296/O.E.C.D.

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

EICHER PUMA I, ES 202, TYPE 3702

Manufactured by:

Gebr. Eicher Traktoren- und Landmaschinenwerke. Forstern/Obb.



This report has been approved by the O.E.C.D. Coordinating Centre (C.N.E.E.M.A.) as being in accordance with the O.E.C.D. Tractor Test Code

Date of Approval: 23-12-1969 *Serial No.: 296*

INSTITUUT VOOR LANDBOUWTECHNIEK EN RATIONALISATIE
DR. S. L. MANSHOLTLAAN 12 - WAGENINGEN

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	Drawbar test without ballast	
	curves of drawbar horse power and wheelslip/drawbar pull.	
	Spec. Fuel consumption and travelling speed	

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Part I SPECIMEN TEST REPORT

Tractors manufacturer's name and address: Gebr. Eicher, Traktoren- und Landmaschinenwerke, 8011 Forstern.

Submitted for test by: Manufacturer

Selected by: Manufacturer, in accordance with testing station

Place of running-in: by manufacturer

Duration of running-in: 15 h

SPECIFICATION OF TRACTOR

Tractor

make: Eicher

model: Puma I, ES 202

type: 3702

Serial no.: 117493

Motor

make: Eicher

model: four-stroke diesel

type: EDK 2-3

Serial no.: 106712

Cylinders

number: 2

disposition: vertical in line

bore/stroke: 100/125 mm

capacity: 1963 cm^3

compression ratio: 20,4 : 1

arrangement of valves: overhead valves

cylinder liners: replaceable Alfin cylinder with cooling ribs

Fuel and ignition system

type of fuel feed: commercial diesel fuel

make, type and model of fuel filters: Knecht/FB 602 M with replaceable fine paper element

capacity of fuel tank: 20 l

make, type and model of injection pump: Kugelfischer:PSSE 02-22.09 B plunger line pump

Serial no.: not available

manufacturer's production setting: 21° before top dead centre

make, type and model of injectors: Kugelfischer DFO 40 A

manufacturer's production setting: 140 + 5 atm

Governor

make: Eicher

type: centrifugal governor

range of speed: 600 - 2140 rev/min engine speed

rated speeds: 2000 rev/min

Air cleaner

main: oil bath filter

make: Mann and Hummel

type: 310 2875 413

oil capacity: 0,75 l

Pre-cleaner

main: centrifugal pre-cleaner

make: Mann and Hummel

type: 480 2477 190

Lubrication system

type: forced feed from gear pump

type and number of filters: replaceable full flow filter

oil capacity: 6,0 l

changing period: 100 h

Cooling system

type: air cooled

details of pump and fan: two separated blowers on one shaft, driven by V-belt

coolant capacity: -

means of temperature control: distance thermometer

pressure details: -

Electrical system

Voltage: 12 V

Generator: DC generator

make: Bosch

type: 0001 354 093

Battery

main: Lead accumulator

make: Mittermaier

type: 12 N 70

capacity: 70 Ah

Starting system

main: electric starting motor

make: Bosch

type: D 331 40 18

aids for cold starting: by means of a hand fuel pump

Transmission

clutch: single plate dry clutch

make: Fichtel and Sachs

type and size: K 10

method of operation: clutch pedal

Gearbox

make: Zahnradfabrik Friedrichshafen

type: A 6/6

no. of speeds: 6 forwards speeds and 1 reverse

Rear axle and final drive

make: own make

type: -

differential lock: own make

type: -

method of operating lock: by hand lever

details of transmission if other than above: final reduction gear near wheels

Oil capacity

gearbox: gearbox and differential gear: 6,5 l type: gear oil SAE 80

rear axle: 1,3 l per reduction gear type: gear oil SAE 80

change period: 1000 h or at least once a year

Gear no.	Number of engine revolutions for one revolution wheel or sprocket	Nominal travelling speed for rated speed of engine km/h
1	243,78	1,52
2	120,27	3,08
3	67,28	5,51
4	50,76	7,28
5	32,50	11,41
6	19,12	19,39
R	68,72	5,40
Gear no.	**travelling speed for max. engine speed**	**travelling speed for rated engine speed**
1	1,7/2245,7	1,52
2	3,4/2238,6	3,1
3	6,1/2219,2	5,48
4	8,1/2223,8	7,29
5	12,7/2230	11,35
6	20,6/2149	19,18

The values mentioned in the upper part are given by the manufacturer, those in the lower part are measured by the testing station.

Power take-off

location: at rear of tractor

dimensions: 29 x 34,9 x 8,7 mm = 1 3/8"

no. of splines: 6

standard B.S.: 1495; ASAE 203.2; DIN 9611/Form A

height above ground: 446 mm

proportional engine speed: 588 rev/min at 2000 rev/min engine speed

engine speed: 1835 rev/min at standard p.t.o. speed of 540 rev/min

direction of rotation: clockwise viewed from driving end

Belt pulley(not fitted on tested tractor, specification as given by manufacturer)

location: at rear p.t.o.

type: -

dimensions: 180 mm

diameter and width of face: 140 mm

speed-liner: 16,6 m/sec and: 1770 rev/min

at rated engine speed: 2000 rev/min

engine speed: 1786 rev/min at standard linear speed 16,75 m/sec

direction of rotation: clockwise or anti-clockwise, depending on way of fitting

Power lift

make: Eicher

type: hydraulic

oil capacity: 1,75 l (in case of double operation pump 2,25 l)
oil changing period: 500 h

category: Cat. I implement linkage, acc. DIN 9674

description of controls: single lever operation

Drawbars

implement linkage: three point linkage

height above ground max.: 675 mm min.: 20 mm

method of changing position power lift and adjustable stay links

distance from rear axle: 709 mm

position relative to p.t.o.: 612 mm

Lateral adjustment swinging drawbar not fitted.

Hitch

height above ground: 600, 650 or 700 mm

distance from rear axle: 378 mm

position relative to p.t.o.: 281 mm

Steering

make: ZF-Gemmer

type: 7328 900 372

method of operation: mechanical

Brakes

make: own make

type: internal shoe brakes

method of operation: by brake pedals, one pedal for braking with both rear wheels, and two pedals for braking with each rear wheel apart

type of parking brake: mechanical by lever

Wheeled tractors

Steering wheels

number: 2

arrangement: at front

type of tyre(s): pneumatic tyres acc. DIN 7807

make: Veith-Pirelli

size: 4.00 - 16

ply rating: 4

maximum permissible weight on each tyre: 295 kg at 3,0 atm.press.

track widths: 665, 810, 910, 1010 and 1110 mm

method of changing: by extending front axles

Driving wheels

number: 2

position: at rear

type of tyre(s): pneumatic tyres acc. DIN 7807

make: Kléber-Colombes

size: 9,5/9 - 24

ply rating: 4

rim size: W 8 x 24

maximum permissible weight on each tyre: 700 kg at 1,4 atm.press.

track widths: 710, 810, 910, 1010, 1110 and 1210 mm

method of changing: reversible discs and rims

wheelbase: 1668 mm

Weights

Tractor (without driver but with tanks full)

	Front	Rear	Total
Without ballast	465 kg	745 kg	1210 kg
With ballast	592 kg	945 kg	1537 kg

Ballast	No. of weights	Total weight	Water
Front	1	77,5 kg	- kg
Rear	-	- kg	127,5 kg
Additional	1	122 kg	

Seat

make: Eicher

type of suspension: springs

type of damping: -

range of adjustments: height and distance between steering wheel and seat are adjustable

Number of grease points (whole tractor): 17

Overall dimensions (mm)

	Length	Width	Height	
with ballast	2800	1450/970	steering wheel: passenger seat:	1200
without ballast	2510	1450/970		1200

special remarks: widths are given at max. and at min. trackwidth.

Lighting

height above ground of centre		diameter or dimension	distance from outside edge of tractor to centre
head lights	800 mm	144 x 75 mm	338 mm
side lights	955 mm	45 x 110 mm	153 mm
rear lights	955 mm	45 x 110 mm	153 mm
reflectors	850 mm	100 mm	190 mm

Mirror and passenger seat: -

Remarks: -

Part II FUELS AND LUBRICANTS USED IN TESTS

TRACK TESTS/LABORATORY TESTS

Fuel: Shell automative gas oil

type: Diesoline — specific gravity at 15°C: 0,8315

octane or cetane number: 53

conforms to: -

Engine oil

type: motor oil HD — viscosity: SAE 20

Transmission oil

type: gear oil — viscosity: SAE 80

Part III COMPULSORY TESTS

Date and location of tests: Wageningen, 4th and 5 th Aug. 1969

Type of dynamometer: 2 RT water brake

Horsepower (h.p.)	Speed		Fuel consumption		
	engine rev/min	p.t.o. rev/min	total l/h	specific ghp/h	hp.h/l
Maximum power - 2 hours test					
29,9	2052	604	7,1	194,6	4,2
Standard p.t.o. speed (540/1000 rev/min					
28,1	1820	536	6,4	187,5	4,4
The speed recommended by the manufacturer for drawbar work					
29,4	2000	587	7,7	194,3	4,2
Part loads					
26,2	2123	625	6,1	190,8	4,3
0	2242	660	2,0	-	-
13,4	2163	637	3,8	231,3	3,5
29,9	2052	604	7,1	194,6	4,2
6,8	2199	647	2,8	338,2	2,4
19,5	2103	619	4,8	200	4,1

No loads maximum engine speed: 2242 rev/min

Equivalent crankshaft torque at maximum power: 10,4 kgm

Maximum equivalent crankshaft torque 11,4 kgm at 1373 rev/min of the engine

Mean atmospheric conditions:	temperature	26 °C
	pressure	767 (mm)Hg
	relative humidity	61 %
Maximum temperature :	coolant	- °C
	engine oil	85 °C
	fuel	25 °C

(2) DRAWBAR PERFORMANCE

Date of tests: 13-8-1969 - 2-9-1969

Type of track: Concrete

Height of drawbar above ground: 530 mm

Gear number	Horse-power (h.p.)	Drawbar pull (kg)	Engine speed rev/min	Slip of wheels %	Fuel consumption	
					drawbar horse-power h.p.h./l	specific h.p.h.
MAXIMUM POWER (ballasted)						
1	7,1	1300	2205	11,9	-	-
2	14,5	1440	1865	12,1	3,1	323,5
3	24,4	1300	2046	9,6	3,9	254,6
4	26,7	1000	2056	5,4	4,1	244,1
5	26,9	630	2092	2,9	4,2	237,9
6	24,6	340	2062	1,6	4,0	248
FIVE HOUR TEST at 75 % of pull at maximum power						
3	18,3	870	2007	5,0	3,16	261
FIVE HOUR TEST at pull corresponding to 15 % wheelslip in test(i)						
3	23,5	1220	1663	15,0	3,21	257
MAXIMUM POWER (unballasted) Measurements are made with an additional weight (122 kg) fitted on the lower side of the tractor)						
. 1	6,86	1230	2215	10,2	-	-
. 2	13,9	1250	2159	9,4	-	-
. 3	23,48	1150	2101	6,1	-	-
. 4	23,3	1000	1754	5,4	-	-
. 5	22,9	540	2066	2,5	-	-
. 6	20,4	370	1616	1,6	-	-

Temperature			Atmospheric conditions		
Fuel °C	Coolant °C	Engine oil °C	Temperature °C	Relative humidity %	Pressure mm Hg
MAXIMUM POWER (ballasted)					
14	-	82	15,1	53	765
14	-	82	15,1	53	765
14	-	82	15,1	53	765
14	-	82	15,3	71	760
14	-	82	15,3	71	760
14	-	82	15,3	71	760
FIVE HOUR TEST at 75 % of pull at maximum power					
13	-	83	14,7		768
FIVE HOUR TEST at pull corresponding to 15 % wheelslip in test(i)					
13	-	84	14,7		768
MAXIMUM POWER (unballasted)					
15	-	82	16,6	88	761
17	-	82	19,7	68,3	761
17	-	82	19,7	68,3	761
17,5	-	83	19,7	68,3	761
17,5	-	83	19,7	68,3	761
17,5	-	83	19,7	68,3	761

(3) TURNING SPACE AND TURNING CIRCLE

Detail of wheel equipment: front: 4.00-16; rear 9,5/9-24, both 4 PR, without ballast

Track of wheels - front 665 mm rear 710 mm

Results	with brakes		without brakes	
	right-hand	left-hand	right-hand	left-hand
Radius of turning space	2750 mm	2600 mm	2920 mm	2720 mm
Radius of turning circle	2650 mm	2500 mm	2820 mm	2620 mm

(4) LOCATION OF CENTRE OF GRAVITY Measurements are made with an additional weight (122 kg) fitted on the lower side of the tractor.

Height above ground: 520 mm

Distance forward from the vertical plane containing the axis of the rear wheels : 630 mm

Distance from the medium plane: 0

(5) BRAKING

Date of test: 8-10-1969

Type of track: Concrete

Weight of ballasted tractor: 1537 kg

Cold brakes

	ballasted	without ballast
travelling speed of the tractor	20 km/h	20 km/h
(I) deceleration m/sec^2	4,8	5,7
(II) stopping distance m	3,00	3,60
(III) force exerted on the brake pedel	62 kg	64 kg

Brake fade characteristics (hot tests)

deceleration hot/deceleration cold. 100 92 %

stopping distance cold/stopping distance/hot. 100 98 %

force on pedal, cold/force on pedal, hot. 100 102 %

efficiency of handbrake or parkinglatch: no rotation of the wheels

pull on handbrake cold: 24 kg, hot: 24 kg

(6) MEASUREMENT OF AMBIENT NOISE EMITTED BY THE TRACTOR

Date of tests: 26-9-1969

Type of sound level meter: Rohde und Schwarz, type EZGN

Type of track: Asphalt

Results of tests:

Gear

Travelling speed: 15,6 km/h before acceleration

Sound level: Left side: 83 dBA; right side: 83 dBA

(7) NOISE MEASUREMENTS AT THE DRIVER'S EAR LEVEL

Date of tests: 26-9-1969

Type of sound level meter and octave filter: Rohde und Schwarz, type EZGN

Type of track: Asphalt

Type of frequence analyser: Rohde und Schwarz, type PBO

Results of tests:

Gear	Travelling speed (km/h)	Loudness sones
4	6,97	86

(8) POWER LIFT AND HYDRAULIC PUMP PERFORMANCE

Date and location of tests: 6-10-1969, Wageningen

Hydraulic fluid:

make and type: Motor oil HD

viscosity: SAE 20

	Vertical movement in (mm)	Maximum force exerted through full range (kg)
Linkage giving maximum mechanical advantage		
At lower hitch points (height above ground in down position)	605	1175
On the frame	690	590
Linkage giving minimum mechanical advantage		
At lower hitch points (height above ground in down position) 20 mm	510	1075
On the frame	990	575

Type of linkage lock for transport: Mechanical

Part IV

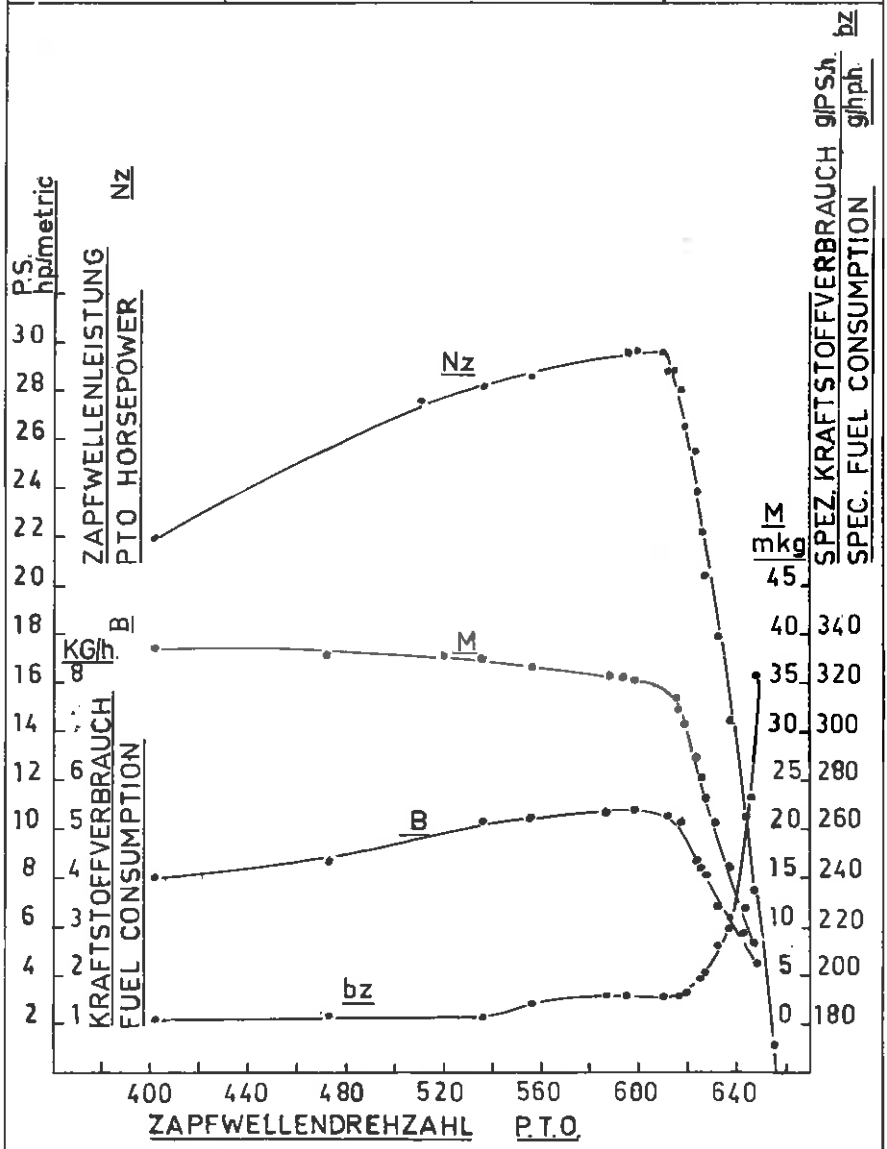
1 Repairs and adjustments during tests: none

2 Remarks : none

Wageningen, 27 december, 1969

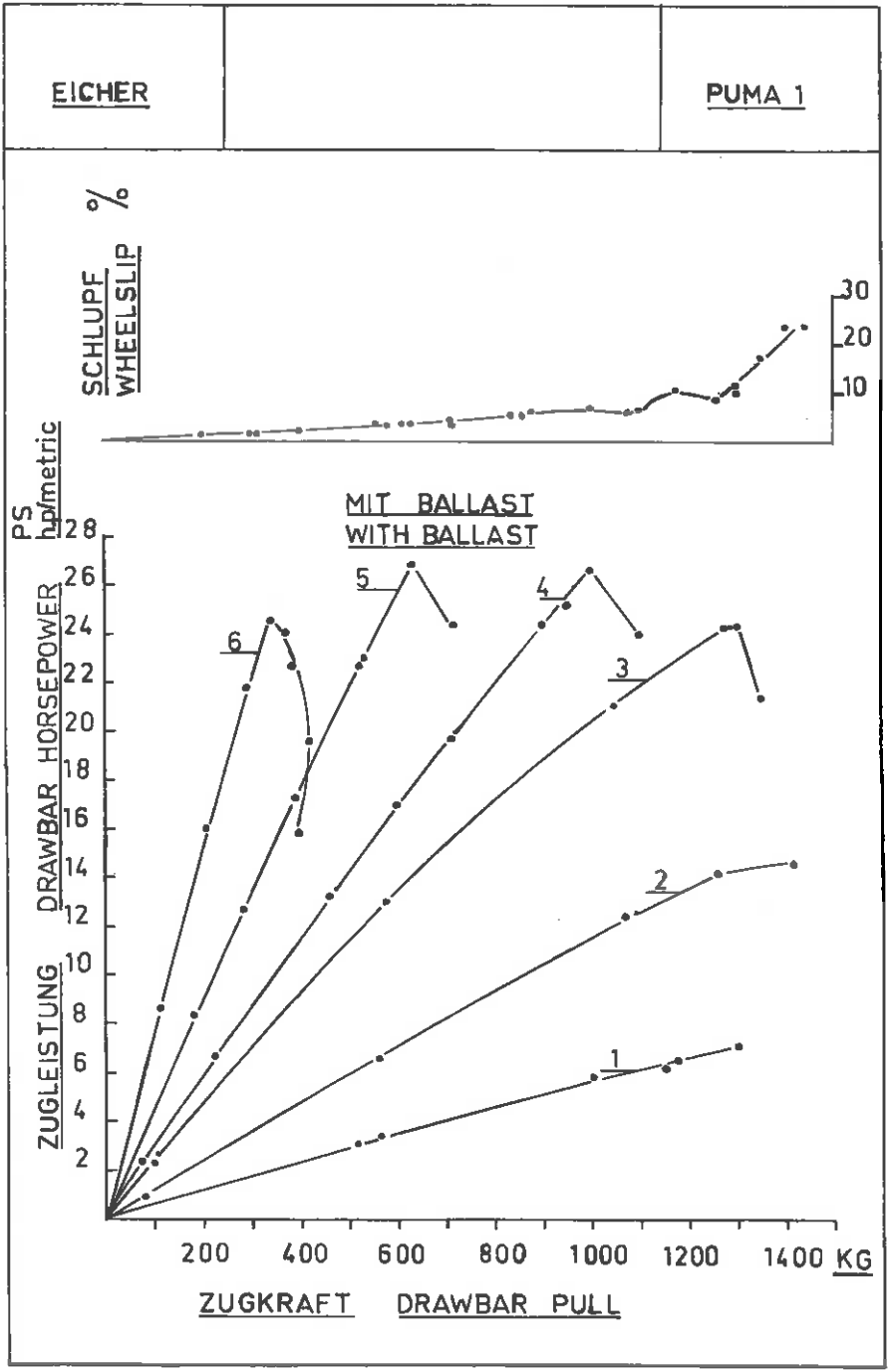
Head of Department of Agricultural Engineering Agricultural University	Head of Testing Department Institute of Agricultural Engineering and Rationalisation
Prof. Ir. G.J. Quast	Ir. A.R. Kraai

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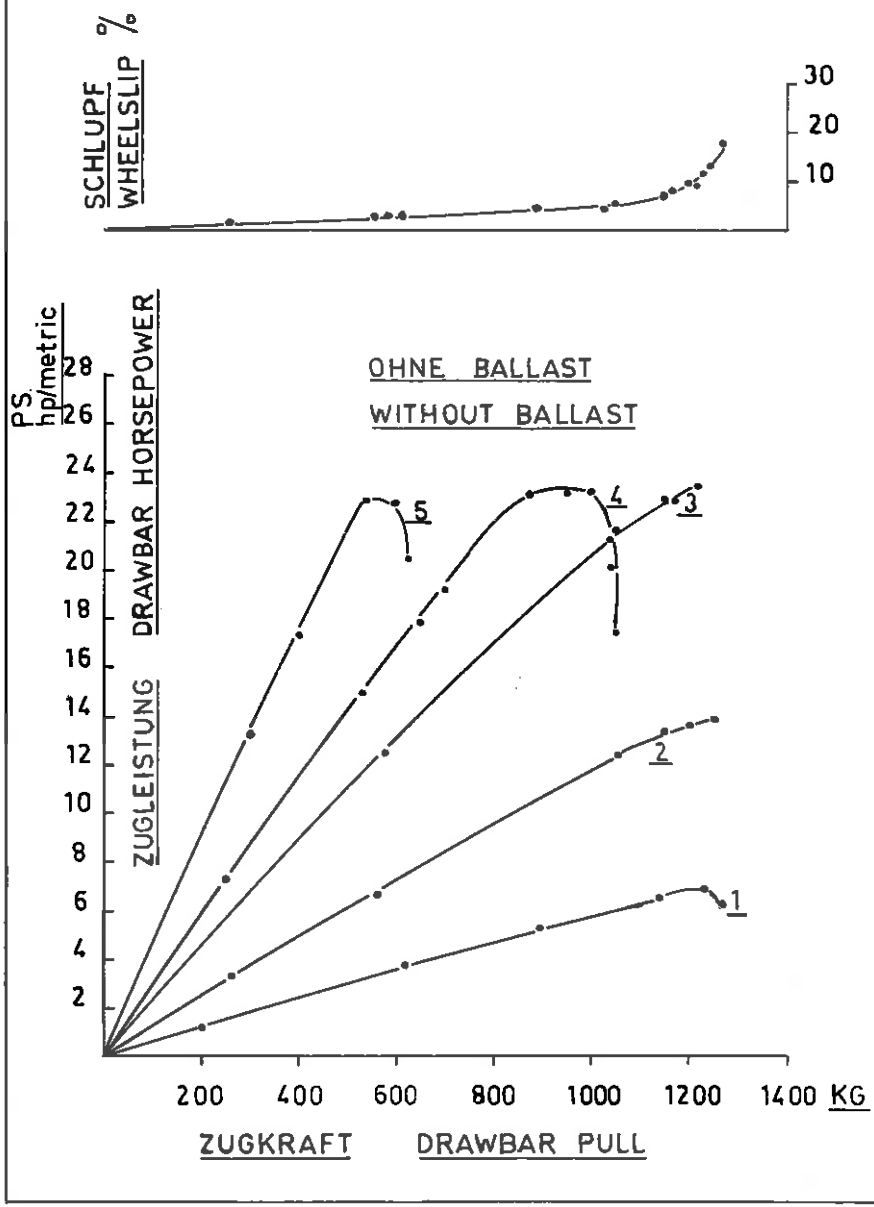
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