Report No.4011/SPF

Report on test in accordance with O.E.C.D. Test Code for agricultural Tractors Nr. 45

RHEINSTAHL-HANOMAG-DIESEL Tractor Brillant 600 with type D28CR - 4 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. 4011/ S P F

HANOMAG - BRILLANT 600

Manufacturer RHEINSTAHL HANOMAG AG., Hannover
Test requested by : RHEINSTAHL HANOMAG AG., Hannover
Date of Test : March 1963/August 1963

This report has 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 : 22.November 1963
Number of Approval: 045

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: Brillant 600
Type : wheel-Type diesel-tractor, semi-frame construction
No. : 240 4757 (tractor tested)

Engine

Make : RHEINSTAHL HANOMAG AG., Hannover
Model: D 28 CR
Type : 4-stroke-diesel with swirl chamber combustion
No. : 1454413 (engine tested)

Rated engine output (manufacturers rating) 50 hp (metric)
Rated engine speed 2300 r.p.m.

Cylinders: 4 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 4A 65 B310 LS 1040 injection pump
Bosch type DN 4 SD 24 injection nozzles
injection timing 22° before T.D.C.
injection pressure 150 kp/cm²
Bosch type FP/KE 22 AD 22 3/4 supply pump
Bosch type FJ/HR 2/1 fuel precleaner and two main filters: Bosch type felt-tube filter FJ/DF 5/103, Bosch type micro filter FJ/DW 5/103
capacity of fuel tank 67 l

Governor: Bosch type EP/RSV 250-1150 A1 A157 d, mechanical variable speed governor; governed range of engine speed 535-2455 r.p.m.

Air cleaner: Make Mann and 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 7,0 l

Cooling system: Pressurised water cooled, impeller and 4-blade fan assisted, thermostat with dual flow circulation for temperature control, cooling water capacity 14 l

Transmission

Clutch: Make Fichtel and Sachs type DO 280/250 K dry disc dual 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 AG., Hannover type Brillant 600; 10 forward speeds and 2 reverse; sliding gear type comprising 5 speed gear box with reverse gear and dual range reduction gear

Differential: Make RHEINSTAHL HANOMAG AG., Hannover crown wheel and pinion bevel gear type differential; lock fitted, hand lever operated;
total oil capacity of transmission 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	1,41 (creeping gear)
2.	279,39 : 1	2,14
3.	209,97 : 1	2,87
4.	136,25 : 1	4,37
5.	86,24 : 1	6,91
fast range of transmission		
1.	152,33 : 1	3,91
2.	100,50 : 1	5,93
3.	75,53 : 1	7,92
4.	49,01 : 1	12,16
5.	31,02 : 1	19,20
reverse gears		
1.	235,94 : 1	2,53
2.	84,87 : 1	7,02

Steering device:	Make Zahnradfabrik Friedrichshafen type ZF-Gemmer-steering GD 28a with single drop arm 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 insides of the rear wheels Steering-brake-actuated by divided main footpedal, 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 16,9/14-30 AS, 6ply pneumatic (acc.to DIN7807) Track 1505-1625-1725 mm (acc. to DIN 9621) changeable by reversing wheel centres and offset lugs and rims Maximum permissible weight on each tyre 1800 kp at 1,1 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

Main p.t.o.	Live power take-off, footpedal and dual clutch operated
Location:	At rear of tractor, 580 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:	558 r.p.m. (acc. to DIN 9611)at 2300 r.p.m. rated engine speed
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/S 10C 1B1 9T 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 1517 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 8 holes apart either side of centre line (acc. to DIN 9676E); 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 885 mm
Trailer hitch	At rear of tractor, height above ground 760-805-850-895 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 FR 11 Battery 12 Volts, lead acids, capacity 135 Ah Starting device Bosch type BNG 4/12 CR 225 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 head-light main beam.

Overall dimensions

Overall length:	3500 mm with three-point linkage and towing hitch
Overall width:	1890 mm without ballast weights at track 1505 mm
Overall height:	1850 mm to top of 2nd seat bak-rest
Maximum ground clearance:	420 mm in centre line of tractor 485 mm at 300 mm apart either side of centre line.

Weights

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

	Without ballast kg	With ballast kg
On front wheels	945	945
On rear wheels	1674	2671
Total	2619	3616

Special remarks: None

S E C T I O N II

1. COMPULSORY TESTS

Main power take - off test

Date and location of test: 22.-23.March 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 commercial quality in accordance with DIN 51601

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

Transmission oil: SAE 90

Horse power	Speeds		Torque	Fuel consumption			Mean temperatures				Atm. press
	engine	pto	equiv.				Coolt	Engine oil	Fuel	Room	
metric hp	rpm	rpm	kpm	l/h	g/hph	hph/l	°C	°C	°C	°C	mm Hg
A. Maximum power, 2 h											
51,3	2310	560	15,90	12,21	198	4,19	80	80	19	18	734
B. Power at standard p.t.o. - speed											
51,3	2310	560	15,90	12,21	198	4,19	80	80	19	18	734
C. Power at maximum torque											
40,7	1610	390	18,10	10,05	206	4,06	80	80	18	17	734
D. Power at engine rated speed											
51,4	2300	558	16,00	12,69	205	4,05	80	80	18	17	734

No load, maximum engine speed: 2460 r.p.m.

2. SUPPLEMENTARY TESTS

a) Engine tests

Date and location of tests: 19.-20.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 Coolt °C	temperatures Engine oil °C	Fuel °C	Room °C	Atm. press. mm Hg.
A. Maximum power, 2 h										
52,0	2300	16,20	12,43	199	4,18	81	84	19	18	731
C. Power at maximum torque										
42,5	1635	18,61	10,28	200	4,13	81	81	16	19	732
D. Power at rated engine speed										
52,0	2300	16,20	12,47	199	4,17	80	82	21	20	731

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

2. SUPPLEMENTARY TESTS

b) Belt tests

Date and location of tests: 22.5.1963 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: SAE 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, 2h (Belt-slip 1%)											
47,6	2300	20,0	14,82	12,52	218	3,80	80	89	18	14	737
B. Power at standard belt - speed											
47,7	2308	20,1	14,82	12,65	221	3,77	80	81	19	20	731
C. Power at maximum torque											
37,4	1620	14,1	16,50	10,02	222	3,73	85	86	20	20	739
D. Power at engine rated speed											
47,7	2308	20,1	14,82	12,65	221	3,77	80	81	19	20	731

No load, maximum engine speed: 2485 r.p.m.

S E C T I O N III

DRAWBAR TESTS ON ARTIFICIAL TRACK

Date of tests: 7. - 17.May 1963
Type of track: Concrete
Position of governor control: Fully open
Type of tyres: Rear 16,9/14 - 30 AS, 6ply pneumatic, open centre straight bar, Conti Farmer

Front 6,00 - 20 AS Front, 6ply pneumatic, Phoenix

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	939 kg	at rear	1763 kg
With ballast:	at front	1040 kg	at rear	2765 kg
Total with ballast:	3805 kg			

Weight of ballast

Front: Wheel - weights (1 per wheel) : 101 kg
water - nil

Rear: Wheel - weights (7 per wheel) : 576 kg
water - 426 kg

Tyre inflation pressure

Front: 2,0 kp/cm²
Rear : 1,1 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.	31,5	3655	19,9	2340	2,33	89	20	745	3819	Wheelspin
4.	40,2	2755	11,0	2305	3,94	92	26	745	3120	Engine stall
5.	41,8	1730	6,2	2300	6,53	88	21	745	1963	Engine stall
fast range of transmission										
1.	40,5	3205	13,4	2308	3,41	93	17	740	3635	Engine stall
2.	42,0	2075	8,0	2305	5,46	86	15	739	2337	Engine stall
3.	42,1	1533	5,7	2300	7,41	89	14	739	1750	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.	273	3,04	3140	2020 - 3755
4.	262	3,82	2580	1520 - 3120
5.	250	3,34	1750	1050 - 1963
fast range of transmission				
1.	251	3,31	2650	1680 - 3615
2.	242	3,43	1845	1320 - 2337
3.	239	3,48	1500	960 - 1750

b) TESTS WITHOUT BALLAST

Weight of tractor with driver

Front : 939 kg
Rear : 1763 kg
Total : 2702 kg

Tyre inflation pressure

Front : 2,0 kp/cm²
Rear : 1,1 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										
4.	34,2	2475	16,2	2301	3,73	84	22	750	2515	Engine stall
5.	41,8	1742	8,4	2315	6,49	86	20	747	2003	Engine stall
fast range of transmission										
1.	31,0	2475	17,6	2360	3,38	81	14	746	2580	Wheelspin
2.	41,6	2096	11,5	2300	5,36	83	22	747	2375	Engine stall
3.	43,0	1552	7,0	2310	7,48	83	20	745	1780	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				
4.	264	3,17	2140	1375 - 2490
5.	245	3,39	2003	940 - 2003
fast range of transmission				
1.	262	3,18	2100	1425 - 2565
2.	244	3,38	1740	1110 - 2360
3.	240	3,47	1340	850 - 1780

S E C T I O N IV

1. Location of centre of gravity

		Test III.a) ballasted	Test III.b) unballasted
Height above ground	mm	818	772
Distance forward from the vertical plane containing the axis of the rear axle	mm	731	572
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 1500 mm
rear 1505 mm

	with steering brakes right-hand	with steering brakes left-hand	without brakes right-hand	without brakes left-hand
Radius of turning space	3,9	3,8	4,4	4,3
Turning radius	3,8	3,7	4,2	4,1

S E C T I O N V

1. Repairs and adjustments during tests:
2. Remarks:

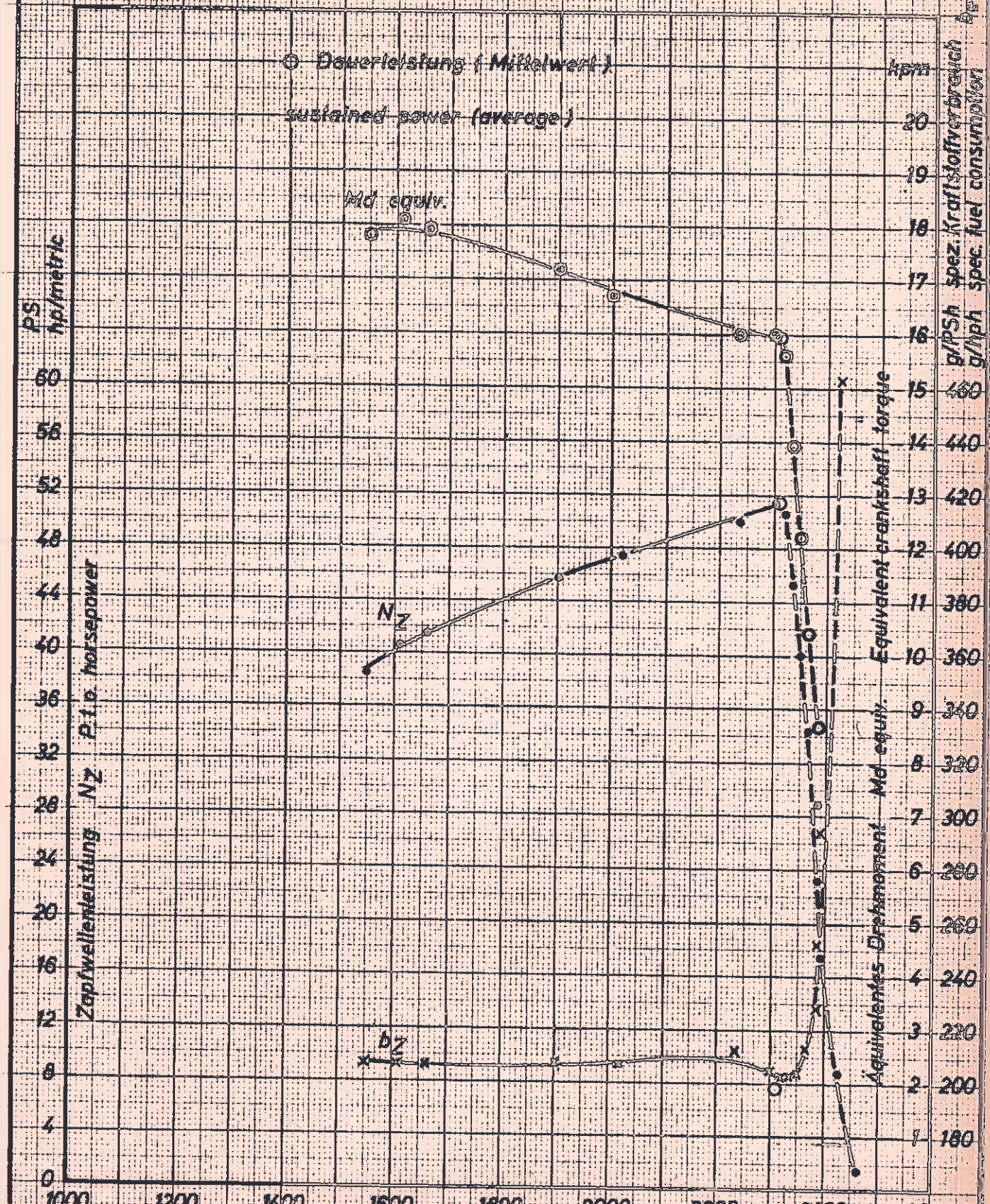
Darmstadt, am 29.November 1963

Schlepperprüffeld Darmstadt

Zapfwellenleistung

Hanomag Brillant 600
Motor Typ D 26 CR
Test Nr. 4011

P.t.o.-test



Motor Nr.: 1454413	Motoröl: HD 10	Versuchstag: 22.3.1963	Versuchsltg.:
Schlepper Nr.: 2404757	Lufttemperatur: 17° C	Versuchs Nr.: 77/4011/63	
Kraftstoff: DK 0,830/15°C	Barometerstd.: 734 mm QS	Kurvenblatt: 1	FT.

DIN A4, 210 x 297 mm

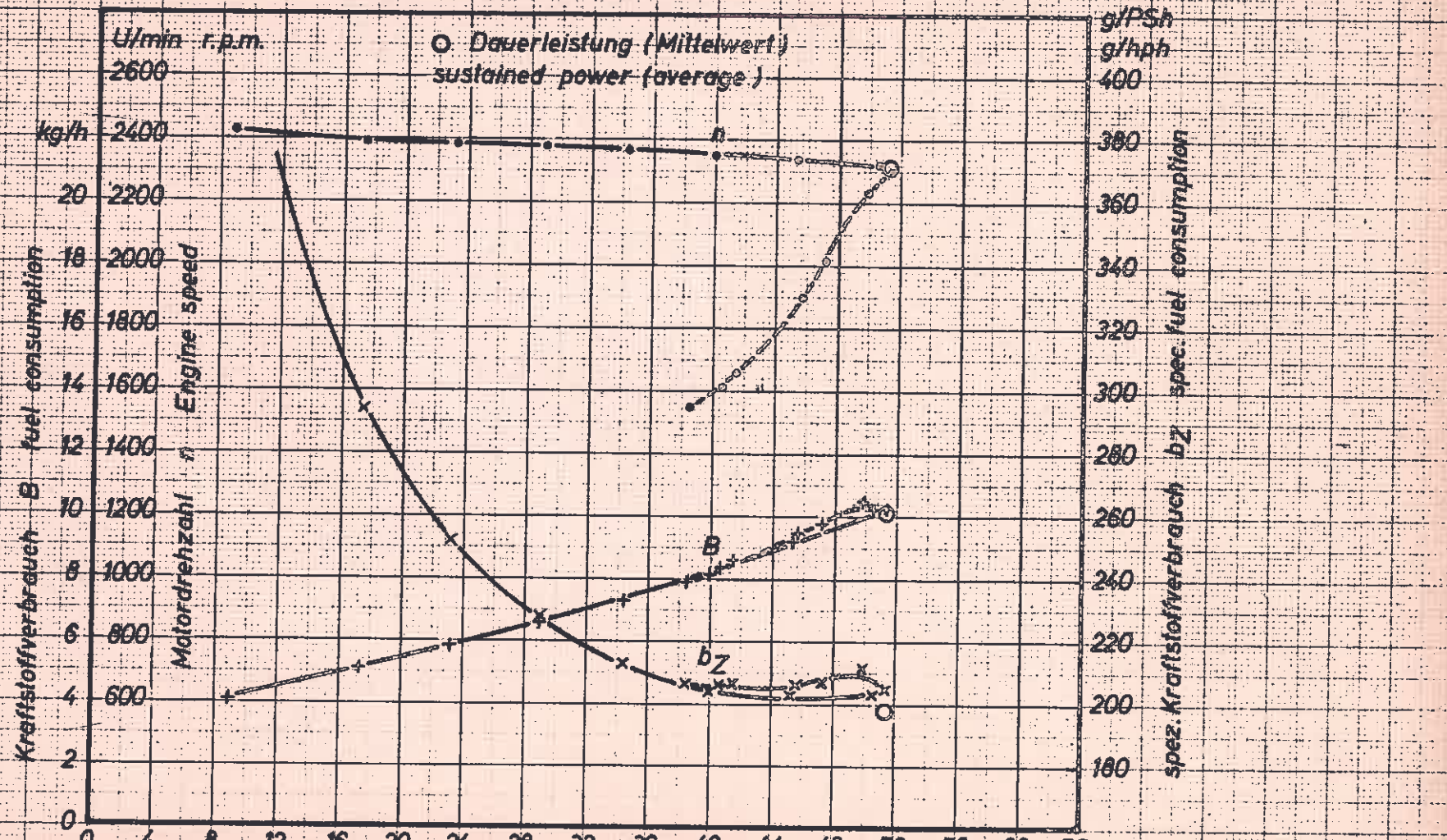
Schlepperprüffeld Darmstadt

Zapfwellenleistung

Hanomag Brillant 600
Motor Typ D 28 CR

Test Nr: 4011

P.t.o.- test



Motor Nr.: 1454413	Kraftstoff: DK 0,830/15°C	Lufttemperatur: 17° C	Versuchstag: 22. 3. 1963	Versuchsltg.:
Schlepper Nr.: 2404757	Motoröl: HD 10	Barometerstd.: 734 mm QS	Versuchs Nr.: 77/4011/63	Kurvenblatt: 2 Fl.

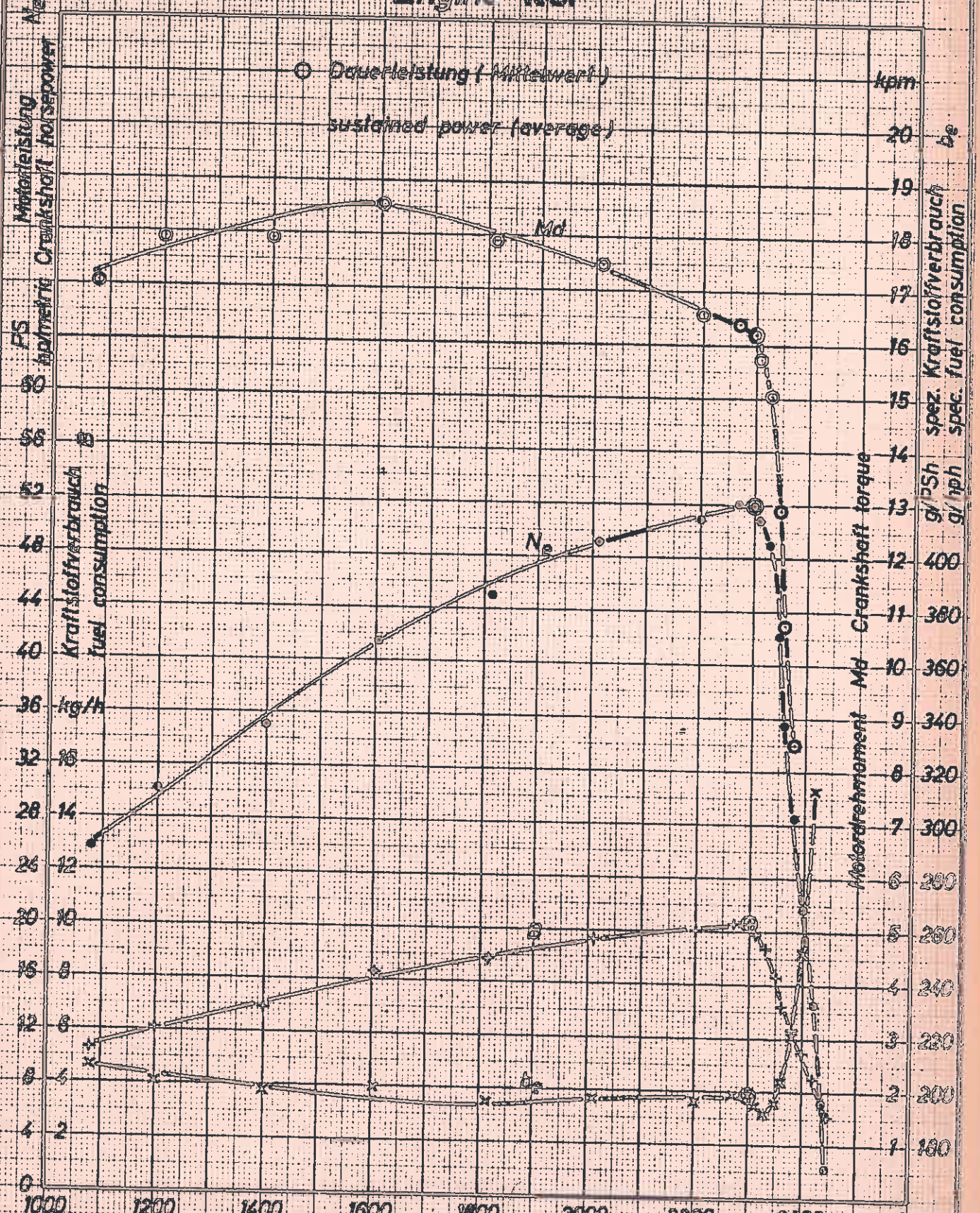
Schlepperprüffeld Darmstadt

Motorleistung

Hanomag Brillant 600
Motor Typ D 28 CR

Engine-test

Test Nr: 4011



Motor Nr.: 1454413	Motoröl: HD 10	Versuchstag: 19. 3. 1963	Versuchsltg.:
Schlepper Nr.: 2404757	Lufttemperatur 18° C	Versuchs Nr.: 62/4011/63	Meier
Kraftstoff: DK 0,830/ 15° C	Barometerst.: 731 mm QS	Kurvenblatt: 3	FI.

A 4 210 × 297 mm 1/4

A4 210 x 297 mm

Schlepperprüffeld Darmstadt

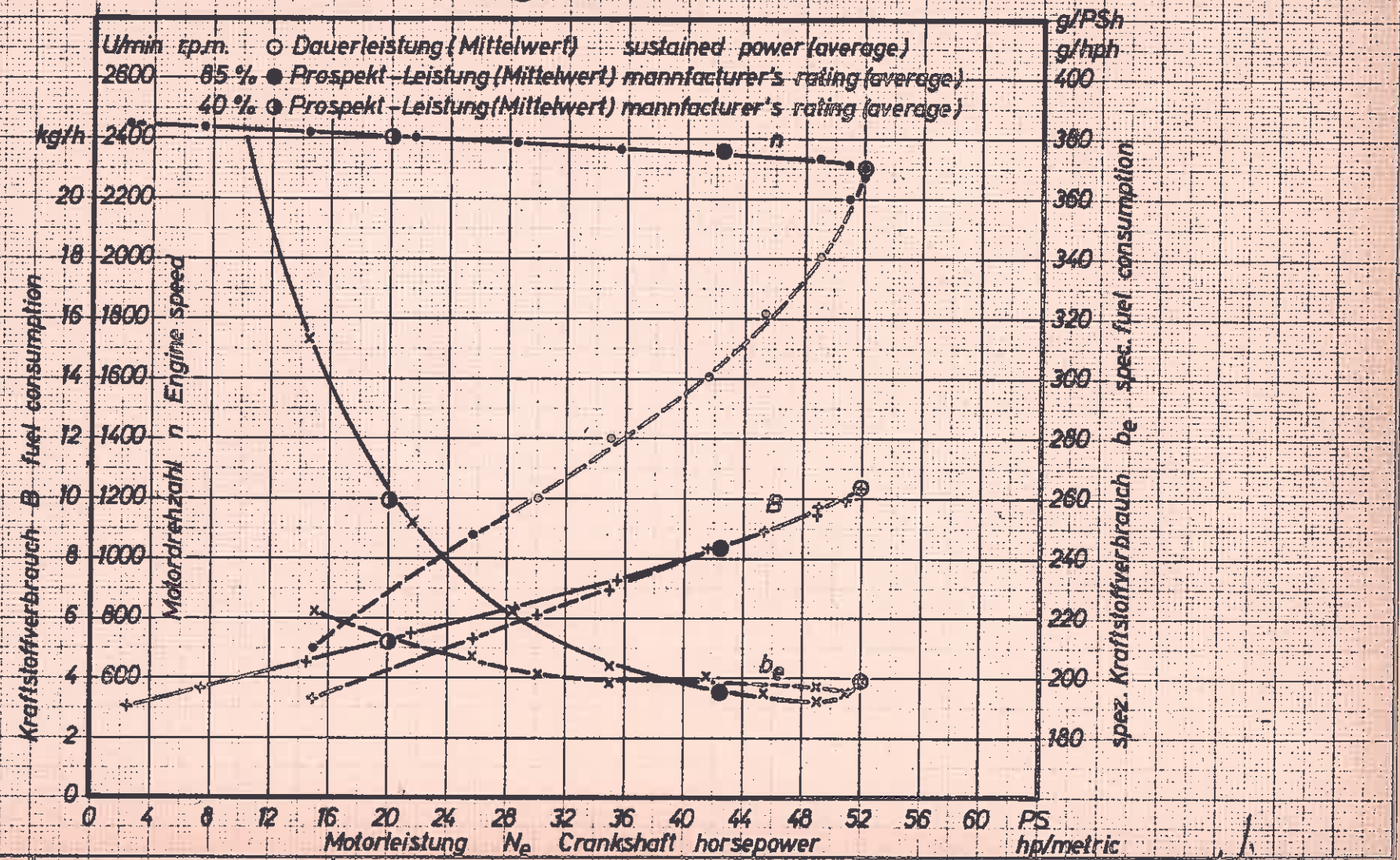
Motorleistung

Hanomag Brillant 600

Motor Typ D 28 CR

Engine-test

Test Nr. 4011



Motor Nr.: 1454413	Kraftstoff: DK QB30/15° C	Lufttemperatur: 18° C	Versuchstag: 19. 3. 1963	Versuchsltg.:
Schlepper Nr.: 2404757	Motoröl: HD 10	Barometerstd.: 731 mm QS	Versuchs Nr.: 62/4011/63	Kurvenblatt: 4 Fl.

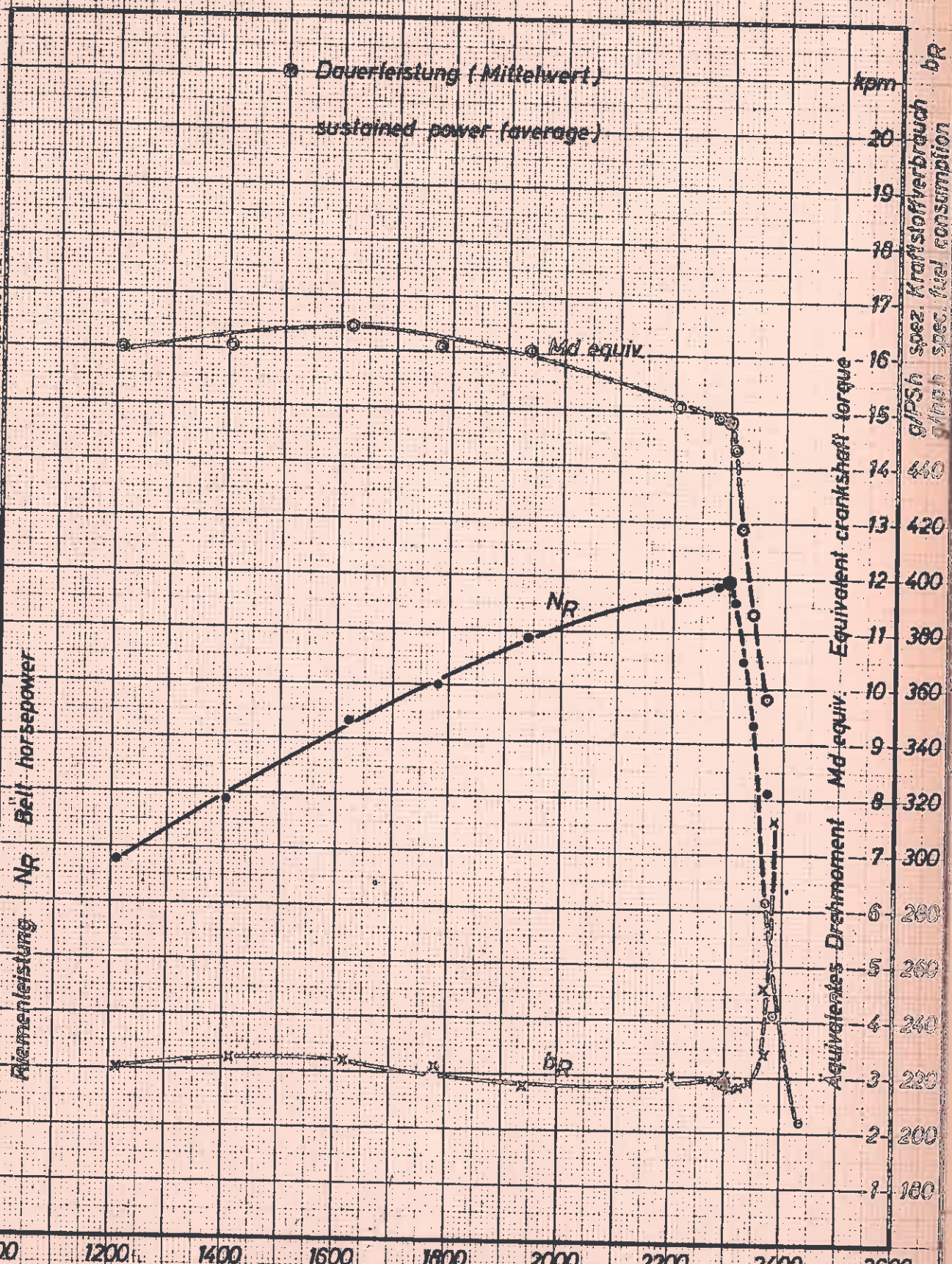
Schlepperprüffeld Darmstadt

Riemenleistung

Hanomag Brillant 600
Motor Typ D 28 CR

Belt-test

Test Nr: 4011



Motor Nr.: 1454413	Motoröl: HD 10	Versuchstag: 22. 5. 1963	Versuchsltg.: Kühl
Schlepper Nr.: 2404 757	Lufttemperatur 20° C	Versuchs Nr.: 105/4011/63	
Kraftstoff: DK 0,830/15° C	Barometerstd.: 731 mm QS	Kurvenblatt: 5	FI.

A 4 210 x 297 mm

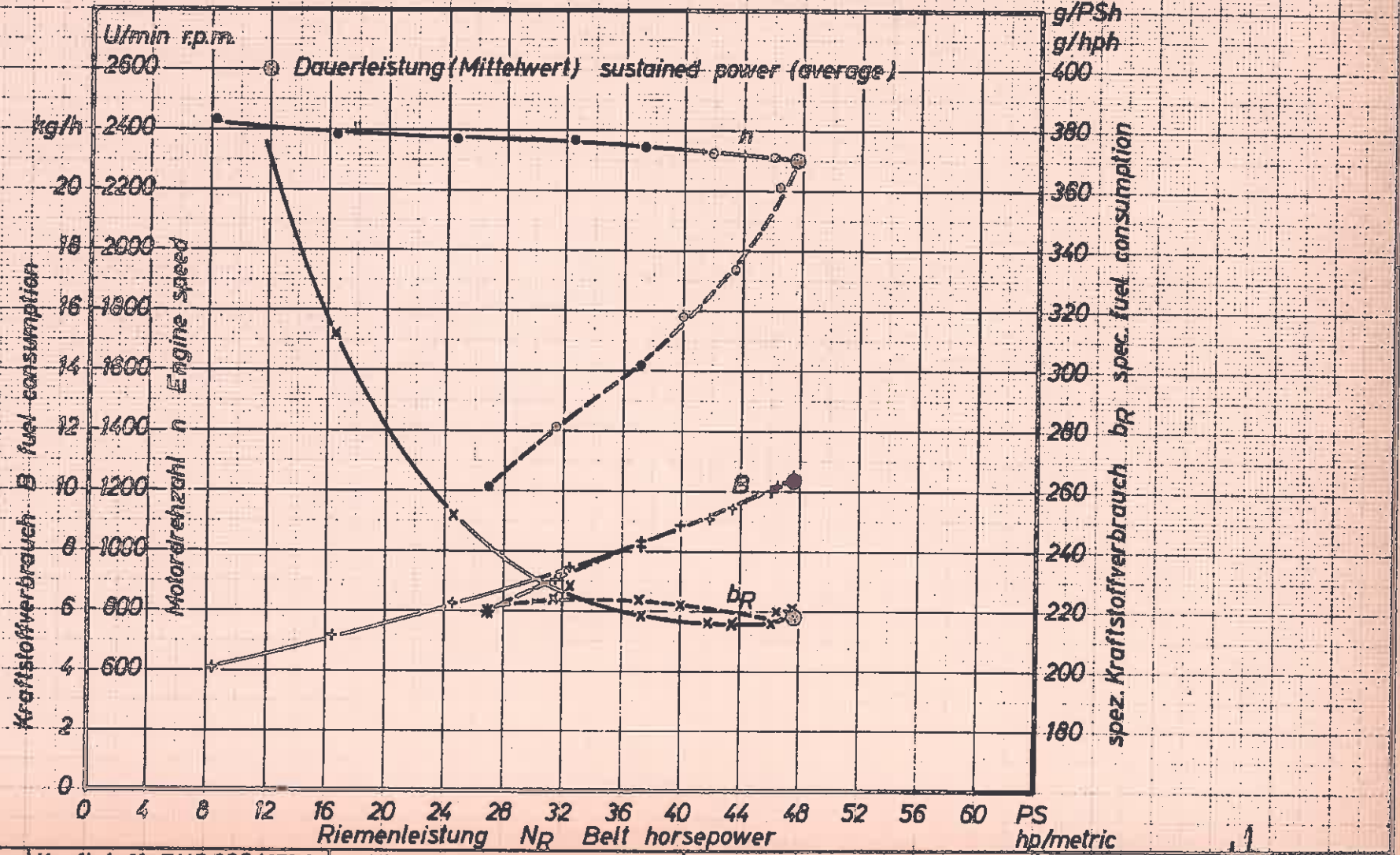
Schlepperprüffeld Darmstadt

Riemenleistung

Hanomag Brillant 600
Motor Typ D 28 CR

Test Nr. 4011

Belt-test



Motor Nr.: 1454413	Kraftstoff: DK 0,830/15° C	Lufttemperatur: 20° C	Versuchstag: 22. 5. 1963	Versuchsltg.:
Schlepper Nr.: 2404 757	Motoröl: HD 10	Barometerstd.: 731 mm QS	Versuchs Nr.: 105/4011/63	Kurvenblatt: F!

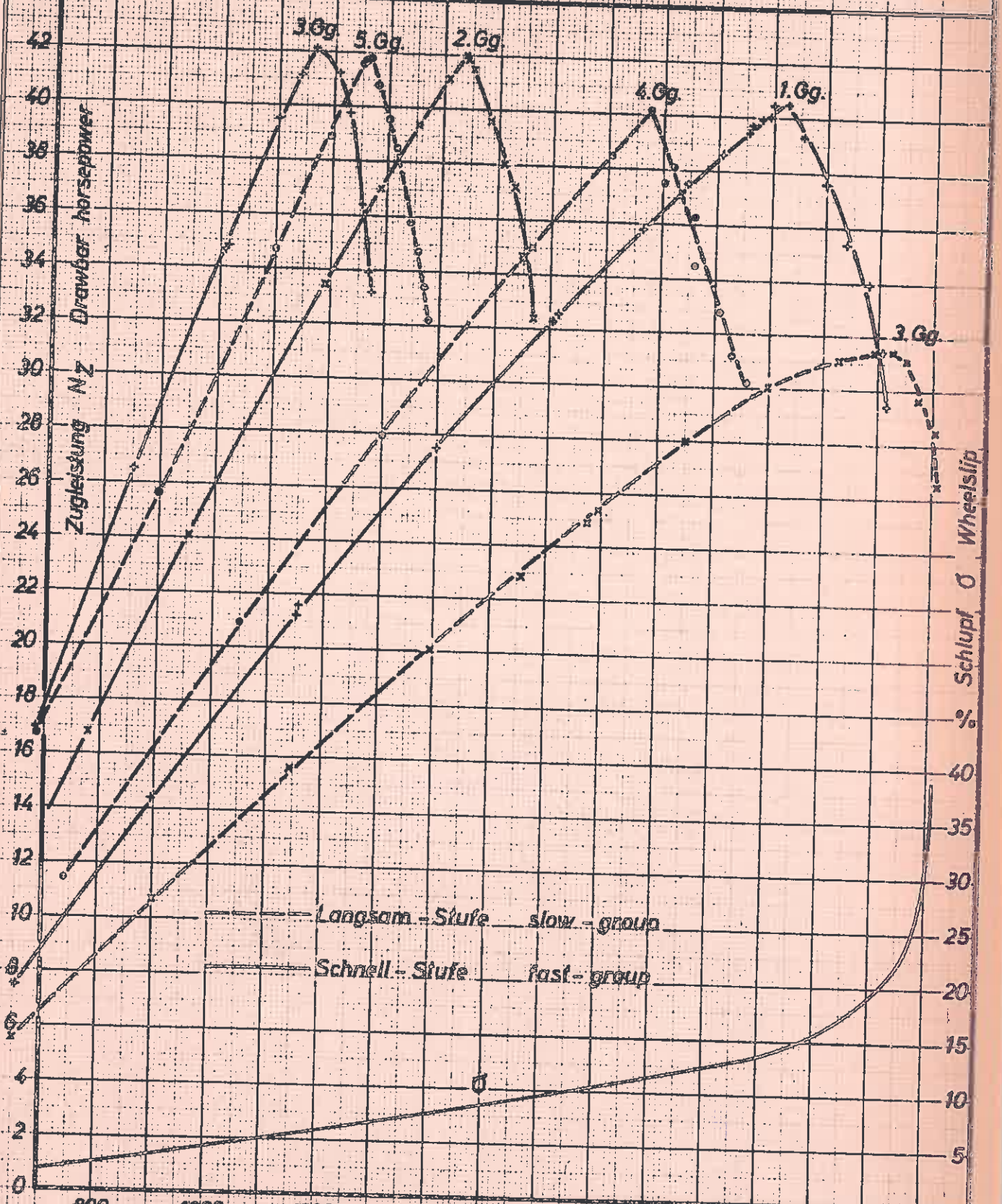
Schlepperprüffeld Darmstadt

Zugprüfung mit Ballast

Hanomag Brillant 600
Motor Typ D 28 CR

Drawbar-Test with Ballast

Test Nr: 4011



Motor Nr.: 1454413	Motoröl: HD 10	Versuchstag: 16.5.-28.6.1963	Versuchsltg.:
Schlepper Nr.: 2404757	Lufttemperatur: 15°C	Versuchs Nr.: 4011/031/63	
Kraftstoff: DK 0,8 bei 15°C	Barometerstd.: 735mm QS	Kurvenblatt: 7	Fl.

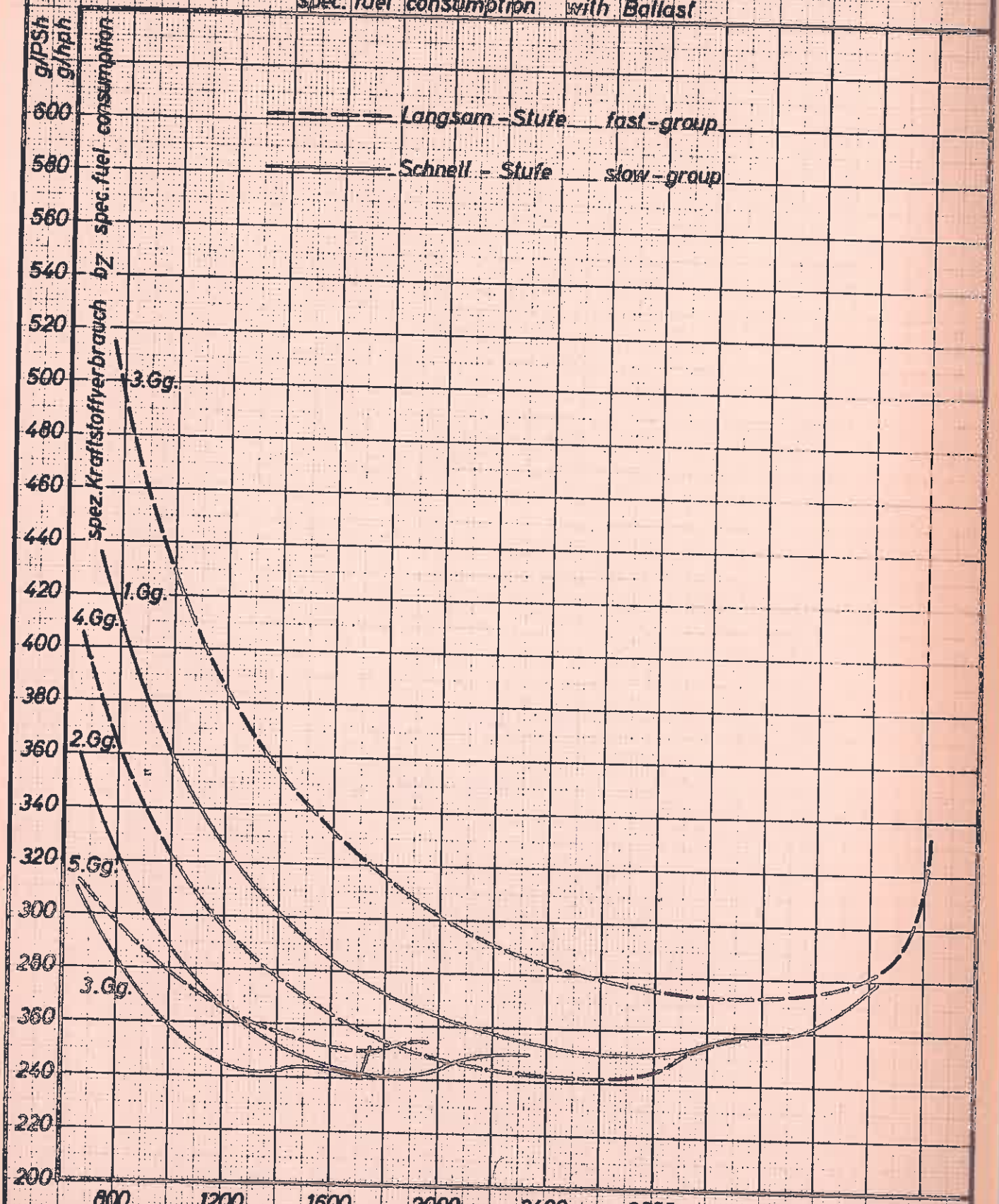
Schlepperprüffeld Darmstadt

Zugprüfung
spez. Kraftstoffverbrauch mit Ballast

Hanomag Brillant 600
Motor Typ D 28 CR

Drawbar-test
spec. fuel consumption with Ballast

Test Nr: 4011



Motor Nr.: 1454413	Motoröl: HD 10	Versuchstag: 16.5.-28.6.1963	Versuchsltg.:
Schlepper Nr.: 2404757	Lufttemperatur: 15° C	Versuchs Nr.: 4011/031/63	
Kraftstoff: DK 0,830/15°C	Barometerstd.: 739 mm QS	Kurvenblatt: 8	

DIN A 4 210 x 297 mm

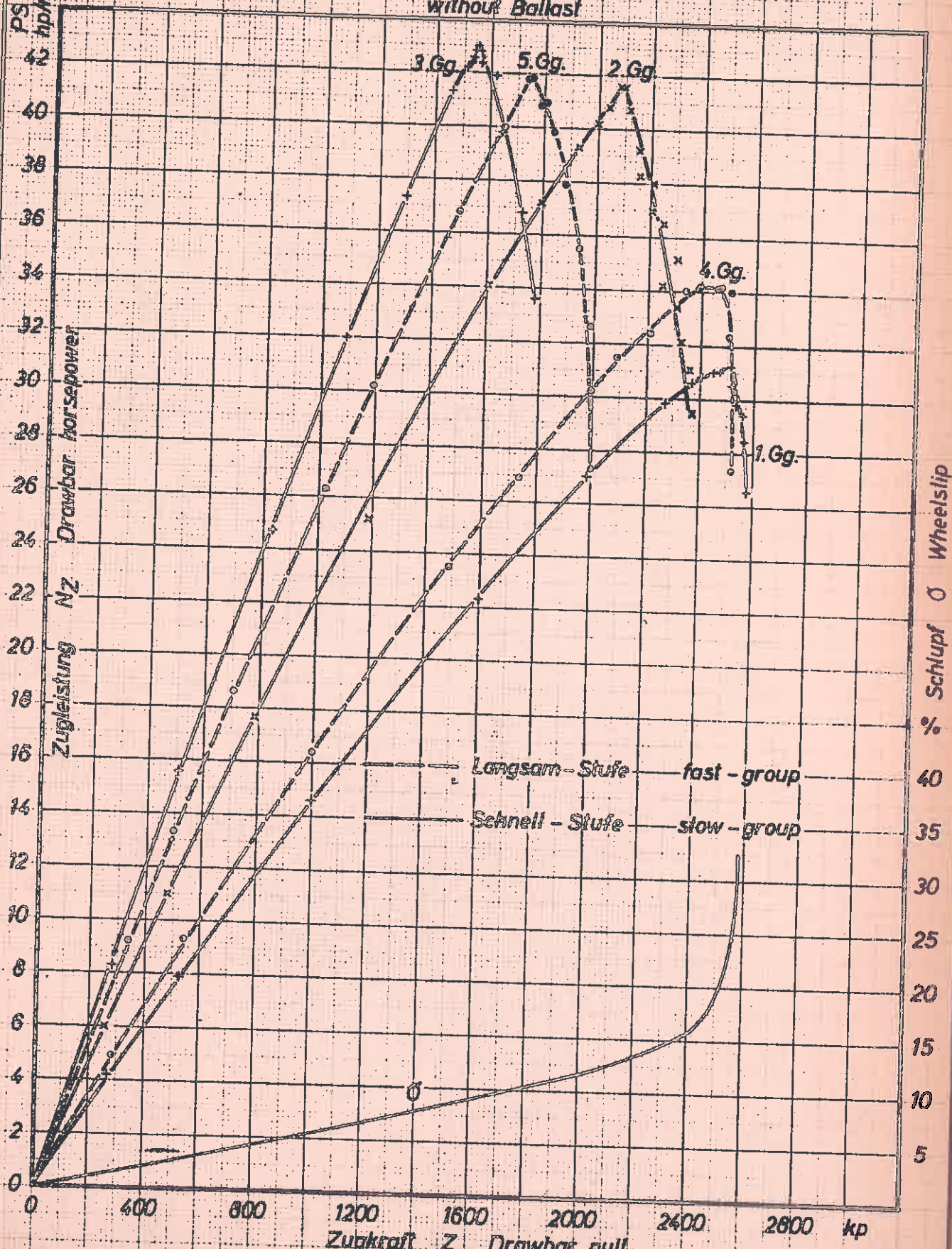
Schlepperprüffeld Darmstadt

Zugprüfung
ohne Ballast

Hanomag Brillant 600
Motor Typ D 28 CR

Drawbar-test
without Ballast

Test Nr: 4011



Motor Nr.: 1454413	Motoröl: HD 10	Versuchstag: 7.5.-29.6.1963	Versuchsltg.:
Schlepper Nr.: 2404757	Lufttemperatur: 20° C	Versuchs Nr.: 4011/023/63	
Kraftstoff: DK 0,830/15°C	Barometerstd.: 747mm QS	Kurvenblatt: 9	

Schlepperprüffeld Darmstadt

Zugprüfung

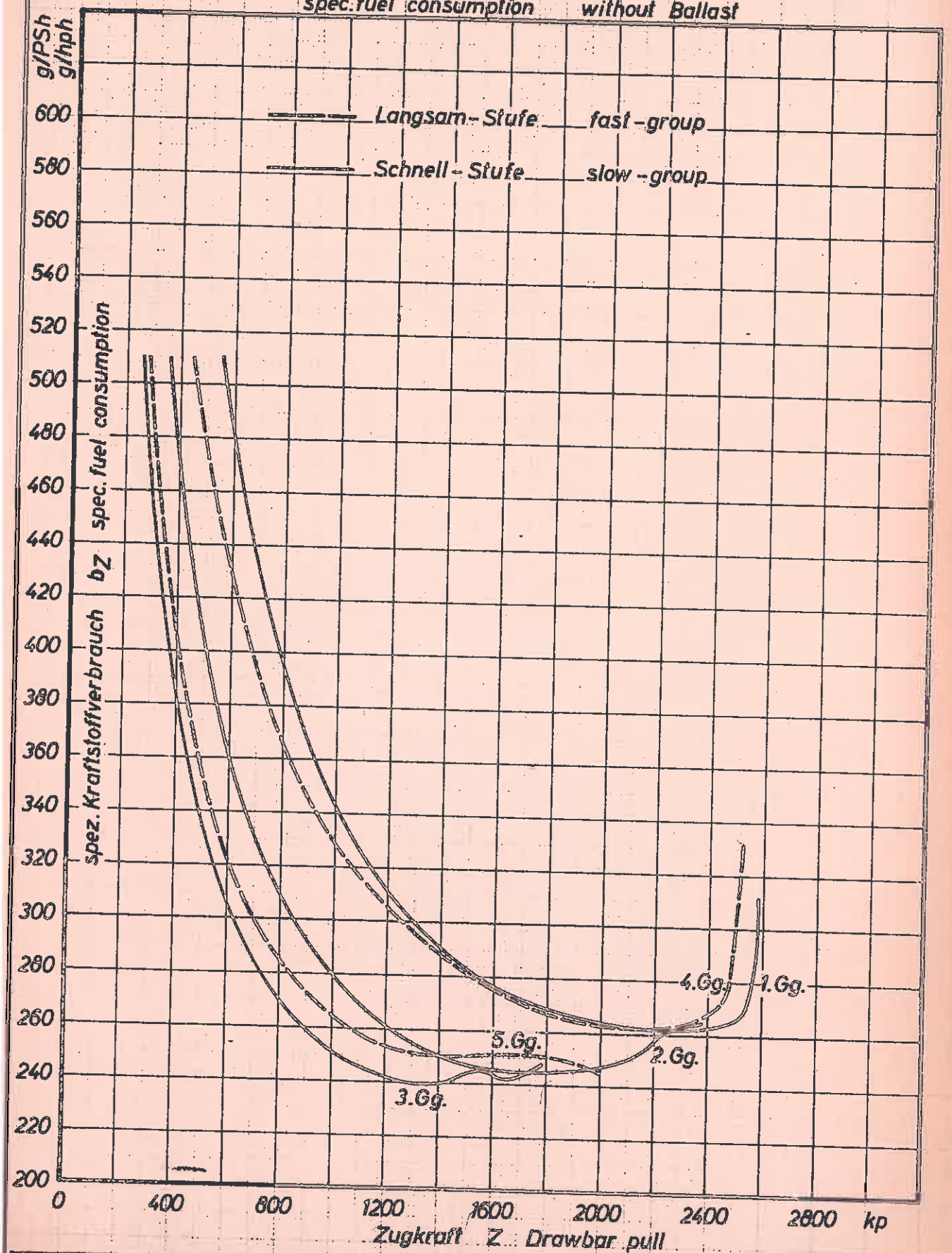
spez. Kraftstoffverbrauch ohne Ballast

Hanomag Brillant 600
Motor Typ D 28 CR

Drawbar-test

spec. fuel consumption without Ballast

Test Nr: 4011



Motor Nr.: 1454413	Motoröl: HD 10	Versuchstag: 7.5.–29.6.1963	Versuchsltg.:
Schlepper Nr.: 2404757	Lufttemperatur: 20°C	Versuchs Nr.: 4011/023/63	
Kraftstoff: DK 0,830/15°C	Barometerstd.: 747mm QS	Kurvenblatt: 10	Fl.