of dynamometer: SCHENCK eddy-current dynamometer W 150

Power kW	Engine speed rev/min	Fuel consumption total l/h	Fuel consumption total kg/h	Fuel consumption specific g/kWh	Specific energy kWh/l
Maximum power					
At 2-hour test					
13.6	2800	6.55	4.91	361	2.08
At standard p.t.o. speed and speed for drawbar work					
13.6	2800	6.55	4.91	361	2.08
Part loads					
(i) 85% of the torque at maximum power at 2-hour test					
12.3	2984	6.47	4.85	395	1.90
(ii) unloaded					
-	3655	2.89	2.17	-	-
(iii) 50% of the load defined in (i)					
6.6	3203	4.61	3.46	524	1.43
(iv) maximum power					
13.6	2800	6.55	4.91	361	2.08
(v) 25% of the load defined in (i)					
3.5	3353	3.50	2.62	760	.99
(vi) 75% of the load defined in (i)					
9.1	2945	5.19	3.90	428	1.75

Optimum fuel consumption: 350 g/kWh at 12,2 kW and 2419 rev/min
No load maximum engine speed: 3655 rev/min
Torque at maximum power (2 hours): 46 Nm
Maximum torque: 48 Nm at 2419 rev/min of the engine

Mean atmospheric conditions:	temperature	18 °C
	pressure	1008 mbar
	relative humidity	55 %
Maximum temperatures:	coolant	85 °C
	engine oil	71 °C
	fuel	18 °C
	engine air intake	19 °C

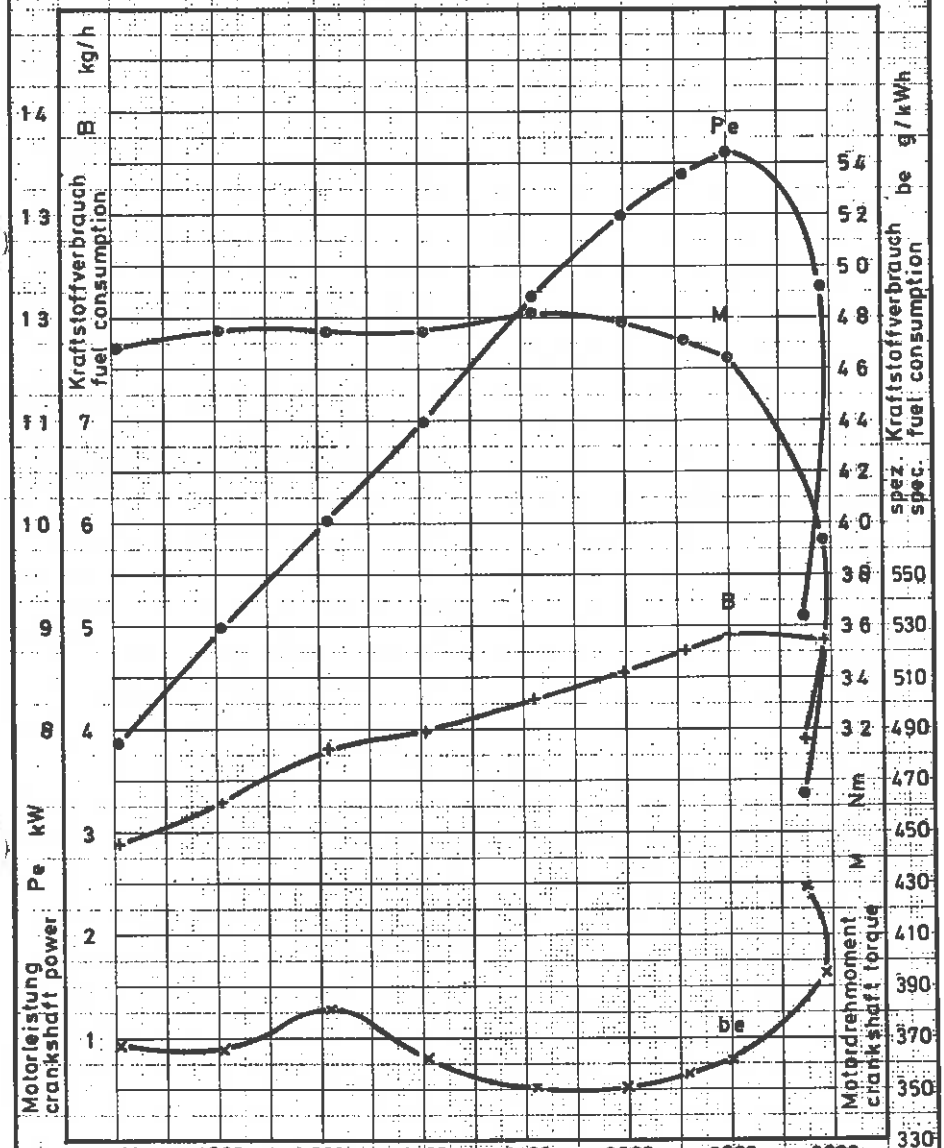
PRÜFUNGS-ABTEILUNG

GUTBROD 2400

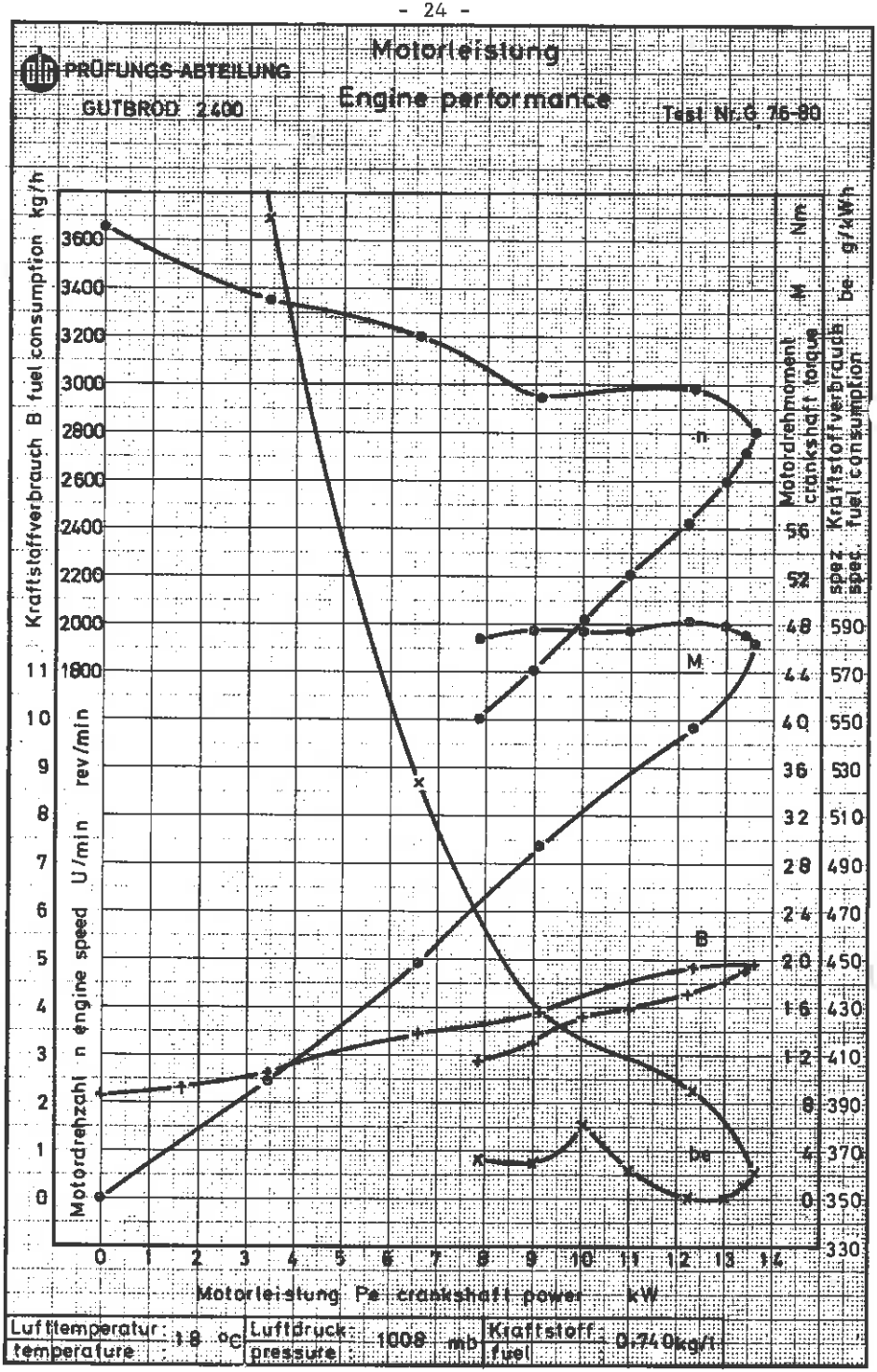
Motorleistung

Engine performance

Test Nr. G 78-80



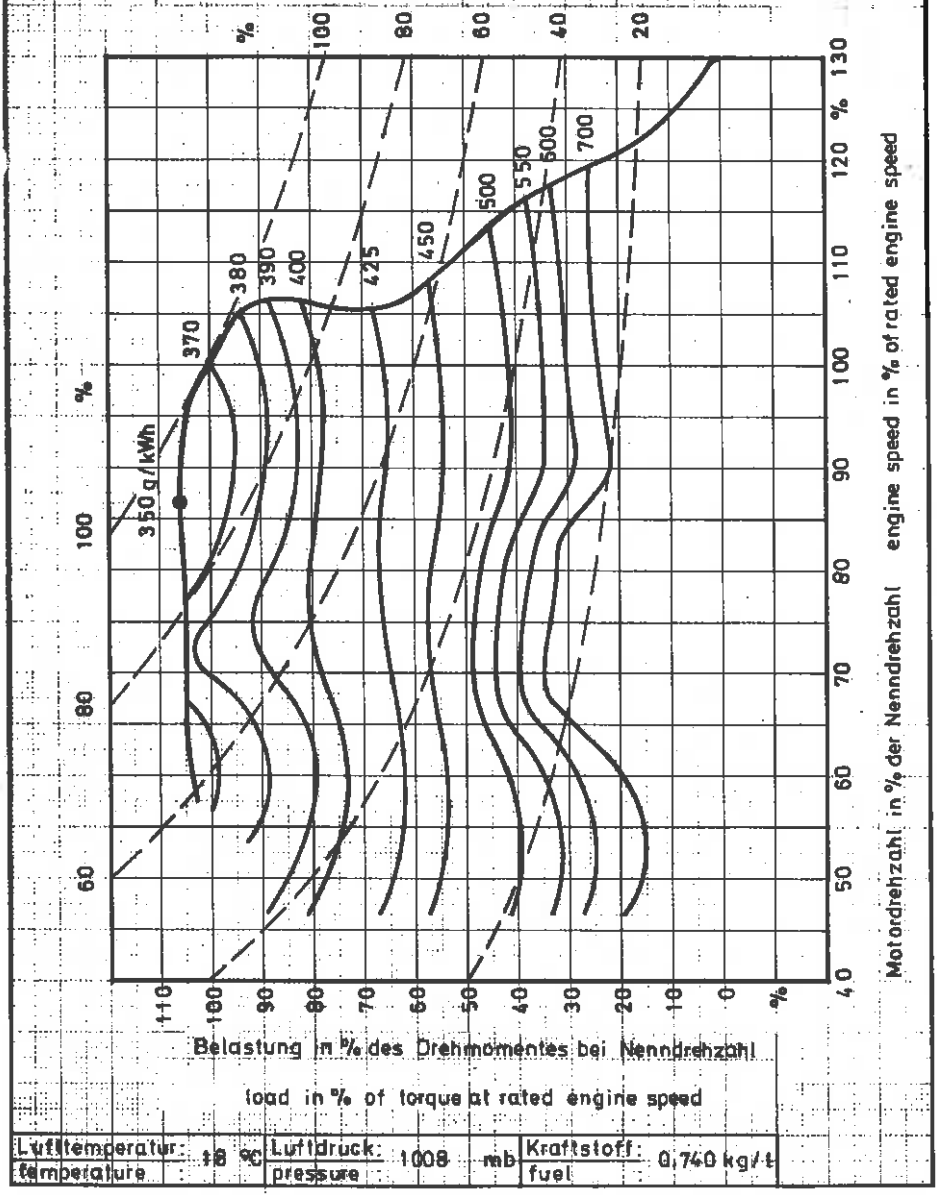
Lufttemperatur: temperature	18 °C	Luftdruck: pressure	1008 mb	Kraftstoff: fuel	0,740 kg/l


PRÜFUNGS-ABTEILUNG
GUTBROD 2400
Motorleistung
Engine performance
Test Nr. G 76-80
Kraftstoffverbrauch B fuel consumption kg/h
Motordrehzahl n engine speed U/min rev/min
Motordrehmoment crankshaft torque M Nm
spez. Kraftstoffverbrauch spec. fuel consumption be g/kWh
n
M
B
be
Motorleistung Pe crankshaft power kW
Lufttemperatur temperature 18 °C
Luftdruck pressure 1008 mb
Kraftstoff fuel 0,740 kg/l

PRÜFUNGS-ABTEILUNG
GUTBROD 2 400

Motorleistung
Engine performance

Test Nr. G 76-80



Lufttemperatur: temperature	+8 °C	Luftdruck: pressure	1008 mb	Kraftstoff: fuel	0,740 kg/l

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