O.E.C.D. Report No. 377
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Report on test in accordance with
O.E.C.D. STANDARD-CODE for the Official Testing
of Agricultural Tractors



HOLDER E 16

Manufactured by: GEBRÜDER HOLDER, Maschinenfabrik
D-7418 Metzingen/Württ.

Date of Tests: July till September 1971

DEUTSCHE LANDWIRTSCHAFTS-GESELLSCHAFT e.V.
Prüfungsabteilung für Landmaschinen
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This bulletin is based on engineering tests in accordance with the O.E.C.D. STANDARD-CODE for the Official Testing of Agricultural Tractors. It does not contain an evaluation of the performance of the tractor on practical work.

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

Date of Approval: December 2nd, 1971

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Printed in Germany

PRÜFUNGS-ABTEILUNG
Holder B 16

Test No. 71-106

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PRÜFUNGS-ABTEILUNG
Holder B 16

Test No. 71-106

Tractor manufacturer:	Gebrüder Holder, Maschinenfabrik D-7418 Metzingen/Württ.
Submitted for test by:	Manufacturer
Selected by:	Manufacturer by agreement with DLG
Place of running-in:	Metzingen and Groß-Umstadt
Duration of running-in:	Engine appr. 145 hours, tractor appr. 70 hours

SPECIFICATION OF TRACTOR

Tractor

Make: Gebrüder Holder, Maschinenfabrik, D-7418 Metzingen/Württ.
Model: B 16
Type: Diesel tractor, unit construction, back-wheel drive
Serial No.: 12 10 149

Engine

Make: Gebrüder Holder, Maschinenfabrik, D-7418 Metzingen/Württ.
Model: HD 1
Type: Water cooled two-stroke Diesel engine with direct injection
Serial No.: D 12 11 433

Cylinders: 1, upright
Bore/stroke: 88/90 mm
Capacity: 547 cm^3
Compression ratio: 16,8 : 1

Fuel system: Gravity type fuel feed
BOSCH-injection pump PFR 1A 50/369/11
manufacturer's production setting 21 mm^3/stroke
injection timing 28° before TDC
BOSCH-injection nozzle DL 90 S 1086
injection pressure 175 kp/cm^2
fuel fine filter with replaceable star type paper cartridge
capacity of fuel tank 6 liter

Governor: Make: Gebrüder Holder, Maschinenfabrik, D-7418 Metzingen/Württ.
Type: Mechanical centrifugal governor;
governed range of engine 600 rev/min to 2800 rev/min;
rated engine speed: 2600 rev/min

Air cleaner: Main cleaner
Make: Torma-Technik
Construction: Oil-bath air cleaner, type OL 160-10
oil capacity 0,65 liter

Precleaner
Make: Torma-Technik
Construction: Cyclonic precleaner, type V 160-1

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Lubrication system:	Recirculation drip feed system with oil pump and separate oil tank; strainer in suction pipe; Oil capacity: 1 liter; oil changing period 250 hours when normal branded HD-oil is used;
Cooling system:	Pressurized thermosyphon water cooling with radiator, fan with 5 blades 220 mm diameter, cooling water capacity 3,6 liter

Electrical equipment

Voltage:	12 Volt, negative earth
Starting device:	Bosch 12 Volt screw-push starter, type AL/EGF 1/12 L
Starting aid:	Ignition cartridge
Generator:	Bosch type EH (R) 14 V 11 A 19
Battery:	Lead acid battery 12 V 24 Ah

Transmission

Clutch	Make: Fichtel & Sachs AG., D-872 Schweinfurt single disc dry clutch type K 160 D, operated by foot pedal
Gearbox :	Make: Gebrüder Holder, Maschinenfabrik D-7418 Metzingen/Württ. Construction: Change speed gear with 3 speeds; group gear with 2 forward and 1 reverse group, total 6 forward and 3 reverse speeds
Rear axle:	Make: Gebrüder Holder, Maschinenfabrik D-7418 Metzingen/Württ. Bevel gear type differential gear with spirally fluted crown wheel and pinion; differential lock fitted, hand lever operated
Final drive:	Spur-wheel drive; portal design
Oil capacity:	3,2 liter total; oil changing period 2500 hours; recommended oil: SAE 80

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Total ratios and speeds

Group gear	Gear No.	Number of engine revolutions for one revolution of the driving wheel	Theoretical travelling speed at rated engine speed of 2600 rev/min without slip of wheels km/h	m/s
slow (L.)	1	290,10 : 1	1,20	0,33
	2	191,27 : 1	1,82	0,51
	3	99,19 : 1	3,52	0,98
fast (S.)	1	55,79 : 1	6,25	1,74
	2	36,78 : 1	9,48	2,63
	3	19,07 : 1	18,29	5,08
reverse (R.)	1	290,10 : 1	1,20	0,33
	2	191,27 : 1	1,82	0,51
	3	99,19 : 1	3,52	0,98

Power take-off

a) Main p.t.o.: dependent of main clutch, manually engaged

Location: At rear of tractor, 430 mm above ground, in median plane

Dimensions: Spline shaft 34,9 x 29 x 8,7 mm = $1\frac{3}{8}$" , 6 splines (acc.to DIN 9611 Form A; B.S. 1495; ASAE S 203.5)

Speed: 667 rev/min at 2600 rev/min rated engine speed; standard p.t.o.speed 540 rev/min at 2106 rev/min engine speed

Direction of rotation: Clockwise, viewed from tractor rear

b) Additional p.t.o. as mower drive, manually engaged

Location: Between the axles, 365 mm above ground, in median plane of tractor

Dimensions: Spline shaft 6 x 21 x 25, 6 splines (acc.to DIN 5463)

Speed: 1529 rev/min at rated engine speed

Direction of rotation: Clockwise, viewed from tractor front

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Power lift: Make: Gebrüder Holder, Maschinenfabrik
D-7418 Metzingen/Württ.
hydraulic power lift with floating position, dissolted design; single acting ram; Bosch gear type oil pump, type HY/ZBR 1/1 R 101, directly driven by the engine;
maximal oil pressure 175 kp/cm²; oil capacity 1,6 liter;
Bosch control valve type HY/SEA 5/175/1;
recommended oil: HD SAE 20 engine oil

Pull attachment

Implement linkage: Three-point implement linkage make Holder, special design, controlled by power lift;
lift height above ground from 145 mm to 580 mm

Drawbar: Fixed on hydraulically controlled implement linkage;
height above ground from 145 mm to 580 mm adjustable by power lift;
centre hole 22 mm diameter and 2 holes with 45 mm distance apart either side of centre line;
distance of centre hole to the end of p.t.o. 370 mm when lower links in horizontal position.

Trailer hitch: At rear of tractor; height above ground 550 mm;
distance from rear axle 325 mm;
not adjustable

Towing hitch: At front of tractor; height above ground 440 mm

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Steering device — Make: Gebrüder Holder, Maschinenfabrik
D 7418 Metzingen/Württ.
spur gear steering device

Brakes

Parking brake: Internal shoe type brake, mechanically acting on brake drums on the rear axle shafts; operated by **hand lever with ratchet**

Foot brake: Internal shoe type brake, mechanically acting on brake drums on the rear axle shafts; operated by foot pedal

Steering brake: Internal shoe type brake, mechanically acting on the same brake drums as the foot brake; operated by 2 foot pedals on the left and on the right hand side of tractor

Wheels

Steering wheels: Two at front; 4,00-10 AM 2 ply pneumatics (acc.to DIN 7813); maximum permissible weight on each tyre 210 kp at 2 kp/cm², 280 kp when transporting mounted implements;
track 690 mm and 850 mm, changed by extending front axle

Rim: 3,00 x 10 (acc.to DIN 7824)

Driving wheels: Two at rear; 7,00-16 AS 4 ply pneumatics (acc.to DIN 7814); maximum permissible weight on each tyre 325 kp at 1,5 kp/cm², 390 kp when transporting mounted implements;
track 645 mm and 885 mm, changed by reversing wheels

Rim: 4,50 E x 16 (acc.to DIN 7826)

Wheel base: 1290 mm

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Weights — With power lift, three-point linkage, full fuel tank, oil and water, as tested

		without driver	with driver
Weight of tractor without ballast:	Front axle load	206 kp	210 kp
	Rear axle load	298 kp	365 kp
	Total	504 kp	575 kp

Ballast front: 1 weight 38 kp

Ballast rear: 1 weight (33 kp) per wheel = total 66 kp
Water in tyres = 35 kp

		without driver	with driver
Weight of tractor with ballast:	Front axle load	258 kp	263 kp
	Rear axle load	385 kp	451 kp
	Total	643 kp	714 kp

Seat — Make: Gebrüder Holder, Maschinenfabrik D 7418 Metzingen/Württ.
upholstered seat and backrest, horizontal links rubber bumper;
height above ground 795 mm, in median plane of tractor

Number of grease points (whole tractor): 4

Overall dimensions

Overall length: 2200 mm with three-point linkage
Overall width: 830/1070 mm at 645/885 mm track, without ballast weights
Overall height: 1060 mm to top of steering wheel
Maximum ground clearance: 270 mm in median plane of tractor

Lighting equipment — Electric 12 Volt, acc.to StVZO (German Govt.Regulation)

	Height above ground of centre mm	Dimensions of area mm	Distance from outside edge of tractor to centre mm*)
Head lights	935	90	295/402,5
Rear lights	765	75	102,5/210
Reflectors	765	75	185/292,5

*) at track 660/875 mm

FUEL AND LUBRICANTS USED IN TESTS

Laboratory and track tests

Fuel:	Aral Diesel oil, specific gravity at 15°C : 0,827 kg/l (commercially available quality acc.to DIN 51 601)
Engine oil:	HD SAE 20
Transmission oil:	SAE 80
Hydraulic oil:	HD SAE 20

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COMPULSORY TESTS

(1) MAIN POWER TAKE-OFF PERFORMANCE

Date and location of Tests: 28th and 29th July 1971, Groß-Umstadt

Type of dynamometer: Schenck hydraulic dynamometer U1-30

Maximum power

Horsepower metric hp	Speed engine rev/min	Speed p.t.o. rev/min	Fuel consumption total l/h	Fuel consumption specific g/metric hp h	Specific energy metric hp h/l
At maximum power 2-hour test					
11,3	2615	671	3,32	242	3,40
At standard p.t.o. speed (540 rev/min)					
8,6	2106	540	2,41	230	3,57
At the speed recommended by the manufacturer for drawbar work					
11,3	2615	671	3,32	242	3,40
Fuel consumption at part loads					
(i) 85% of torque at maximum power					
9,8	2670	685	2,65	222	3,70
(ii) unloaded					
-	2760	708	0,96	-	-
(iii) 50% of the load defined in (i)					
5,0	2725	699	1,53	252	3,27
(iv) maximum power					
11,3	2615	671	3,32	242	3,40
(v) 25% of the load defined in (i)					
2,5	2745	704	1,12	368	2,23
(vi) 75% of the load defined in (i)					
7,4	2691	690	2,10	234	3,52

No load maximum engine speed: 2760 rev/min

Equivalent crankshaft torque at maximum power: 3,09 kpm

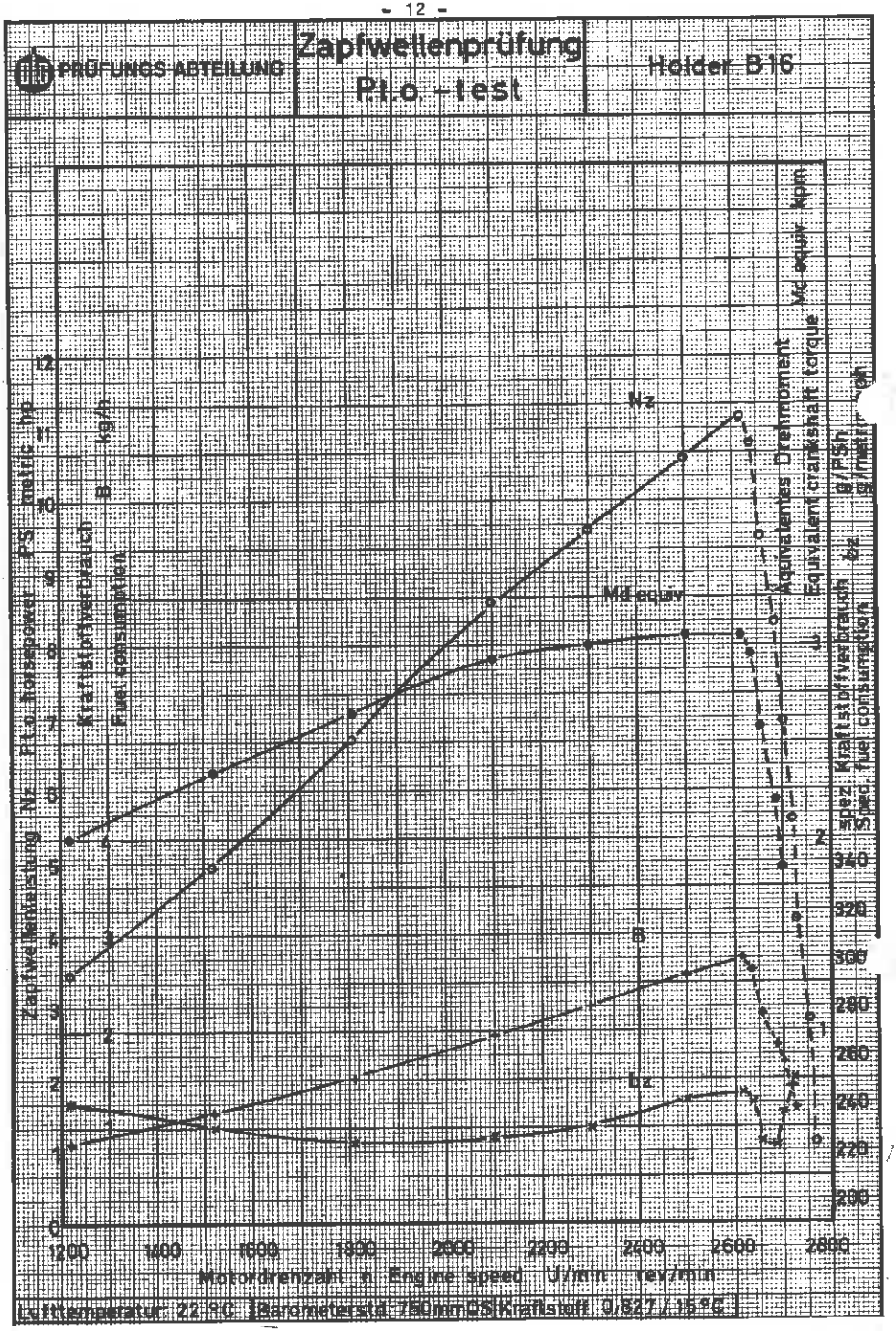
Maximum equivalent torque: 3,09 kpm at 2615 rev/min of the engine

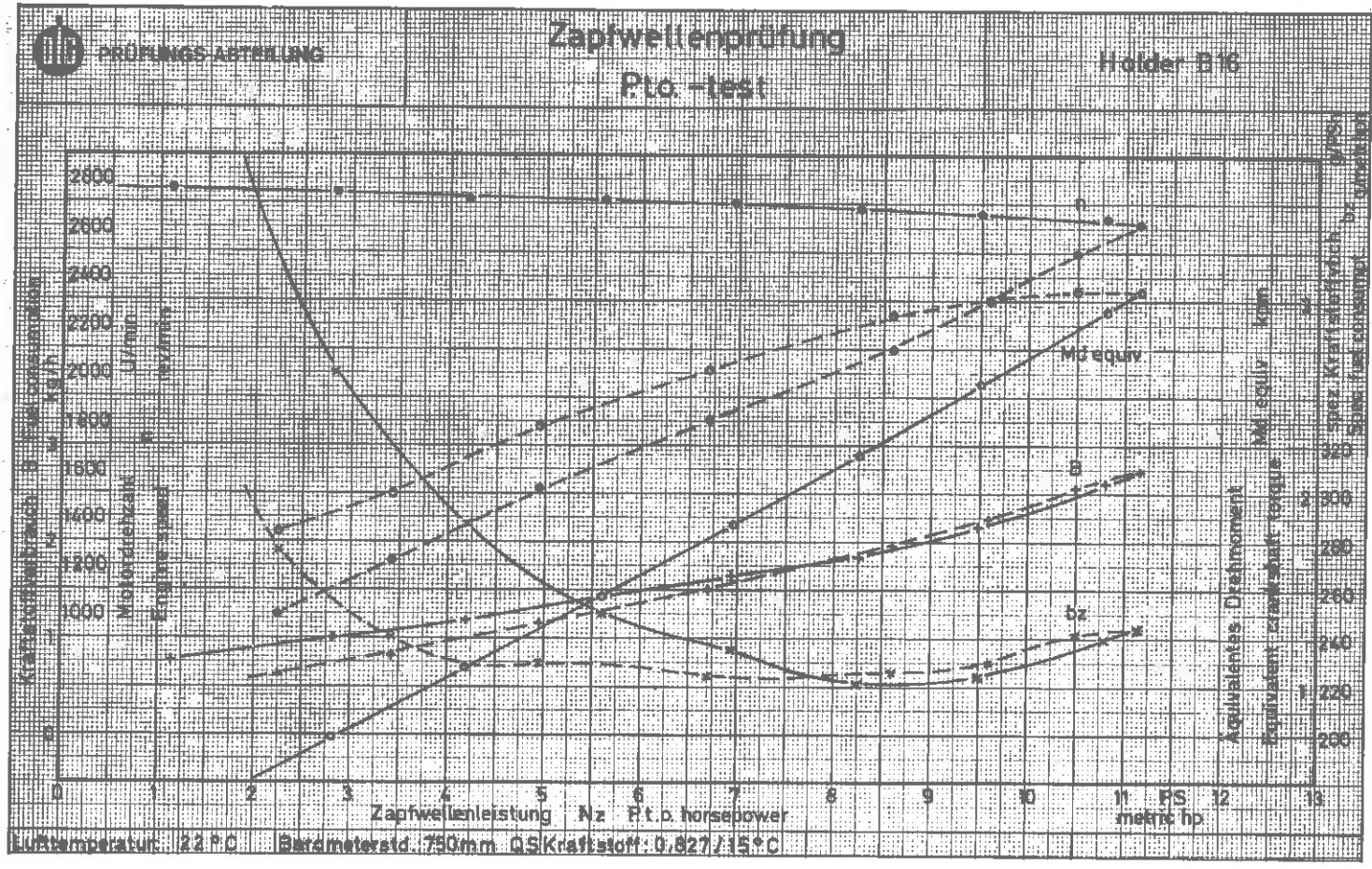
Mean atmospheric conditions:

temperature	22°C
pressure	750 mm Hg
relative humidity:	85%

Maximum temperatures:

coolant	not recorded
engine oil	not recorded
fuel	26°C


PRÜFUNGS-ABTEILUNG
Zapfwellenprüfung
P.t.o. - test
Holder B16
Zapfwellenleistung Nz P.t.o. horsepower PS metric hp
Kraftstoffverbrauch B kg/h
Fuel consumption
Nz
Md equiv
bz
Äquivalentes Drehmoment Md equiv kpm
Equivalent crankshaft torque
g/PSh
g/metric hph
spez. Kraftstoffverbrauch bz
Spec. fuel consumption
Motordrehzahl n Engine speed U/min rev/min
Lufttemperatur: 22 °C Barometerstd. 750 mmQS Kraftstoff 0,827 / 15 °C


PRÜFUNGS-ABTEILUNG
Zapfwellenprüfung
P.t.o. -test
Hatz E 116
Md equiv
B
bz
Zapfwellenleistung Nz P.t.o. horsepower
metric hp
Lufttemperatur: 22 °C Barometerstd. 750mm Q.S. Kraftstoff: 0,827 / 15 °C

(2) DRAWBAR PERFORMANCE

Date of test: 5th August till 19th August 1971

Type of track: concrete

Height of drawbar above ground: 370 mm

Gear No. and Group	Speed km/h	Horse-power metr.hp	Drawbar pull kp	Engine speed rev/min	Slip of wheels %	Specific energy metr.hp h/l	Specific fuel consumpt. g/metr.hp h	Temperatures Fuel °C	Coolant °C	Engine oil °C	Atmospheric conditions Tempe-rature °C	Relative humidity %	Pressure mm Hg
(i) MAXIMUM POWER with ballast													
1 sl.	1,06	2,7	696	2735	15,0	2,00	411	26	not recorded		28	41	749
2 sl.	1,59	4,1	695	2699	14,8	2,20	373	25	not recorded		27	44	749
3 sl.	2,99	7,5	680	2643	15,0	2,45	335	29	not recorded		29	40	748
1 f.	5,60	9,4	451	2601	8,9	2,85	289	21	not recorded		24	50	751
2 f.	8,89	9,5	290	2610	5,2	2,86	287	25	not recorded		26	45	751
3 f.	17,70	9,6	146	2600	2,2	2,88	285	27	not recorded		29	42	750
(ii) FIVE-HOUR-TEST AT 75% OF PULL AT MAXIMUM POWER IN 1st GEAR OF FAST GROUP													
1 f.	5,95	7,4	338	2688	6,2	3,11	265	22	not recorded		22	52	750
(iii) FIVE-HOUR-TEST AT PULL CORRESPONDING TO 15% WHEEL SLIP IN TEST (i)													
3 sl.	2,99	7,5	680	2643	15,0	2,45	335	23	not recorded		23	60	750
(v) MAXIMUM POWER without ballast													
2 sl.	1,60	3,3	563	2700	14,9	1,83	448	28	not recorded		32	39	745
3 sl.	3,04	6,4	571	2668	14,9	2,79	294	28	not recorded		32	39	745
1 f.	5,54	9,2	450	2613	10,7	2,76	299	21	not recorded		22	55	750
2 f.	8,85	9,6	294	2613	6,4	2,82	292	26	not recorded		29	43	745
3 f.	17,56	9,4	144	2606	3,3	2,85	289	21	not recorded		22	60	750

Engine oil consumption during ten hours duration of tests (ii) and (iii): 100 g/h

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(3) TURNING SPACE AND TURNING CIRCLE

Wheel equipment front: 4,00-10 AM, 2 ply, without ballast
rear: 7,00-16 AS, 4 ply, without ballast

Track of wheels front: 690 mm
rear: 660 mm

	With brakes		Without brakes	
	left-hand m	right-hand m	left-hand m	right-hand m
Radius of turning space	2,14	2,18	2,34	2,38
Radius of turning circle	2,10	2,09	2,25	2,30

(4) LOCATION OF CENTRE OF GRAVITY

	Without ballast mm
Height above ground	574
Distance forward from the vertical plane containing the axis of the rear wheels	469
Distance of the median plane of the tractor	0

(5) BRAKING PERFORMANCE

A) FOOT BRAKE

Date of test: 3rd and 6th September 1971

Type of track: concrete

Type of decelerometer: Motor Meter Bremsverzögerungs- und Pedalkraftschreiber, Moto Meter Hermann Schlaich D 7 Stuttgart N

Travelling speed of tractor: 18,8 km/h

With cold brakes

		Tractor with ballast	Tractor without ballast
Deceleration	m/s^2	4,1	3,9
Stopping distance	m	3,6	3,8
Force on pedal	kp	33	25
Force on pedal to achieve a deceleration of 2,5 m/s^2	kp	23	19

BRAKE FADE CHARACTERISTICS

		Tractor with ballast	Tractor without ballast
Deceleration hot/cold	%	119	110
Stopping distance cold/hot	%	100	106
Force on pedal cold/hot	%	100	104

B) PARK BRAKE

Tractor facing up slope

Pull on hand brake 17 kp, tractor does not roll

Tractor facing down slope

Pull on hand brake 17 kp, tractor does not roll

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(6) AMBIENT NOISE EMITTED BY THE TRACTOR

Date of test: 6th September 1971
Type of track: concrete
Type of sound level meter: Bruel & Kjaer type 2203

Results of test

Speed: 3rd fast
Travelling speed before acceleration: 14 km/h
Sound level: 87 dBA

(7) NOISE AT THE DRIVER'S EAR LEVEL

Date of test: 20th August 1971
Type of track: concrete
Type of sound level meter: Bruel & Kjaer, type 2203
Type of octavfilter: Bruel & Kjaer, type 1613

No cab fitted on tractor

Results of tests

Gear	Drawbar pull at which the tractor develops the maximum sound level kp	Travelling speed nominal km/h	Travelling speed effective km/h	Sound level dBA	Sone
1 fast	400	6,37	5,71	99	111

The 1st fast gear corresponds to the travelling speed nearest to 7,25 km/h

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(8) POWER LIFT AND HYDRAULIC PUMP PERFORMANCE

Date and location of tests: 8th September 1971, Groß-Umstadt

Hydraulic fluid: HD SAE 20

POWER LIFT

a) Lift rods in the foremost holes of the lift arms

Height above ground in down position hitch point mm	Height above ground in down position test frame mm	Total vertical movement mm	Maximum force exerted through full lift range kp	Pressure of hydr. oil kp/cm²	Linkage load at which unballasted front end of tractor lifts off the ground kp
Measured on the hitch points of lower links					
145	*)	435	487	175	408

b) Lift rods in the rearmost holes of the lift arms

Measured on the hitch points of lower links					
345	*)	190	787	175	408

Type of linkage lock for transport: No lock fitted
Opening pressure of the cylinder overpressure relief valve: No valve fitted

*) Tests with the test frame not applicable because the test frame is not suitable for the three-point linkage of this small tractor.

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OPTIONAL TESTS

(9) ENGINE PERFORMANCE

Date and location of tests: 20th till 26th July 1971, Groß-Umstadt

Type of dynamometer: Schenck eddy-current dynamometer W 150

Maximum power

Horsepower metric hp	Engine speed rev/min	Fuel consumption total l/h	Fuel consumption specific g/metric hp h	Specific energy metric hp h/l
At maximum power 2-hour test				
12,1	2602	3,30	225	3,67
At standard p.t.o. speed (540 rev/min)				
9,0	2102	2,38	218	3,78
At the speed recommended by the manufacturer for drawbar work				
12,1	2602	3,30	225	3,67
Fuel consumption at part loads				
(i) 85% of torque at maximum power				
10,5	2650	2,63	207	3,99
(ii) unloaded				
-	2750	0,73	-	-
(iii) 50% of the load defined in (i)				
5,4	2720	1,47	224	3,67
(iv) maximum power				
12,1	2602	3,30	225	3,67
(v) 25% of the load defined in (i)				
2,7	2740	1,06	322	2,55
(vi) 75% of the load defined in (i)				
7,9	2680	1,97	205	4,01

Optimum fuel consumption: 201 g/metric hp h at 7,2 metric hp and 2385 rev/min

Standard fuel consumption 1/2 (acc.to DIN 9606): 1,33/ 2,57 l/h

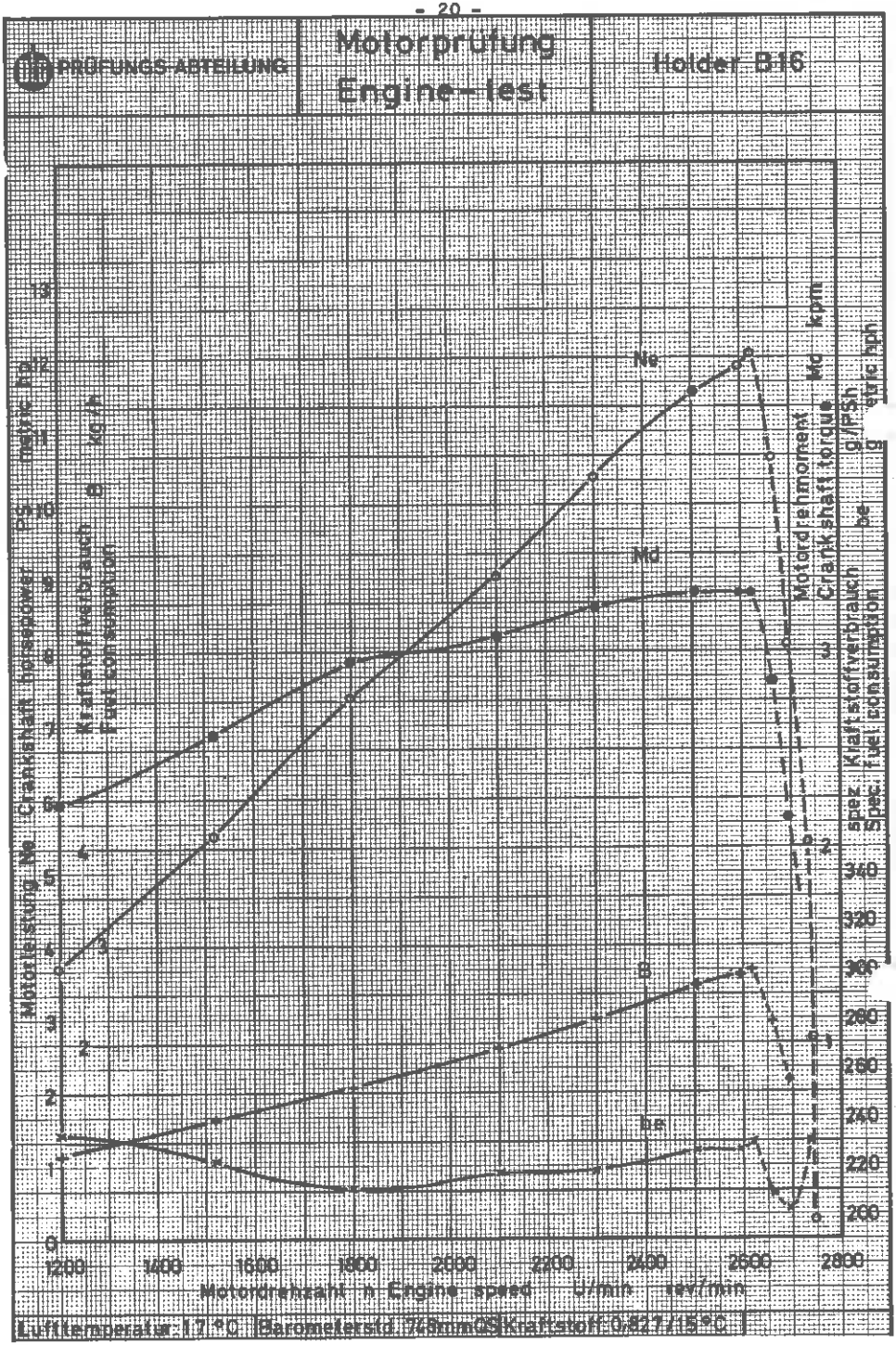
No load maximum engine speed: 2750 rev/min

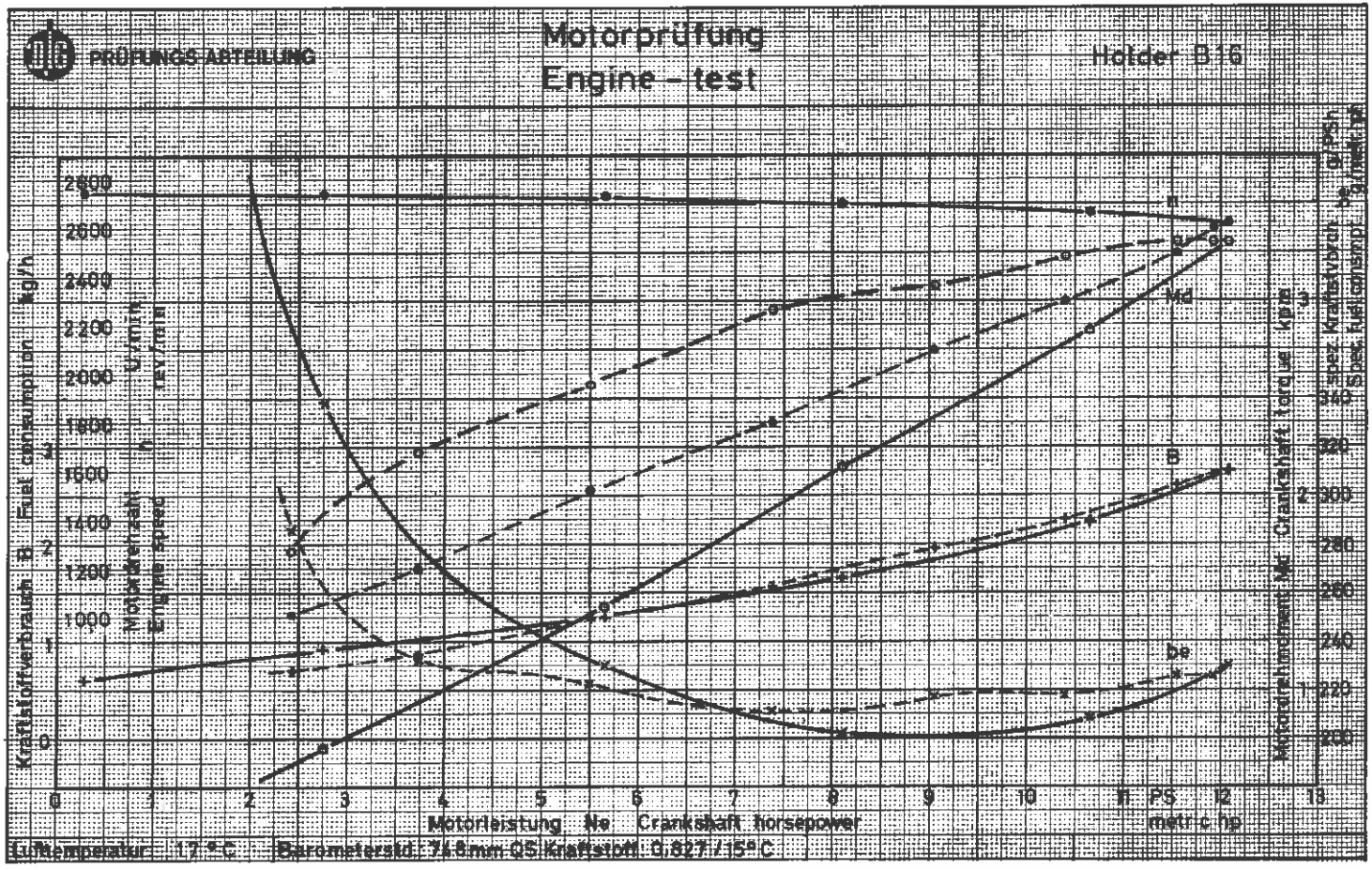
Torque at maximum power: 3,33 kpm

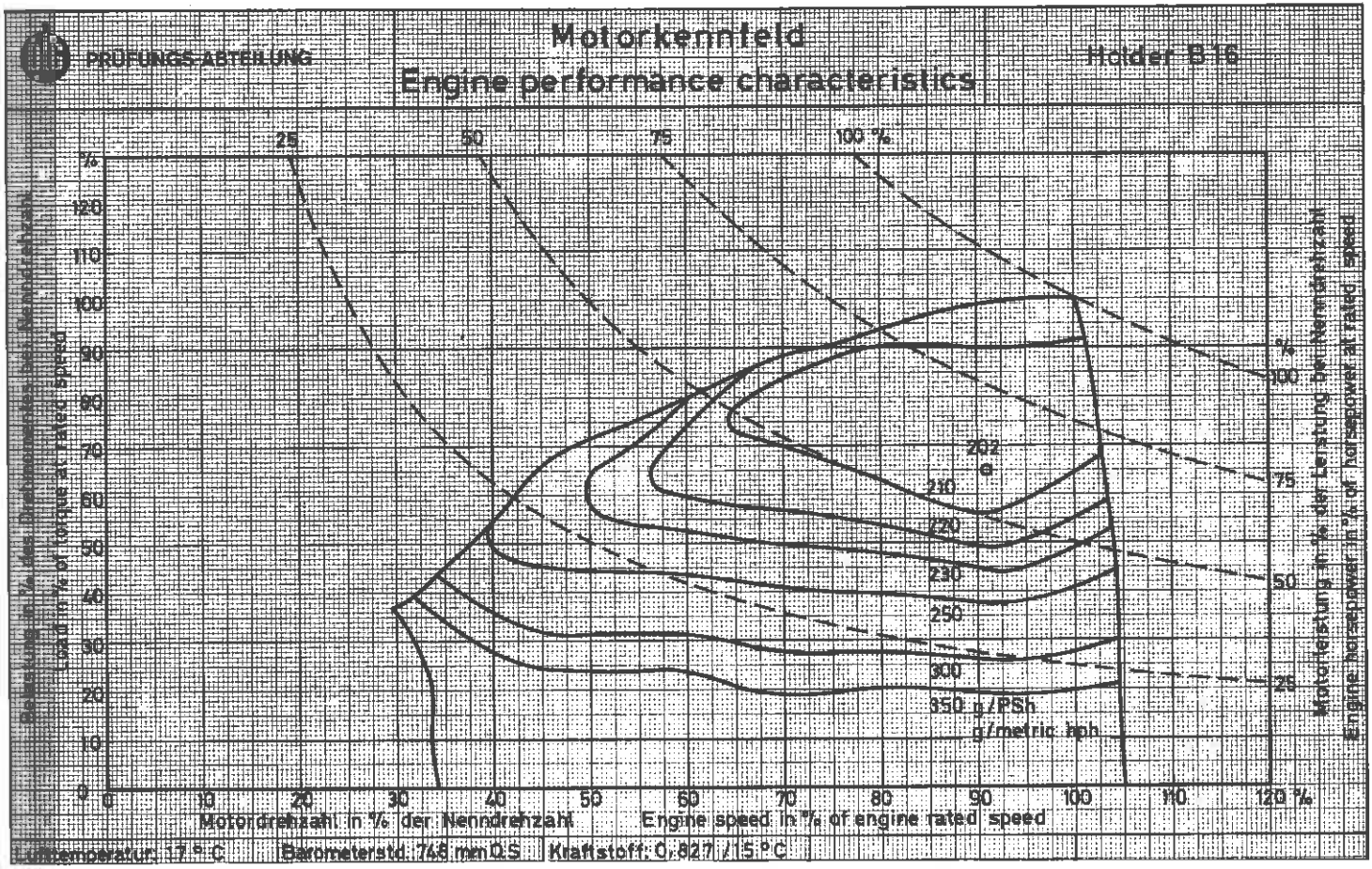
Maximum torque: 3,33 kpm at 2602 rev/min of the engine

Mean atmospheric conditions: temperature 17°C
pressure 748 mm Hg
relative humidity 64°C

Maximum temperatures: coolant not recorded
engine oil not recorded
fuel 29°C


PRÜFUNGS-ABTEILUNG
Motorprüfung
Engine-Test
Holder B16
Ne
Md
Motorleistung Ne
Engine power
Kraftstoffverbrauch
Fuel consumption
Motordrehmoment Md
Crankshaft torque
spez. Kraftstoffverbrauch
Spec. fuel consumption
Motordrehzahl n Engine speed U/min rev/min
Lufttemperatur 17 °C Barometerstd. 726mm QS Kraftstoff 0,827/15 °C


PRÜFUNGS ABTEILUNG
Motorprüfung
Engine – test
Holder B16
Kraftstoffverbrauch B Fuel consumption kg/h
Motordrehzahl n Engine speed U/min
Drehmoment M Crankshaft torque kgm
Spez. Kraftstoffverbrauch be Specific fuel consumption g/PSh
Motorleistung Ne Crankshaft horsepower
metric hp
Lufttemperatur 17 °C
Barometerstand 748mm QS Kraftstoff 0,827/15°C


PRÜFUNGS-ABTEILUNG
Motorkennfeld
Engine performance characteristics
Holder B 16
25
50
75
100 %
%
120
110
100
90
80
70
60
50
40
30
20
10
0
202
210
220
230
250
300
350 g/PSh
g/metric hph
10
20
30
40
50
60
70
80
90
100
110
120 %
Motordrehzahl in % der Nenndrehzahl
Engine speed in % of engine rated speed
Motorleistung in % der Leistung bei Nenndrehzahl
Engine horsepower in % of horsepower at rated speed
Lufttemperatur: 17 °C
Barometerstd. 748 mm QS
Kraftstoff: 0,827 / 15 °C