Report No. 4010/SPF

Report on test in accordance with O.E.C.D. test code for agricultural Tractors

No. 43

RHEINSTAHL - HANOMAG - DIESEL Tractor Granit 500
with type D 21 CR - 3 cylinder engine

Manufactured by: Rheinstahl Hanomag AG., Hannover - Linden



Date of Test: March/August 1963

SCHLEPPER - PRÜFFELD DARMSTADT
Darmstadt - Kranichstein

SCHLEPPER-PRÜFFELD

KURATORIUM FÜR TECHNIK IN DER LANDWIRTSCHAFT

REPORT ON TEST No. 4010/ S P F

HANOMAG - GRANIT 500

Manufacturer : RHEINSTAHL HANOMAG AG., Hannover

Test requested by : RHEINSTAHL HANOMAG AG., Hannover

Date of Test : March 1963/August 1963

This report has been approved by the
OECD Coordinating Centre (C.N.E.E.M.A., F r a n c e)
as beeing in accordance with the
O E C D Tractor Test Code

It does not contain an evaluation of
the performance of the tractor on practical farm
work.

Date of Approval : 21. October 1963
Number of Approval: 043

Darmstadt, den 19. September 1963

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S E C T I O N I

SPECIFICATION OF TRACTOR

Tractor

Make: RHEINSTAHL HANOMAG AG., Hannover
Model: Granit 500
Type: wheel-type diesel tractor, semi frame construction
No.: 221 6031 (tractor tested)

Engine

Make: RHEINSTAHL HANOMAG AG., Hannover
Model: D 21 CR
Type: 4-stroke-diesel with swirl chamber combustion
No.: 1383569 (engine tested)

Rated engine output (manufacturers rating) 38 hp (metric)
Rated engine speed 2300 r.p.m.

Cylinders: 3 cylinders; vertical in line;
90 mm bore x 110 mm stroke
compression ratio 21:1
replaceable wet sleeves
overhead valves

Rated speeds: For p.t.o. work 2300 r.p.m.
for field drawbar work 2300 r.p.m.
for belt work 2300 r.p.m.
for road transport work 2300 r.p.m.

Fuel system: Fuel - commercial available diesel fuel
Bosch type PE 3A 65 C4 10LS 1039 injection pump
Bosch type DN 4 SD24 injection nozzles
injection timing 22° before T.D.C.
injection pressure 150 kp/cm²
Bosch type FP/KS 22 AD 6/4 supply pump
fuel pre-cleaner-Bosch type FJ/HR 2/1
fuel main filter-Bosch type FJ/DF 5/103 felt tube filter
capacity of fuel tank 67 l.

Governor: Bosch type EP/RSV 250-1150 A1B 156D, mechanical variable speed governor; governed range of engine speed 525 - 2450 r.p.m.

Air cleaner: Make Mann & Hummel oil bath cleaner with centrifugal precleaner
oil capacity 0,7 l

Oiling System: Forced feed from gear type pump
Mann and Hummel screen type full flow filter

recommended oil in winter: SAE 10W HD
in summer: SAE 20 HD

oil-change period 100 hrs
oil capacity 5,5 l

Cooling system: Pressurised water cooled, impeller and 2-blade fan assisted, thermostate with dual flow circulation for temperature control
cooling water capacity 12 l

Transmission

Clutch: Make Fichtel and Sachs type 250/225 K dry disc clutch, for p.t.o.-shaft and gear box drive respectively; foot pedal operated; foot lever with lock for p.t.o. clutch

Gearbox: Make RHEINSTAHL HANOMAG, Hannover
type Granit 500; 10 foreward speeds and 2 reverse; sliding gear type comprising 5 speed gear box with reverse gear and dual range reduction gear

Differential: Make RHEINSTAHL HANOMAG, Hannover
crown wheel and pinion, bevel gear type differential; lock fitted, hand lever operated;
total oil capacity 20 l

Speeds:

Gear No.	Number of engine revolutions for one revolution of driving wheel	Theoretical travelling speed for 2300 r.p.m. rated speed of engine, km/h
slow range of transmission		
1.	423,48:1	1,50 (creeping gear)
2.	279,39:1	2,27
3.	209,97:1	2,98
4.	136,25:1	4,64
5.	86,24:1	7,33
fast range of transmission		
1.	152,33:1	4,16
2.	100,50:1	6,29
3.	75,53:1	8,37
4.	49,01:1	12,91
5.	31,02:1	20,40
reverse gears		
1.	235,94:1	2,68
2.	84,87:1	7,45

Steering device:	Make Zahnradfabrik Friedrichshafen type ZF-Gemmer steering GD 28a with single drop arm and fixed drag link
Brakes:	Hand-brake - internal shoe-type brake acting on a drum on a gear shaft Foot-brake - internal shoe-type brake acting on drums inside of the rear wheels Steering-brake - actuated by devided main foot-pedal, combined by a latch for normal use, independant for steering brake use.

Wheels

Steering wheels:	Two at front. Tyres 6,00-20 AS Front, 6ply pneumatic (acc.to DIN 7808). Track 1250-1375-1500-1600-1700-1800 mm (acc.to DIN 9621) changed by extending front axle. Maximum permissible weight on each tyre 625 kp at 2,0 kp/cm², 940 kp at 2,5 kp/cm² (acc. to DIN 7808)
Driving wheels:	Two at rear. Tyres 12,4/11-38 AS, 6ply pneumatic (acc. to DIN 7807). Track 1250-1365-1385-1500-1665-1800 mm (acc. to DIN 9621) changeable by reversing wheel centres and offset lugs on rims. Maximum permissible weight on each tyre 1100 kp at 1,0 kp/cm², 1420 kp at 1,6 kp/cm² (acc. to DIN 7807). Wheel base 2105 mm.

Belt pully

Location:	At rear of tractor, p.t.o. driven
Diameter x width:	265 x 140 mm
Speed:	1438 r.p.m. at 2300 r.p.m. rated engine speed
Linear belt speed:	20,0 m/s (acc. to DIN 9630)
Direction of rotation:	anticlockwise viewed from right hand side of tractor

Power take off

a) Main p.t.o.:	Live power take - off, foot pedal and dual clutch operated
Location:	At rear of tractor, 615 mm above ground, 55 mm to the right of centre line
Dimensions:	Spline shaft 29 x 34,9 x 8,7 mm = 1 3/8" (acc. to DIN 9611 and B.S. 1495 : 1958)
Speed:	556 r.p.m. at 2300 r.p.m. rated engine speed (acc. to DIN 9611)
Direction of rotation:	clockwise viewed from tractor rear.

Power lift	Own make live hydraulic with Bosch type HY/ZFR 1/16 L4 gear type pump; single acting ram; tapping for external cylinder; Bosch type HY/S20 C1 B1 10T control valve with hand operated rear axle load amplifier and control valve system HANOMAG-Pilot for automatically control of ploughing depth; oil capacity 7,0 l same oil as used in engine; maximum oil pressure 125 kp/cm², maximum oil flow 16 l/min; maximum load liftable through complete range of movement at the ends of the lower links 1573 kp.
Implement linkage	Three-point linkage, categorie I or II, controlled by hydraulic power lift (acc. to DIN 9674 and B.S.1841:1951)
Drawbar	Fixed on hydraulic controlled implement linkage with centre hole and 6 holes apart either side of centre line (acc. to DIN 9674E); vertical adjustment from 180 mm to 820 mm above ground, may be fixed by hanging up the lifting rods in a special support. distance from rear axle in horizontal position of lower links 945 mm
Trailer hitch	At rear of tractor, height above ground 780-825-870-915 mm adjustable by pins; distance from rear axle 570 mm
Towing hitch	At front of tractor, height above ground 730 mm
Electrical equipment	Voltage 12 Volts Generator Bosch type LJ/GEH 90/12/1800 FR11 Battery 12 Volts, lead acids capacity 105 Ah Starting device Bosch type BNG 4/12 CR225 solenoid engaged starter motor; glowing plugs Bosch type KE/GSA 10/1 or Beru type 107 M Lighting equipment 12 Volts according to StVZO (German lighting regulation) additionally headlight main beam.

Overall dimensions

Overall length: 3500 mm with three point linkage and towing hitch

Overall width: 1740 mm without ballast weights at 1250 mm track
Overall height: 1920 mm to top of 2 nd seat back rest
Maximum ground clearance: 355 mm in centre line of tractor,
480 mm at 300 mm apart of either side of centre line.

Weights

With implement linkage, power lift, full fuel tank, öl, cooling water, as tested, but without driver

	Without ballast	With ballast
On front wheels	873	957
On rear wheels	1657	2536
Total	2530	3493

Special remarks: None

S E C T I O N II

LABORATORY TESTS

1. COMPULSORY TESTS

Main power take-off tests

Date and location of test: 8.May 1963, Schlepper-Prüffeld Darmstadt, Darmstadt-Kranichstein

Type of dynamometer: Schenck hydraulic brake

Position of governor control: Fully open, giving maximum governor controlled engine speed

Fuel: Shell diesel-fuel, density 0,830 kg/l at 15°C commercial quality in accordance with DIN 51 601

Engine oil: BP Energol Diesel D, HD 10W (SAE)

Transmission oil: SAE 90

Horse power	Speeds		Torque	Fuel consumption			Mean temperatures				Atm.
	engine	pto	equiv.				Coolt	Engine oil	Fuel	Room	press
metric hp	rpm	rpm	kpm	l/h	g/hph	hph/l	°C	°C	°C	°C	mm Hg
A. Maximum power, 2 h											
37,5	2345	569	11,43	9,63	213	3,89	80	81	20	24	738
B. Power at standard p.t.o. - speed (acc. to DIN 9611)											
37,1	2300	558	11,56	9,48	212	3,92	80	83	20	24	738
C. Power at maximum torque											
29,6	1638	397	12,95	7,59	213	3,90	80	82	21	24	738
D. Power at engine rated speed											
37,1	2300	558	11,56	9,48	212	3,92	80	83	20	24	738

No load, maximum engine speed 2440 r.p.m.

2.SUPPLEMENTARY TESTS

a)Engine tests

Date and location of tests: 26.-28.March 1963 Schlepper-Prüffeld Darmstadt, Darmstadt-Kranichstein

Type of dynamometer: Schenck water brake

Position of governor control: Fully open, giving maximum governor controlled engine speed

Fuel: Shell diesel-fuel, density 0,830 kg/l at 15°C, commercial quality in accordance with DIN 51 601

Engine oil: BP Energol Diesel D, HD 10W (SAE)

Horse power metric hp	Engine speed r.p.m.	Torque kpm	Fuel consumption l/h	g/hph	hph/l	Mean temperatures Coolt °C	Engine oil °C	Fuel °C	Room °C	Atm. press. mm Hg.
A. Maximum power, 2 h										
39,6	2350	12,08	9,64	202	4,11	80	92	17	11	727
C. Power at maximum torque										
31,7	1647	13,76	7,93	208	4,00	80	84	18	10	729
D. Power at rated engine speed										
39,6	2305	12,32	9,67	202	4,09	84	92	17	15	729

No load, maximum engine speed 2450 r.p.m.

2.SUPPLEMENTARY TESTS

b)Belt tests

Date and location of tests: 15.-16.May 1963 Schlepper-Prüffeld Darmstadt, Darmstadt-Kranichstein

Type of dynamometer: Schenck water brake

Belt: Siegling Extremultus 140 x 6 mm

Position of governor control: Fully open,giving maximum governor controlled engine speed

Fuel: Shell diesel-fuel, density 0,830 kg/l at 15°C commercial quality in accordance with DIN 51 601

Engine oil: BP Energol Diesel D, HD 10W (SAE)

Transmission oil: HD 90

Power	Speeds		Torque	Fuel consumption			Mean temperatures				Atm.
	engine	belt	equiv.				Coolt	Engine oil	Fuel	Room	press
hp metric	rpm	m/s	kpm	l/h	g/hph	hph/l	°C	°C	°C	°C	mm Hg
A. Maximum power, 2 h,belt-slip < 1%											
36,1	2352	20,4	11,0	9,75	224	3,70	80	89	18	14	737
B. Power at standard belt - speed											
35,1	2310	20,1	10,90	9,68	229	3,62	80	89	18	16	734
C. Power at maximum torque											
29,4	1629	14,2	12,92	7,84	221	2,94	80	82	16	14	737
D. Power at engine rated speed											
35,1	2310	20,1	10,90	9,68	229	3,62	80	89	18	16	734

No load, maximum engine speed 2440 r.p.m.

S E C T I O N III

DRAWBAR TESTS ON ARTIFICIAL TRACK

Date of tests: 4.-19.Juni 1963
Type of track: Concrete
Position of governor control: Full open, giving maximum governor controlled engine speed
Type of tyres: Rear 12,4/11-38 AS, 6ply pneumatic, open centre straight bar, Conti Farmer.
Front 6,00-20 AS Front, 6 ply pneumatic, Dunlop,

Fuel: Shell diesel-fuel, density 0,830 kg/l at 15°C, commercial quality in accordance with DIN 51 601

Engine oil: BP Energol Diesel D HD 10W (SAE)

Transmission oil: SAE 90

a) TESTS WITH BALLAST

Weight of tractor with driver

Without ballast:	at front	865 kg	at rear	1748 kg
With ballast:	at front	964 kg	at rear	2624 kg
Total with ballast: 3588 kg				

Weight of ballast

Front:	Wheel - weights (1 per wheel) :	99 kg
	water - nil	
Rear:	Wheel - weights (7 per wheel) :	586 kg
	water - 290 kg	

Tyre inflation pressure

Front: 2,5 kp/cm²
Rear: 1,5 kp/cm²

Height of drawbar above ground: 500 mm (acc.to DIN 9670)

(1) Maximum power and pulls

Gear No.	Maximum powers: Horse power metric hp	Pull kp	Wheel slip %	Engine speed r.p.m.	Speed km/h	Water temp. °C	Air temp. °C	Atm. press mm Hg	Maximum pulls: Pull	Reason for stall
Slow range of transmission										
2.	23,9	3495	19,5	2420	1,85	82	18	747	3640	Wheelspin
3.	29,5	3055	13,5	2345	2,61	84	15	744	3465	Engine stall
4.	30,9	1950	7,5	2348	4,28	85	28	748	2285	Engine stall
5.	31,5	1213	4,4	2350	7,02	34	27	749	1395	Engine stall
Fast range of transmission										
1.	31,1	2213	8,9	2356	3,79	81	20	744	2525	Engine stall
2.	31,9	1458	5,4	2342	5,91	82	25	746	1660	Engine stall
3.	32,2	1080	4,1	2350	8,05	85	24	747	1250	Engine stall

(2) Fuel consumption

Gear No.	Optimum fuel consumption: Spec.fuel-consumption g/hph	Drawbar hph/l	corresponding pull kp	Range of pull kp over which specific fuel consumption does not exeed optimum consumption by more than 10 %		
Slow range of transmission						
2.	284	2,92	2800	1335	-	3440
3.	267	3,14	3210	1615	-	3455
4.	242	3,42	2285	1340	-	2285
5.	256	3,24	1200	700	-	1395
Fast range of transmission						
1.	264	3,14	1900	1200	-	2525
2.	235	3,54	1660	1070	-	1660
3.	245	3,38	1123	670	-	1250

b) TESTS WITHOUT BALLAST

Weight of tractor with driver

Front : 865 kg
Rear : 1748 kg
Total : 2613 kg

Tyre inflation pressure

Front : 2,5 kp/cm²
Rear : 1,5 kp/cm²

Height of drawbar above ground 500 mm (acc.to DIN 9670)

(1) Maximum powers and pulls

Gear No.	Maximum powers								Maximum pulls	
	Horse power metric hp	Pull kp	Wheel slip %	Engine speed r.p.m.	Speed km/h	Water temp. °C	Air temp. °C	Atm. press mm Hg	Pull kp	Reason for stall
Slow range of transmission										
3.	23,0	2400	17,9	2405	2,59	81	20	742	2480	Wheelspin
4.	30,4	1950	11,9	2360	4,21	79	21	742	2290	Engine stall
5.	31,9	1225	6,7	2355	7,02	82	29	745	1420	Engine stall
Fast range of transmission										
1.	30,2	2240	14,4	2350	3,64	84	24	745	2460	Engine stall
2.	31,8	1450	8,1	2358	5,92	85	30	745	1665	Engine stall
3.	32,5	1090	6,0	2350	8,04	83	27	745	1220	Engine stall

(2) Fuel consumption

Gear No.	Optimum fuel consumption			Range of pull kp over which specific fuel consumption does not exeed optimum consumption by more than 10 %	
	Spec. fuel-consumption g/hph	Drawbar hph/l	corresponding pull kp		
Slow range of transmission					
3.	292	2,84	2200	1380 -	2440
4.	238	3,48	1400	905 -	1830
5.	248	3,35	1200	680 -	1420
Fast range of transmission					
1.	260	3,19	1900	1190 -	2415
2.	226	3,67	1665	1530 -	1665
3.	241	3,44	1140	630 -	1220

S E C T I O N IV

1.Location of centre of gravity

Tractor equipped as in		Test III.a) ballasted	Test III.b) unballasted
Height above ground	mm	830	825
Distance forward from the vertical plane containing the axis of the rear axle	mm	654	648
Distance from the medium plane parallel to the longitudinal axis of the tractor bisecting the track	mm	0	0

2. Turning space and turning radius

Tractor weight and wheel equipment as tested in section III.b), track front 1.250 mm,
rear 1.230 mm.

	with steering brakes		without brakes	
	right-hand	left-hand	right-hand	left-hand
Radius of turning space	4,7	4,6	4,1	4,1
Turning radius	4,5	4,5	4,0	4,0

S E C T I O N V

1. Repairs and adjustments during tests: None
2. Remarks: None

Darmstadt, am 31. October 1963

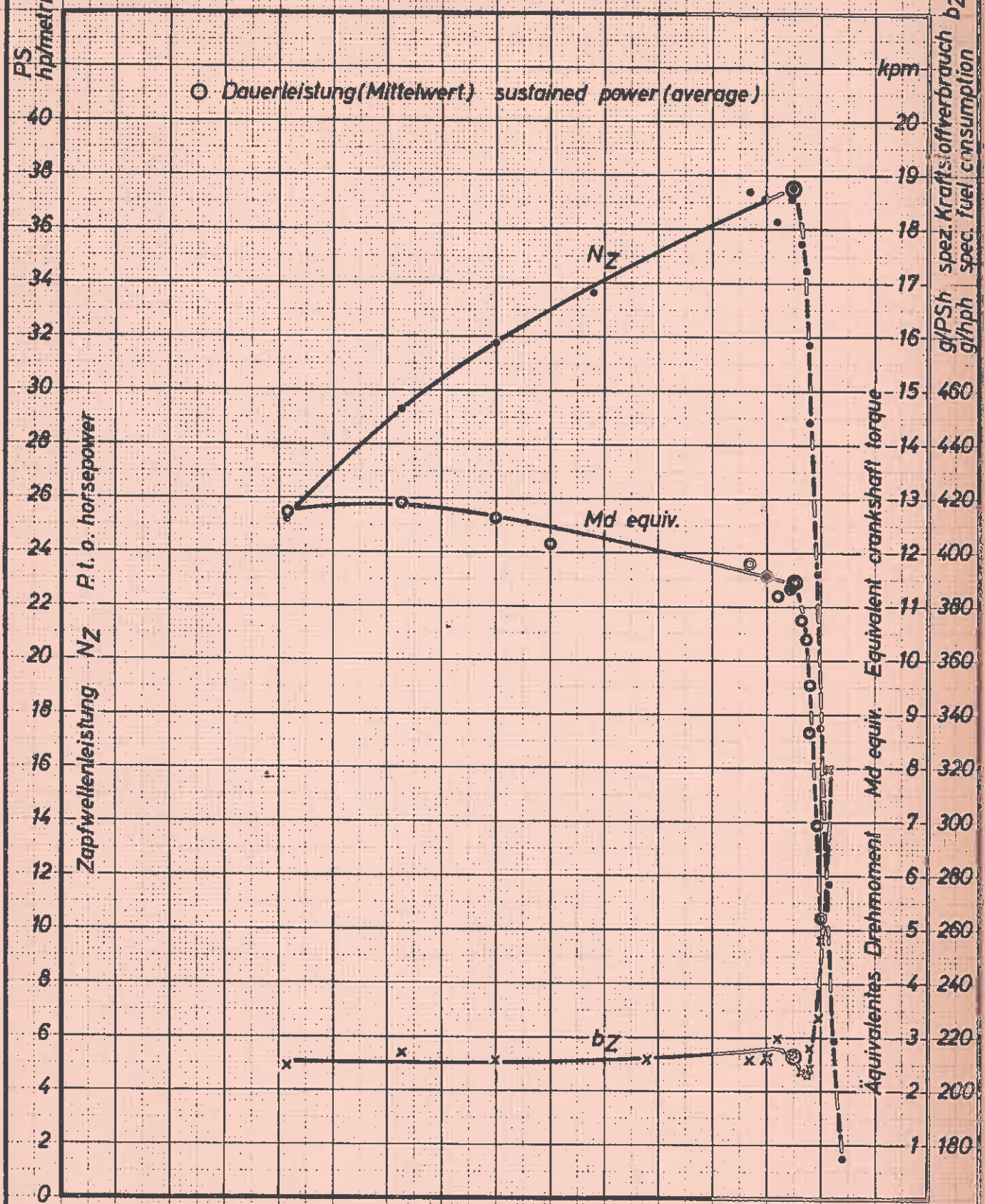
Schlepperprüffeld Darmstadt

Zapfwellenleistung

Hanomag Granit 500
Motor Typ D 21 CR

P.t.o.-test

Test Nr: 4010



Motor Nr.: 1383569	Motoröl: HD 10W	Versuchstag: 8. 5. 1963	Versuchsltg.:
Schlepper Nr.: 2216031	Lufttemperatur: 24° C	Versuchs Nr.: 95/4010/63	
Kraftstoff: DK 0,830 / 15° C	Barometerstd.: 738 mm QS	Kurvenblatt: 1	Fl.

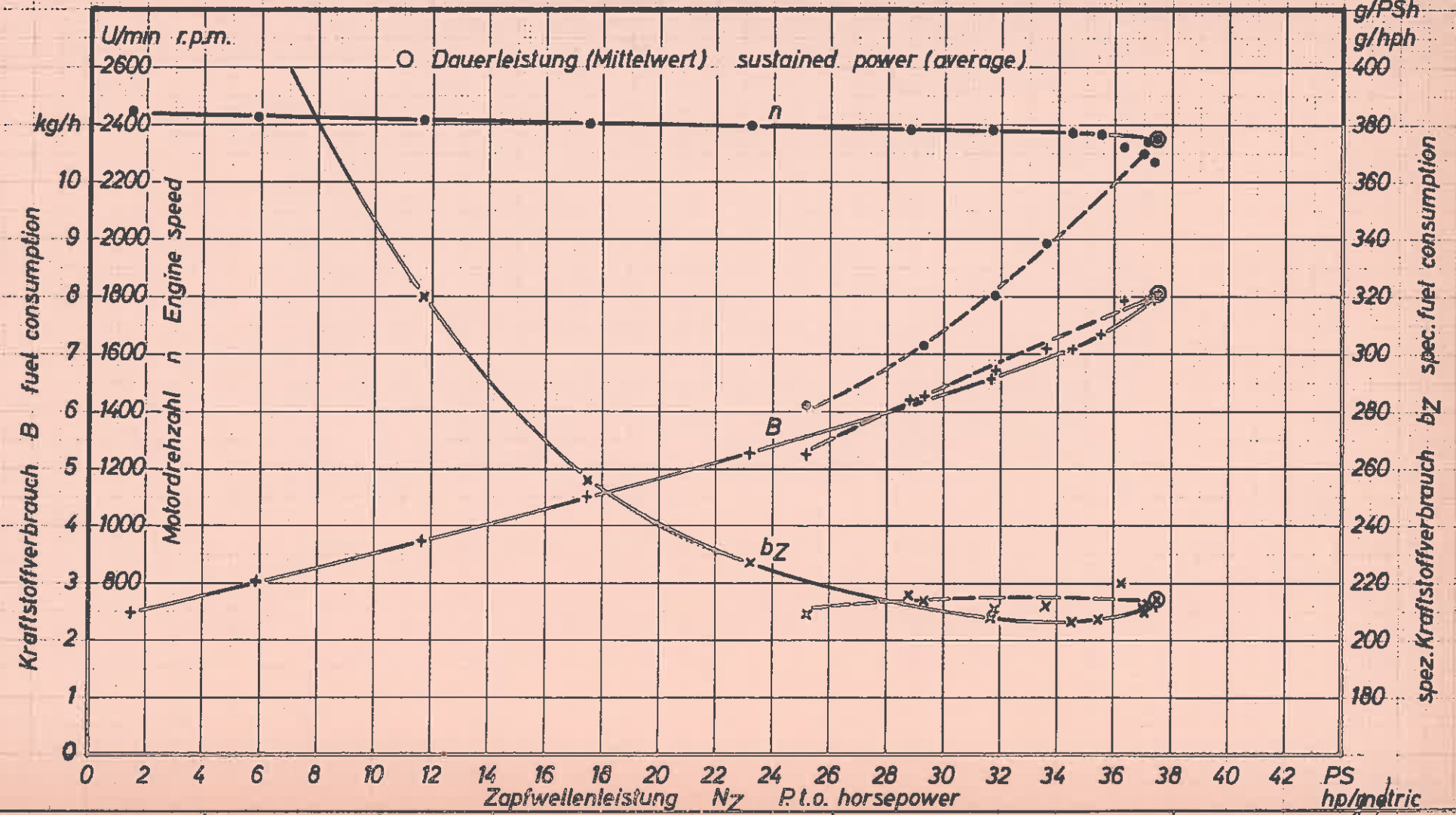
Schlepperprüffeld Darmstadt

Zapfwellenleistung

Hanomag Granit 500
Motor Typ D 21 CR

Test Nr. 4010

P.t.o.-test



Motor Nr.: 1383569	Kraftstoff: DK 0,830/15° C	Lufttemperatur: 24° C	Versuchstag: 8. 5. 1963	Versuchsltg.: Rohne
Schlepper Nr.: 2216031	Motoröl: HD 10 W	Barometerstd.: 738 mm QS	Versuchs Nr.: 95/4010/63	Kurvenblatt: 2 Fl.

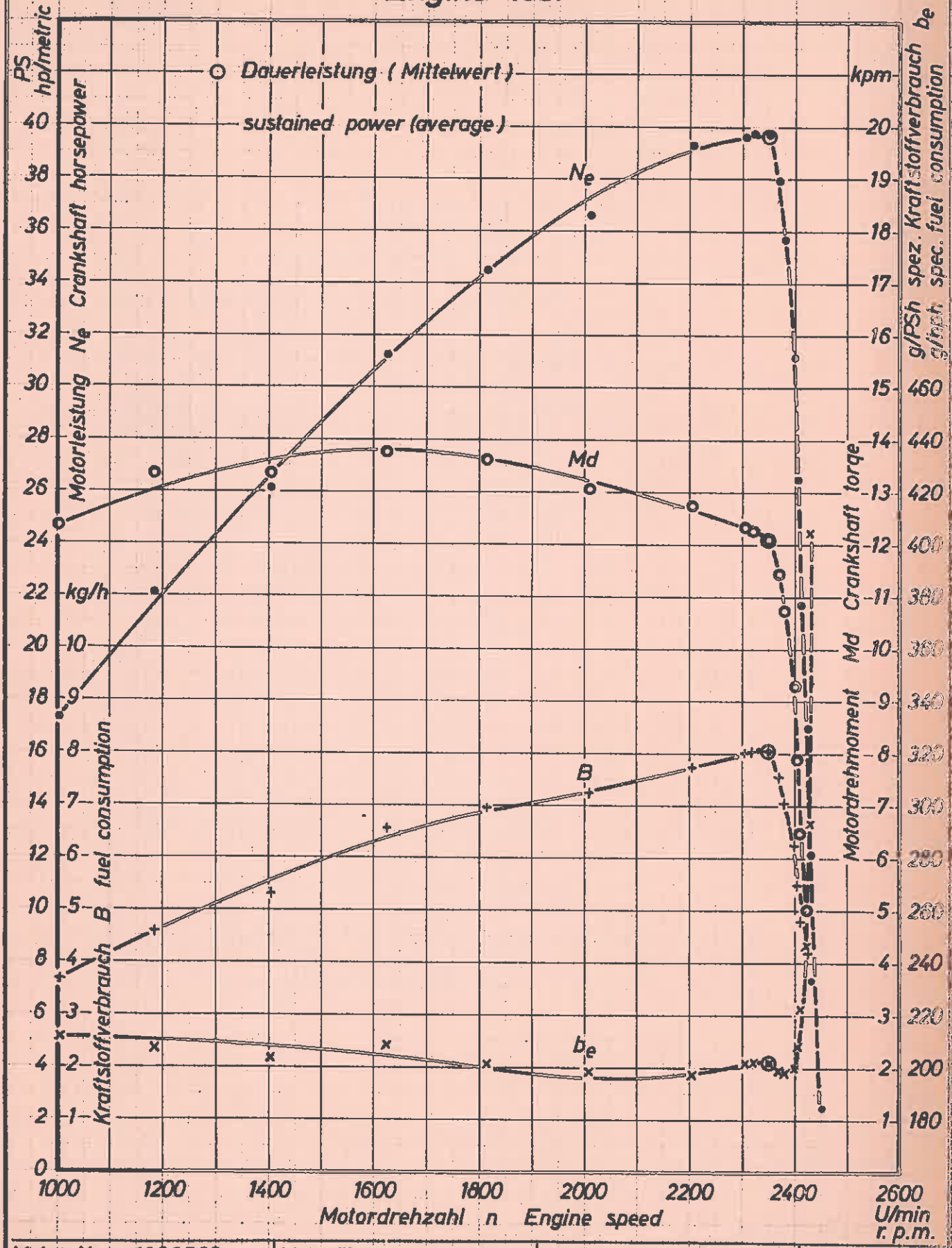
Schlepperprüffeld Darmstadt

Motorleistung

Hanomag Granit 500
Motor Typ D 21 CR

Engine-test

Test Nr: 4010



Motor Nr.: 1383569	Motoröl: HD 10 W	Versuchstag: 26. 3. 1963	Versuchsltg.: Kühn
Schlepper Nr.: 2216031	Lufttemperatur: 13° C	Versuchs Nr.: 80/4010/63	
Kraftstoff: DK 0,830/15° C	Barometerstd.: 729 mm QS	Kurvenblatt: 3	FI.

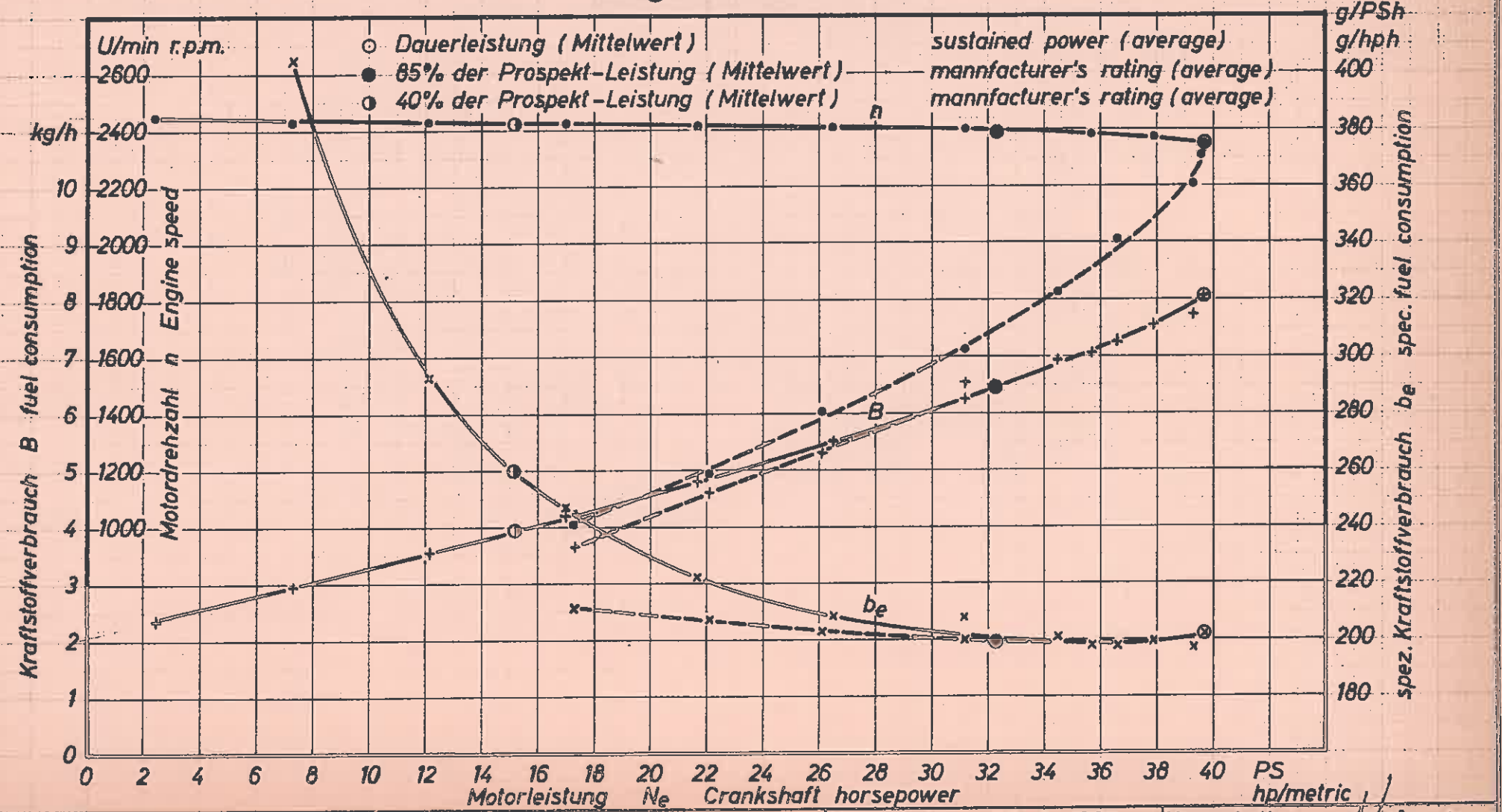
Schlepperprüffeld Darmstadt

Motorleistung

Hanomag Granit 500
Motor Typ D 21 CR

Test Nr: 4010

Engine-test



Motor Nr.: 1383569	Kraftstoff: DK 0,830/15° C	Lufttemperatur: 13° C	Versuchstag: 26. 3. 1963	Versuchsltg.:
Schlepper Nr.: 2216031	Motoröl: HD 10 W	Barometerstd.: 729 mm QS	Versuchs Nr.: 80/4010/63	Kurvenblatt: 4 Fl.

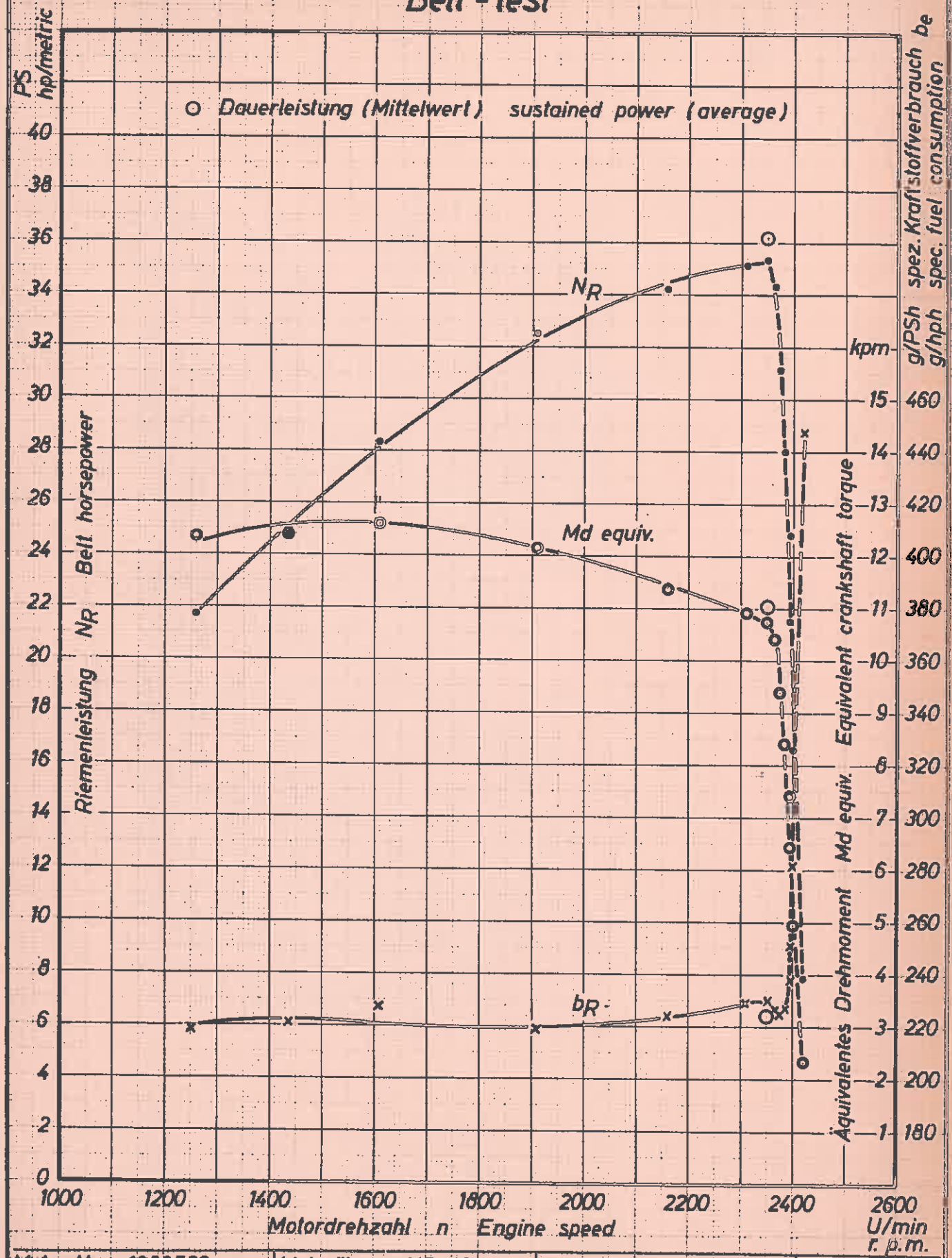
Schlepperprüffeld Darmstadt (KTL)

Riemenleistung

Hanomag Granit 500
Motor Typ D 21 CR

Belt - test

Test Nr: 4010



Motor Nr.: 1383569	Motoröl: HD 10W	Versuchstag: 15. 5. 1963	Versuchsltg.: Fl.
Schlepper Nr.: 2216031	Lufttemperatur: 16° C	Versuchs Nr.: 100/4010/63	
Kraftstoff: DK 0,830/15°C	Barometerstd.: 734 mm QS	Kurvenblatt: 5	

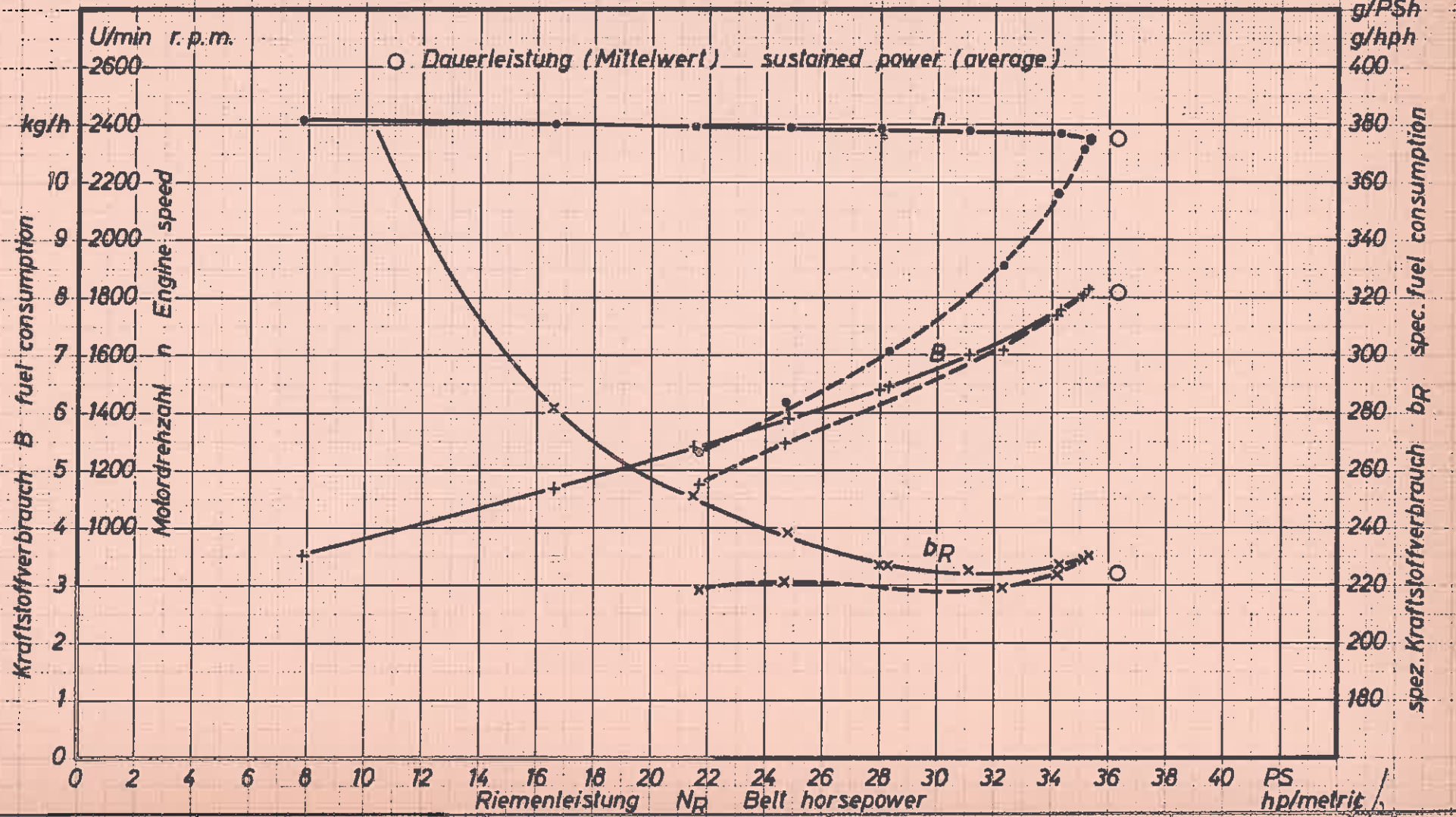
Schlepperprüffeld Darmstadt

Riemenleistung

Hanomag Granit 500
Motor Typ D 21 CR

Test Nr: 4010

Belt - test



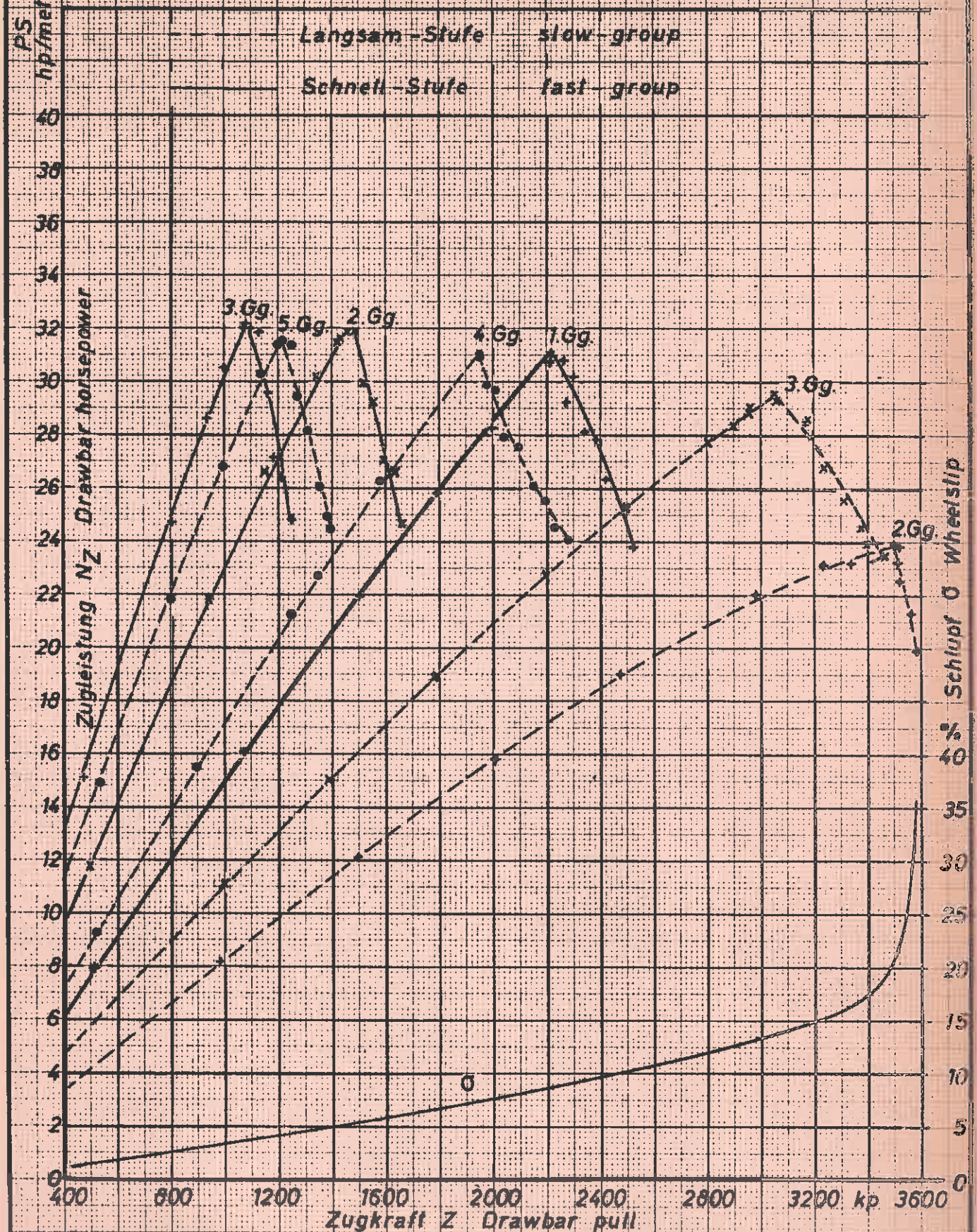
Motor Nr.: 1383569	Kraftstoff: DK 0,830/15°C	Lufttemperatur: 16° C	Versuchstag: 15. 5. 1963	Versuchsltg.:
Schlepper Nr.: 2216031	Motoröl: HD 10W	Barometerstd.: 734 mm QS	Versuchs Nr.: 100/4010/63	Kurvenblatt: 6 Fl.

Schlepperprüffeld Darmstadt

Zugprüfung
mit Ballast

Drawbar-test
with Ballast

Hanomag Granit 500
Motor Typ D 21 CR
Test Nr. 4010



Motor Nr.: 1454413	Motoröl: HD 10 W	Versuchstag: 12.6.1963	Versuchsltg.:
Schlepper-Nr.: 2404757	Lufttemperatur: 15 °C	Versuchs Nr.: 4010/041/63	
Kraftstoff: DK 0,830/15°C	Barometerstd.: 747 mm QS	Kurvenblatt: 7	Md.

A 4 210 x 297 mm

Schlepperprüffeld Darmstadt

Zugprüfung

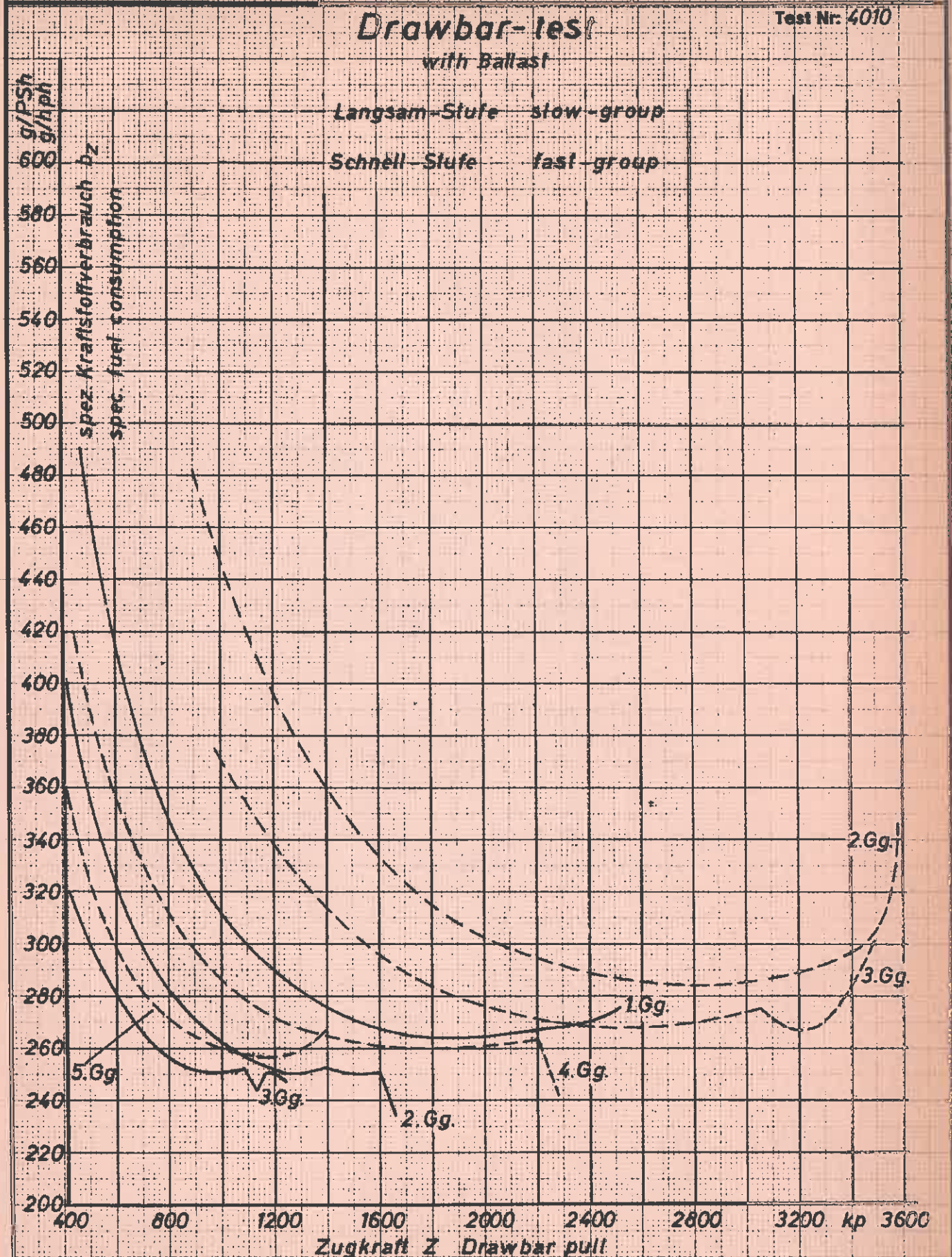
spez. Kraftstoffverbrauch mit Ballast

Hanomag Granit 500
Motor Typ D 21 CR

Test Nr. 4010

Drawbar-Test

with Ballast



Motor-Nr.: 1454413	Motoröl: HD 10 W	Versuchstag: 12.6.1963	Versuchsltg.: Müller
Schlepper-Nr.: 2403757	Lufttemperatur: 15°C	Versuchs Nr.: 4010/041/63	
Kraftstoff DK 0,830/15°C	Barometerstd.: 747 mm QS	Kurvenblatt: 8	Md.

A 4 210 × 297 mm

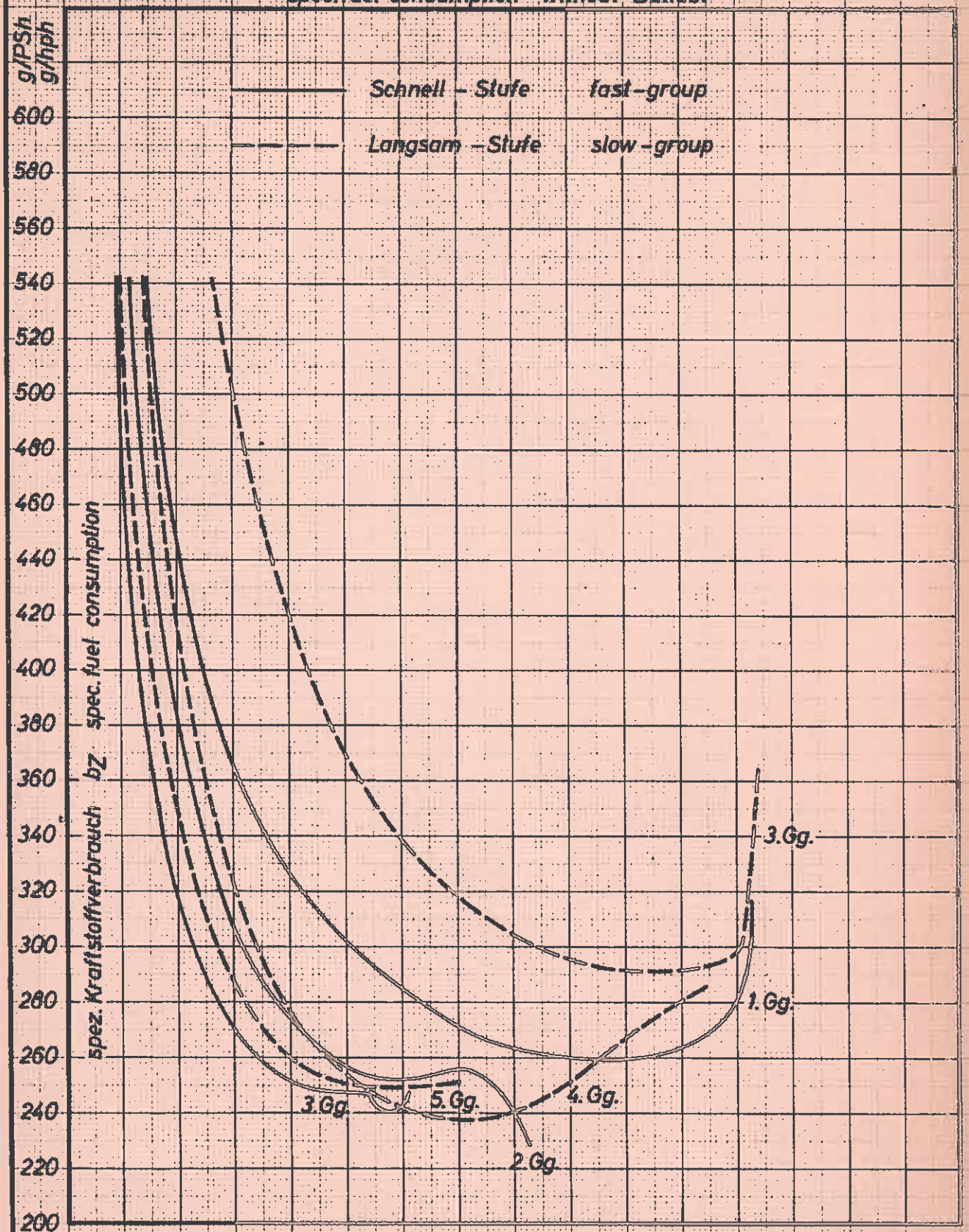
Schlepperprüffeld Darmstadt

Zugprüfung
spez. Kraftstoffverbrauch ohne Ballast

Hanomag Granit 500
Motor Typ D 21 CR

Drawbar-test
spec. fuel consumption without Ballast

Test Nr: 4010



Motor Nr.: 1383569	Motoröl: HD 10W	Versuchstag: 6.–11. 6. 1963	Versuchsltg.:
Schlepper Nr.: 2216031	Lufttemperatur: 25° C	Versuchs Nr.: 4010/035/63	
Kraftstoff: DK 0,830/15° C	Barometerstd.: 744 mm QS	Kurvenblatt: 9	Fl.

A 4 210 × 297 mm

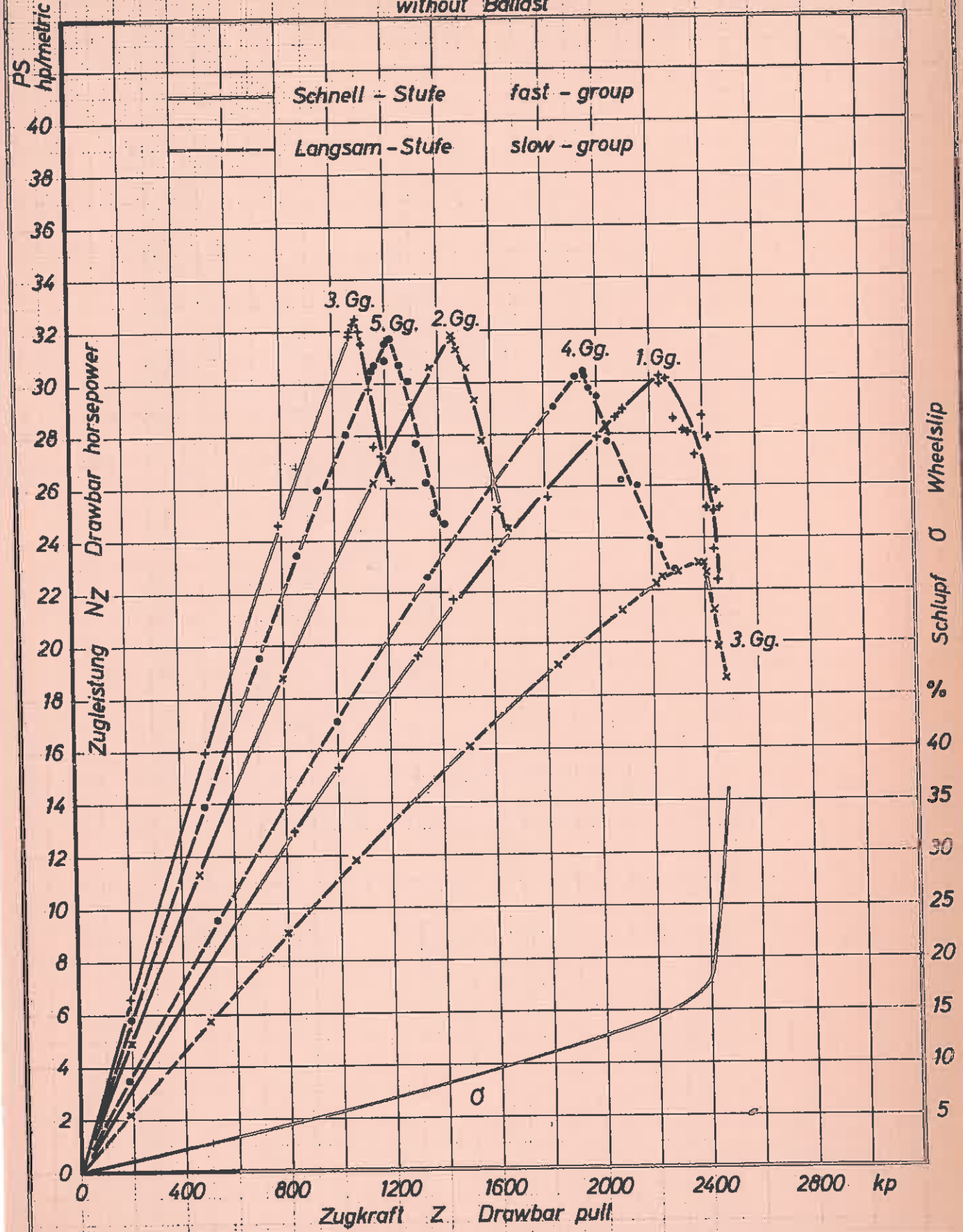
Schlepperprüffeld Darmstadt

Zugprüfung
ohne Ballast

Hanomag Granit 500
Motor Typ D 21 CR

Drawbar-test
without Ballast

Test Nr: 4010



Motor Nr.: 1383569	Motoröl: HD 10 W	Versuchstag: 6.–11.6.1963	Versuchsltg.:
Schlepper Nr.: 2216031	Lufttemperatur: 25° C	Versuchs Nr.: 4010/035/63	
Kraftstoff: DK 0,830/15° C	Barometerstd.: 744 mm QS	Kurvenblatt: 10	