O.E.C.D. No.: 455
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Report on test in accordance with O.E.C.D.
STANDARD CODE for the Official Testing of
Agricultural Tractors



HOLDER AGRICULTURAL TRACTOR A 16

Manufactured by: GEBRÜDER HOLDER, Maschinenfabrik
D-7418 Metzingen

Date of tests: October till November 1973

DLG-Testing Station for Agricultural Machinery
D-6114 Groß-Umstadt

DEUTSCHE LANDWIRTSCHAFTS-GESELLSCHAFT e.V.
Prüfungsabteilung für Landmaschinen
D-6000 Frankfurt/Main 1, Zimmerweg 16

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. Coordinating Center (C.N.E.E.M.A., France) as being in accordance with the O.E.C.D. STANDARD CODE..

Date of Approval: 26th March 1974

Serial No.: 455

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PRÜFUNGS-ABTEILUNG
Holder A 16

Test No. 73-79

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PRÜFUNGS-ABTEILUNG
Holder A 16

Test No. 73-79

Tractor manufacturer:	GEBRÜDER HOLDER, MASCHINENFABRIK D-7418 Metzingen
Submitted for test by:	Manufacturer
Selected by:	Manufacturer with agreement by DLG
Place of running-in:	Metzingen and Groß-Umstadt
Duration of running-in:	Engine and tractor appr. 50 hours

SPECIFICATION OF TRACTOR

Tractor

Make:	GEBRÜDER HOLDER
Model:	A 16
Type:	Wheel type tractor, unit construction, all wheel drive, pivotal steering
Serial No:	11 10 401

Engine

Make:	GEBRÜDER HOLDER
Model:	HD 1
Type:	2-stroke Diesel engine, watercooled, with direct injection
Serial No:	D 12 13805
Cylinders:	1, vertical, bore 88 mm, stroke 90 mm; displacement 547 cm^3, compression ratio 16,8 : 1
Fuel system:	Fuel feed by gravity; BOSCH-built in injection pump PFR 1 A 50/369/11; manufacturer's production setting 20 mm^3/stroke at rated engine speed and full load; injection timing 28° before TDC; BOSCH injection nozzle DL 90 S 1086; injection pressure 175 kp/cm^2; paper element fuel filter with replaceable cartridge; capacity of fuel tank appr. 6 l
Governor:	Mechanically acting variable speed governor; own make; governed range of engine speed from 600 to 2800 rev/min; rated engine speed 2600 rev/min

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Air cleaner:	TORNA-TECHNIK oil bath air cleaner OL 160 - 10; oil capacity 0,65 l; cyclonic precleaner V 160 - 1
Exhaust silencer:	Own make; multichamber reflection type silencer; 120 mm diameter, 300 mm long; mouth showing downwards to the left-hand side
Lubrication system:	Fresh oil lubrication with pump; MANN UND HUMMEL micro-mesh filter W 9/20 with replaceable cartridge; oil supply in separate oil tank 1 l; oil changing period 250 hours; recommended oil viscosities: winter SAE 10W HD summer SAE 20W/20 HD tropics SAE 30 HD
Cooling system:	Thermosyphon water cooling with overpressure, overpressure valve set to 0,8 kp/cm^2; fan with 5 blades, 200 mm diameter; water filling 3,6 l
Starting system:	Electrical; BOSCH starter motor AL/EGF 1/12 L; spark plug for starting aid
Electrical equipment:	12 V, negative earth; BOSCH direct current generator: EH (R) 14 V 11 A 19; 1 battery 24 Ah at 20 hours rating
Clutch	FICHTEL UND SACHS AG single plate dry clutch K 160 D; pedal operated

Gear box

Transmission gear:	Own make; speed change gear with 3 forward speeds; group gear with 2 forward and 1 reverse group; total 6 forward and 3 reverse speeds
Rear axle, front axle and final drives:	Crown wheel and pinion in front and in the rear; bevel gear type differentials in front and in the rear; differential lock only in front axle; pedal operated, self disengaging; spur gear final drives in portal axles in front and in the rear
Oil capacity:	Speed change gear and rear axle together 4,0 l front axle 1,5 l final drives each 0,2 l
Oil changing period:	2500 hours

Total ratios and speeds

Group	Gear	Number of engine revolutions for one revolution of the driving wheel	Nominal travelling speed at rated engine speed *	
			km/h	m/s
forward slow	1	290,10	1,17	0,32
	2	191,27	1,78	0,49
	3	99,19	3,43	0,95
forward fast	1	55,79	6,10	1,69
	2	36,78	9,24	2,57
	3	19,07	17,90	4,97
reverse	1	290,10	1,17	0,32
	2	191,27	1,78	0,49
	3	99,19	3,43	0,95

*) calculated with the standard tyre radius acc. to DIN 7814

Power take-off	Proportional engine speed p.t.o.; not independent; manually engaged; in the rear of tractor; 430 mm above ground in median plane of tractor; 29 x 34,9 x 8,7 mm = 1 3/8", 6 spines; (DIN 9611 Form A, BS 1495; ASAE S 203.7); 666 rev/min at rated engine speed; standard speed of p.t.o. 540 rev/min at 2106 rev/min engine speed; direction of rotation clockwise, viewed from tractor rear
Power lift	Own make; hydraulic power lift in disintegrated construction; floating position, no controls; 1 single acting ram; 40 mm bore, 140 mm stroke; BOSCH hydraulic pump HY/ZBR 1/1 R 101; directly driven by engine; BOSCH control valve HY/SEA 5/175/1; maximum pressure 175 kp/cm²; oil delivery in the hydraulic oil tank 1,6 l
Implement linkage	Three point linkage in special construction for vertical lifting; lift height above ground from 160 to 630 mm
Holed drawbar	Fitted on clevis of lower links; length between the ball joints 346 mm; centre hole and 2 holes with 42,5 mm distance each on either side; all holes 22 mm diameter; height above ground adjustable by power lift from 170 to 640 mm measured on the surface of the drawbar; hydraulically lockable in any height; with lower links in horizontal position distance of centre hole: to rear axle centre 575 mm to end of p.t.o.-shaft 370 mm

Trailer hitch	Own make; height above ground 555 mm; diameter of clevis hole 18 mm; distance to rear axle centre 240 mm
Towing hitch	Height above ground 430 mm
Steering	Pivotal-steering; own make; spur gear steering device; acting on tractor's limber; operated by hand-wheel

Brakes

Parking brake:	Mechanically operated internal shoe type brake; acting on 2 brake drums in the rear wheels; brake drum diameter 150 mm; operated by hand lever with ratchet
Foot brake:	Mechanically operated internal shoe type brake; acting on 2 brake drums in the front wheels; brake drum diameter 150 mm; pedal-operated

Wheels

Steering wheels:	In front and rear, pivotal steering
Driving wheels:	In front and rear; 4 pneumatics 6.00-16 AS 4 ply DIN 7814 maximum permissible load on each tyre 375 kp at 1,5 kp/cm^2 inflation pressure; track width 580 and 820 mm; changeable by turning wheels; rims 4,50 E x 16
Wheel base:	1120 mm

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Weights	Ready for use, as tested	without driver	with driver
Without ballast:	front	389 kp	403 kp
	rear	237 kp	301 kp
	total	626 kp	704 kp
Front and rear ballast:	1 weight per wheel	35 kp each	140 kp
With ballast:	front	459 kp	473 kp
	rear	307 kp	371 kp
	total	766 kp	844 kp

Seat: Own make;
upholstered seat mould with back rest;
adjustable spring with shock absorber;
height above ground 800 mm in median plane of tractor

Number of grease points: 10

Dimensions

Total length:	2280 mm with implement linkage
Total width	740 mm at 580 mm track width 980 mm at 820 mm track width
Total height:	1065 mm to top of steering wheel
Ground clearance:	260 mm in median plane of tractor

Lighting equipment: Electrical, 12 V
acc. StVZO, German governmental regulations

	Dimensions mm	Height above ground to centre mm	Distance from outside edge of tractor to centre mm *)
Head lights	90 ø	905	305/375
Rear lights	84 x 94	835	97/212
Reflectors	45 x 90	835	27/147

*) 1st figure at 580 mm track width
2nd figure at 820 mm track width

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Test No. 73-79

FUEL AND LUBRICANTS USED IN TESTS

Fuel:	ARAL-Diesel fuel (DIN 51 601) specific gravity at 15°C 0,830 kg/l
Engine oil:	ARAL HD SAE 20W/20
Transmission oil:	SAE 80
Hydraulic fluid:	Engine oil HD SAE 20W/20

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Test No. 73-79

COMPULSORY TESTS

(1) MAIN POWER TAKE-OFF PERFORMANCE

Date of tests: 12th and 15th October 1973
Type of dynamometer: Schenck hydraulic dynamometer U1-30

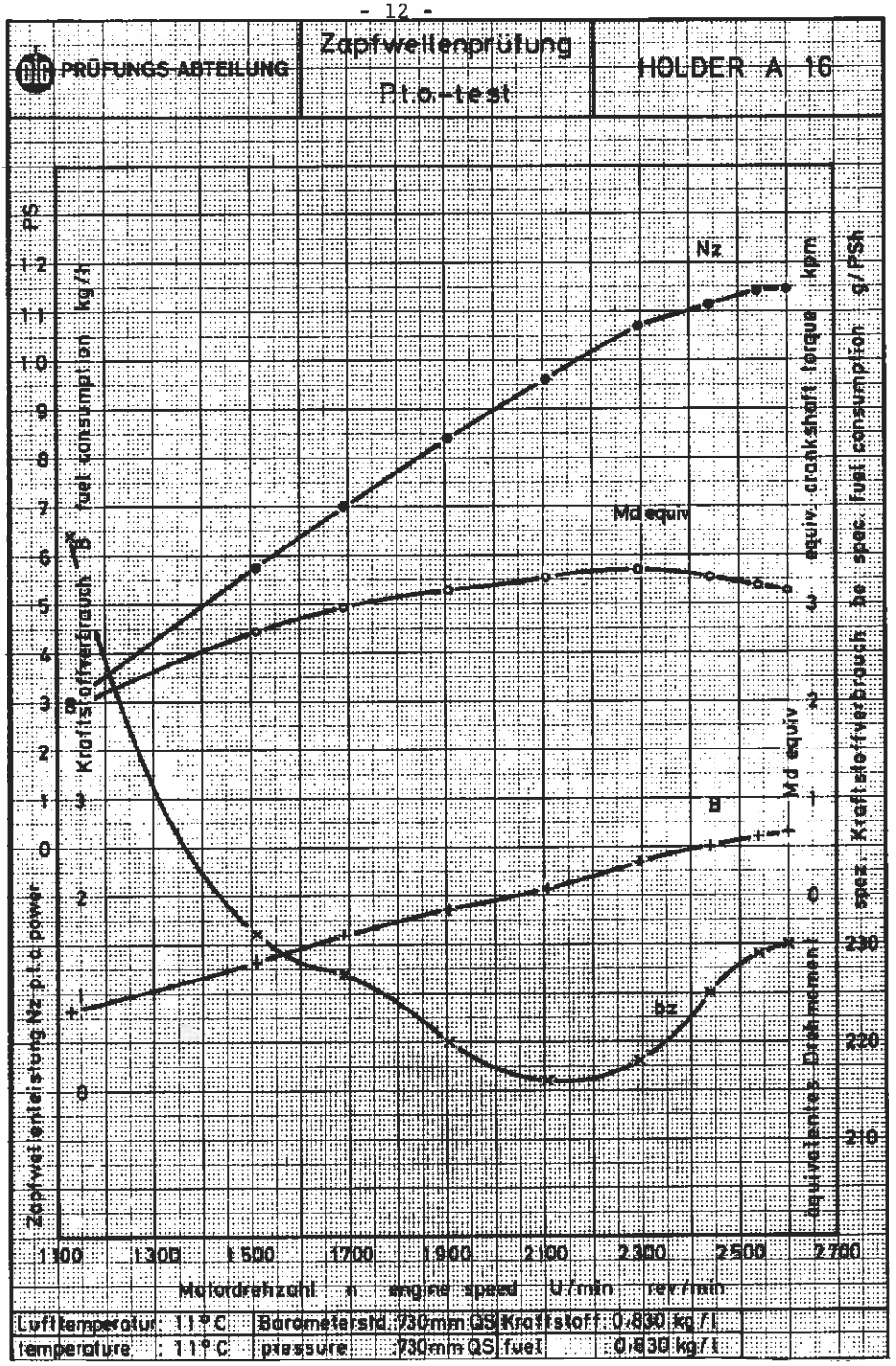
Maximum power

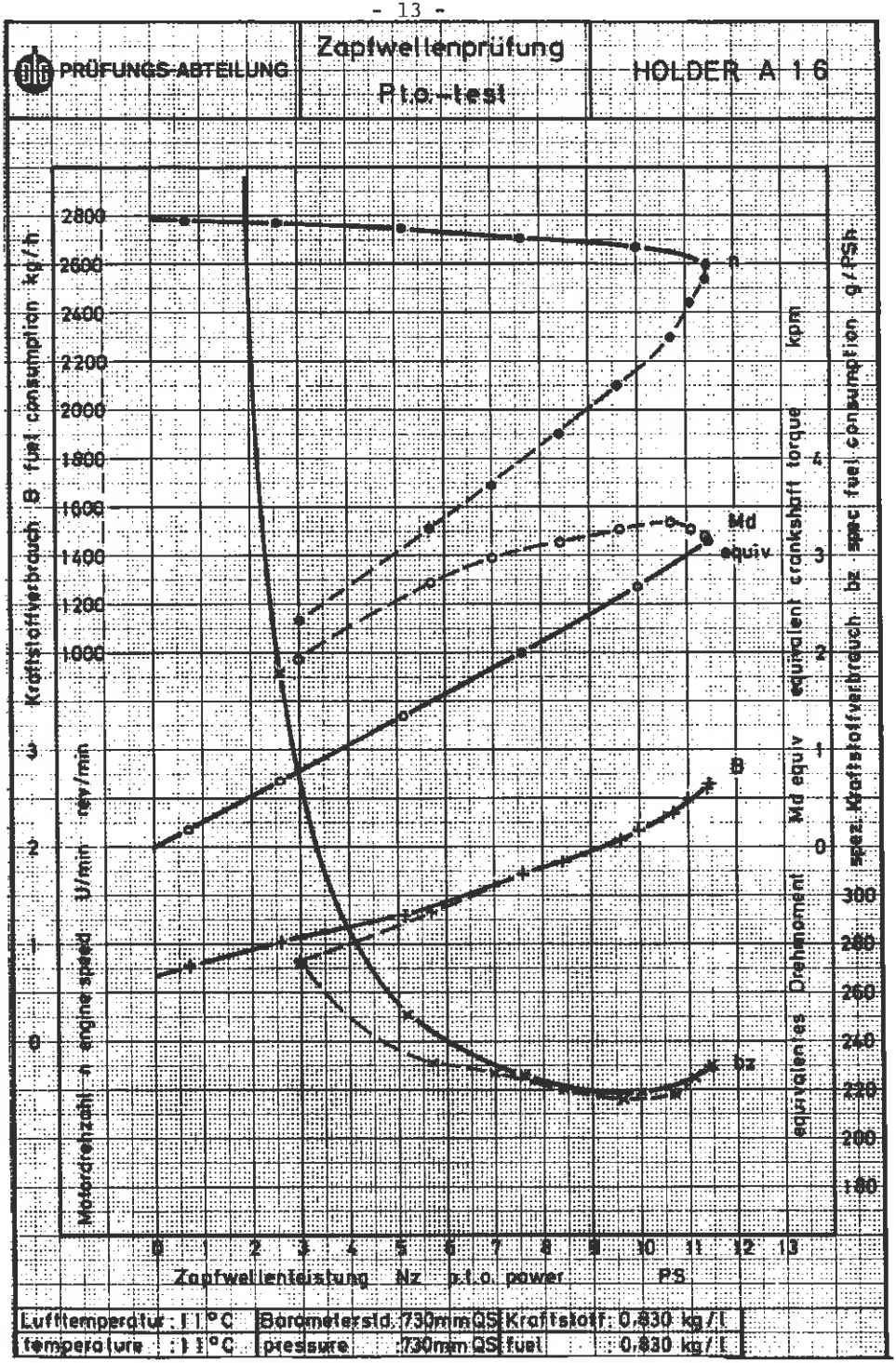
Power PS	Speed engine rev/min	Speed p.t.o. rev/min	Fuel consumption total 1/h	Fuel consumption total kg/h	Fuel consumption specific g/PSh	Specific energy PSh/l
At maximum power 2-hour test						
11,5	2600	666	3,18	2,64	230	3,62
At standard p.t.o. speed (540 rev/min)						
9,6	2106	540	2,52	2,08	216	3,82
At the speed recommended for drawbar work						
11,5	2600	666	3,18	2,64	230	3,62
Part loads						
(i) 85% of the torque at maximum power						
10,0	2669	684	2,63	2,18	219	3,81
(ii) unloaded						
-	2780	713	0,84	0,70	-	-
(iii) 50% of the load defined in (i)						
5,2	2749	705	1,55	1,29	251	3,35
(iv) maximum power						
11,5	2600	666	3,18	2,64	230	3,62
(v) 25% of the load defined in (i)						
2,6	2773	711	1,23	1,02	392	2,11
(vi) 75% of the load defined in (i)						
7,6	2712	696	2,07	1,72	226	3,67

No load maximum engine speed: 2780 rev/min
Equivalent crankshaft torque at maximum power: 3,16 kpm
Maximum equivalent crankshaft torque: 3,34 kpm at 2295 rev/min of the engine

Mean atmospheric conditions:	temperature	11°C
	pressure	730 mm Hg
	relative humidity	90%
Maximum temperatures:	coolant	80°C
	engine oil	not recorded *
	fuel	17°C

*) because of fresh oil lubrication


PRÜFUNGS ABTEILUNG
Zapfwellenprüfung
P.t.o.-test
HOLDER A 16
PS
Nz
Md equiv
Zapfwellenleistung Nz p.t.o. power
Kraftstoffverbrauch B fuel consumption kg/h
equiv. crankshaft torque kpm
spez. Kraftstoffverbrauch be spec. fuel consumption g/PSh
Md equiv
be
Äquivalentes Drehmoment
1100 1300 1500 1700 1900 2100 2300 2500 2700
Motordrehzahl n engine speed U/min rev/min
Lufttemperatur 11 °C Barometerstd. 730mm QS Kraftstoff 0,830 kg/l
temperature 11 °C pressure 730mm QS fuel 0,830 kg/l


PRÜFUNGS-ABTEILUNG
Zapfwellenprüfung
P.t.o.-test
HOLDER A 16
Kraftstoffverbrauch B fuel consumption kg/h
Motordrehzahl n engine speed U/min rev/min
Md equiv
B
bz
Kpm
spez. Kraftstoffverbrauch bz specif. fuel consumption g/PSh
Md equiv equivalent crankshaft torque
equivalentes Drehmoment
Zapfwellenleistung Nz p.t.o. power PS
Lufttemperatur : 11 °C
temperature : 11 °C
Barometerstd. 730mm QS
pressure : 730mm QS
Kraftstoff: 0,830 kg/l
fuel : 0,830 kg/l

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(2) DRAWBAR PERFORMANCE

Date of test: 1st, 9th and 12th November 1973
Type of track: Concrete

Gear No. and Group	Speed km/h	Horse-power PS	Drawbar pull kp	Engine speed rev/min	Slip of wheels %	Specific energy PSh/l
(i) MAXIMUM POWER with ballast height of drawbar above ground 290 mm						
1 slow	1,06	3,2	820	2737	15,1	1,95
2 slow	1,60	4,9	820	2722	15,1	2,42
3 slow	2,94	8,7	800	2600	14,2	2,64
1 fast	5,75	9,4	440	2600	6,3	2,88
2 fast	8,92	9,3	280	2602	3,9	2,90
(ii) FIVE-HOUR-TEST at 75% of pull at maximum power in 1st gear of fast group						
1 fast	6,04	7,4	330	2684	4,7	3,19
(iii) FIVE-HOUR-TEST at pull corresponding to 15% wheel slip in test (i)						
2 slow	-	-	820	2723	-	-
(v) MAXIMUM POWER without ballast height of drawbar above ground 300 mm						
2 slow	1,59	4,1	700	2723	15,1	2,23
3 slow	3,00	7,9	710	2657	14,9	2,87
1 fast	5,66	9,2	440	2600	7,1	2,84
2 fast	8,84	9,4	290	2601	4,5	2,89

Total oil consumption during ten hours duration of tests (ii) and (iii): 149 g/h (fresh oil lubrication)

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Tyres make and size
front: Veith Pirelli Agrar 6.00-16 AS 4 ply
rear: Veith Pirelli Agrar 6.00-16 AS 4 ply

Specific fuel consumpt. g/PSh	Temperatures: Fuel °C	Coolant °C	Engine oil °C	Atmospheric conditions: Temperature °C	Relative humidity %	Pressure mm Hg
tyre inflation pressure 1,5 kp/cm² active tyre radius under static load 349 mm						
426	11	77	-	8	97	761
343	11	78	-	8	96	761
314	12	80	-	8	88	761
285	15	80	-	12	99	761
283	16	80	-	13	100	761
257	15	80	-	12	97	760
-	15	80	-	12	98	760
tyre inflation pressure 1,0 kp/cm² active tyre radius under static load 347 mm						
368	16	80	-	9	78	760
286	16	80	-	9	78	760
291	16	80	-	9	78	760
284	15	80	-	10	77	760

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

(3) TURNING SPACE AND TURNING CIRCLE

Wheel equipment front: 6.00-16 AS 4 ply
rear: 6.00-16 AS 4 ply

Track of wheels front: 820 mm
rear: 820 mm

	With brakes left-hand m	With brakes right-hand m	Without brakes left-hand m	Without brakes right-hand m
Radius of turning space	no steering brakes		1,90	1,88
Radius of turning circle			1,79	1,76

(4) LOCATION OF CENTRE OF GRAVITY

Height above ground	496 mm
Distance forward from the vertical plane containing the axis of the rear wheels	640 mm
Distance of the median plane of the tractor	0 mm

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(5) BRAKING PERFORMANCE

A) FOOT BRAKE

Date of tests: 7th and 8th November 1973
Type of track: Concrete
Type of decelerometer: MOTO METER-Bremsverzögerungs- und Pedalkraftschreiber

Weight of ballasted tractor: 844 kp with driver

Cold brakes

		with ballast	without ballast
Travelling speed	km/h	19,0	19,0
Deceleration	m/s^2	6,0	6,4
Stopping distance	m	2,6	2,6
Force on pedal	kp	41	40
Force on pedal to achieve a deceleration of 2,5 m/s^2	kp	29	20

Brake fade characteristics (hot tests)

Deceleration	hot/cold	%	94	97
Stopping distance	cold/hot	%	93	103
Force on pedal	cold/hot	%	96	96

B) PARK BRAKE

Tractor facing up slope:
Pull on hand brake 5 kp, tractor does not roll

Tractor facing down slope:
Pull on hand brake 5 kp, tractor does not roll

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Test No. 73-79

(6) AMBIENT NOISE EMITTED BY THE TRACTOR

Date of test: 7th November 1973
Type of track: Concrete
Type of sound level meter: Brüel and Kjaer type 2203

Results of test

Gear: 3 fast
Travelling speed before acceleration: 14,0 km/h
Sound level: 89 dBA

(7) NOISE AT THE DRIVER'S EAR LEVEL

Date of tests: 7th November 1973
Type of track: Concrete
Type of sound level meter: Brüel and Kjaer type 2607
Type of frequency analyser: Brüel and Kjaer type 1614
(fitted with octave filter)

No cab or frame fitted on tractor

Results of tests

Gear	Drawbar pull at which the tractor develops the maximum sound level	Travelling speed nominal	Travelling speed effective	Sound level	
	kp	km/h	km/h	dBA	Sone
1 slow	690	1,17	1,07	96	
2 slow	700	1,78	1,61	97	
3 slow	710	3,43	2,98	99	
1 fast *	450	6,10	5,65	100	128
2 fast	300	9,24	8,81	100	
3 fast	light load	17,90	19,20	94	

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

(8) POWER LIFT PERFORMANCE

Date of tests: 15th November 1973

	Height above ground in down position		Vertical movement	Maximum force excerted throughout the full lift range	Oil-pressure	Lifting force when front of tractor lifts
	hitch points mm	test frame mm	mm	kp	kp/cm²	kp
At hitch points	160	-	470	510	175	780

The test frame cannot be fitted because of the special construction of the implement linkage

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OPTIONAL TESTS

(9) ENGINE PERFORMANCE

Date of tests: 9th October 1973
Type of dynamometer: Schenck eddy current dynamometer W 150

MAXIMUM POWER

Power PS	Engine speed rev/min	Fuel consumption total l/h	Fuel consumption total kg/h	Fuel consumption specific g/PSh	Specific energy PSh/l
At maximum power 2-hour test					
12,1	2600	3,16	2,62	216	3,83
At standard p.t.o. speed (540 rev/min)					
10,2	2106	2,53	2,10	206	4,03
At the speed recommended for drawbar work					
12,1	2600	3,16	2,62	216	3,83
Fuel consumption at part loads					
(i) 85% of torque at maximum power					
10,6	2680	2,49	2,07	196	4,26
(ii) unloaded					
-	2784	0,80	0,66	-	-
(iii) 50% of the load defined in (i)					
5,45	2751	1,53	1,27	232	3,56
(iv) maximum power					
12,1	2600	3,16	2,62	216	3,83
(v) 25% of the load defined in (i)					
2,74	2766	1,11	0,92	335	2,37
(vi) 75% of the load defined in (i)					
8,04	2716	1,99	1,65	206	4,03

Optimum fuel consumption: 193 g/PSh at 11,2 PS and 2361 rev/min
Standard fuel consumption 1/2 (DIN 9606): 1,33/2,32 l/h
No load maximum engine speed: 2784 rev/min
Torque at maximum power: 3,34 kpm
Maximum torque: 3,52 kpm at 2295 rev/min of the engine

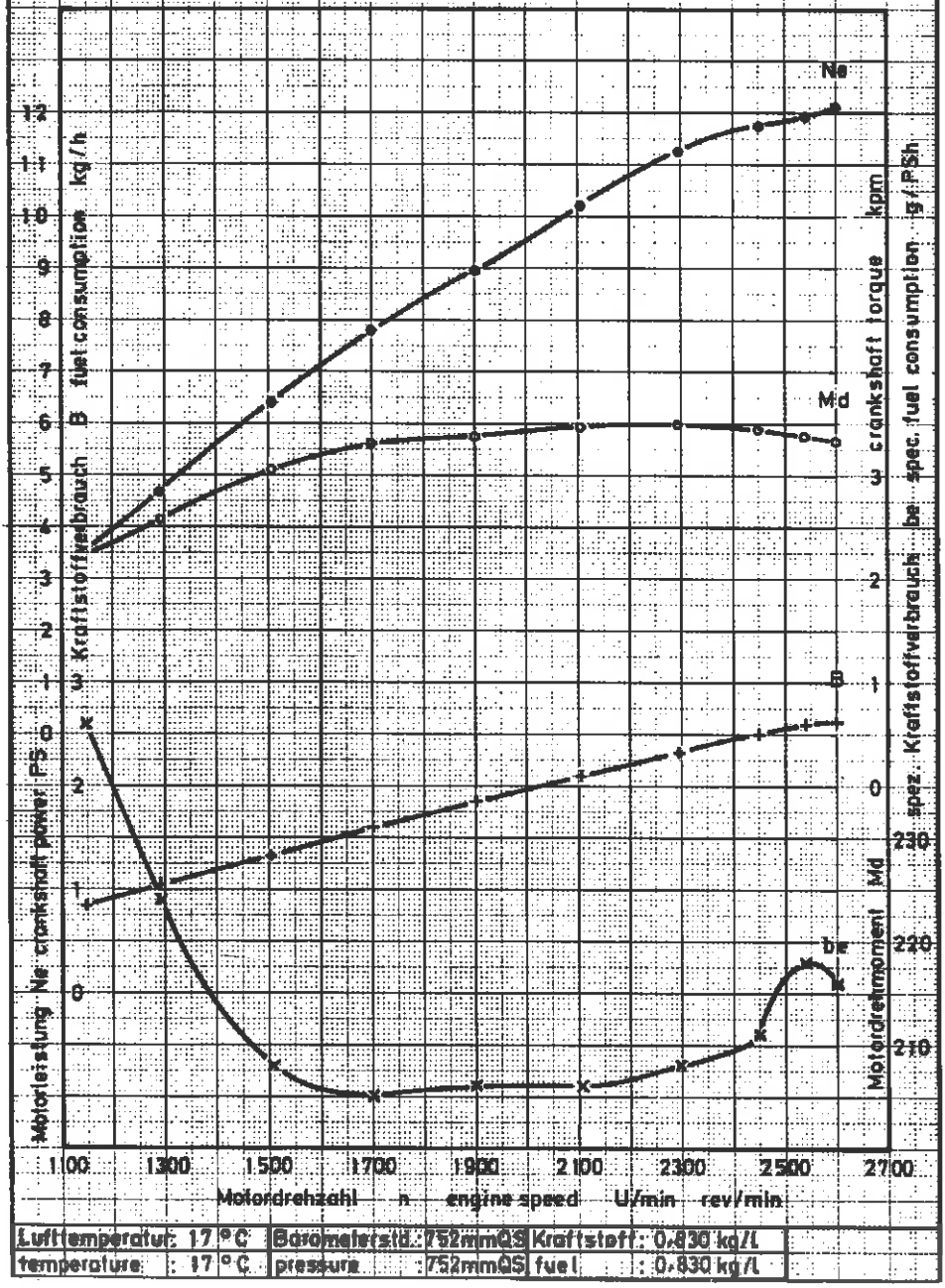
Mean atmospheric conditions:	temperature	17°C
	pressure	752 mm Hg
	relative humidity	94%
Maximum temperatures:	coolant	80°C
	engine oil	not recorded *)
	fuel	20°C

*) because of fresh oil lubrication

PRÜFUNGS-ABTEILUNG

Motorprüfung
Engine-test

HOLDER A 16

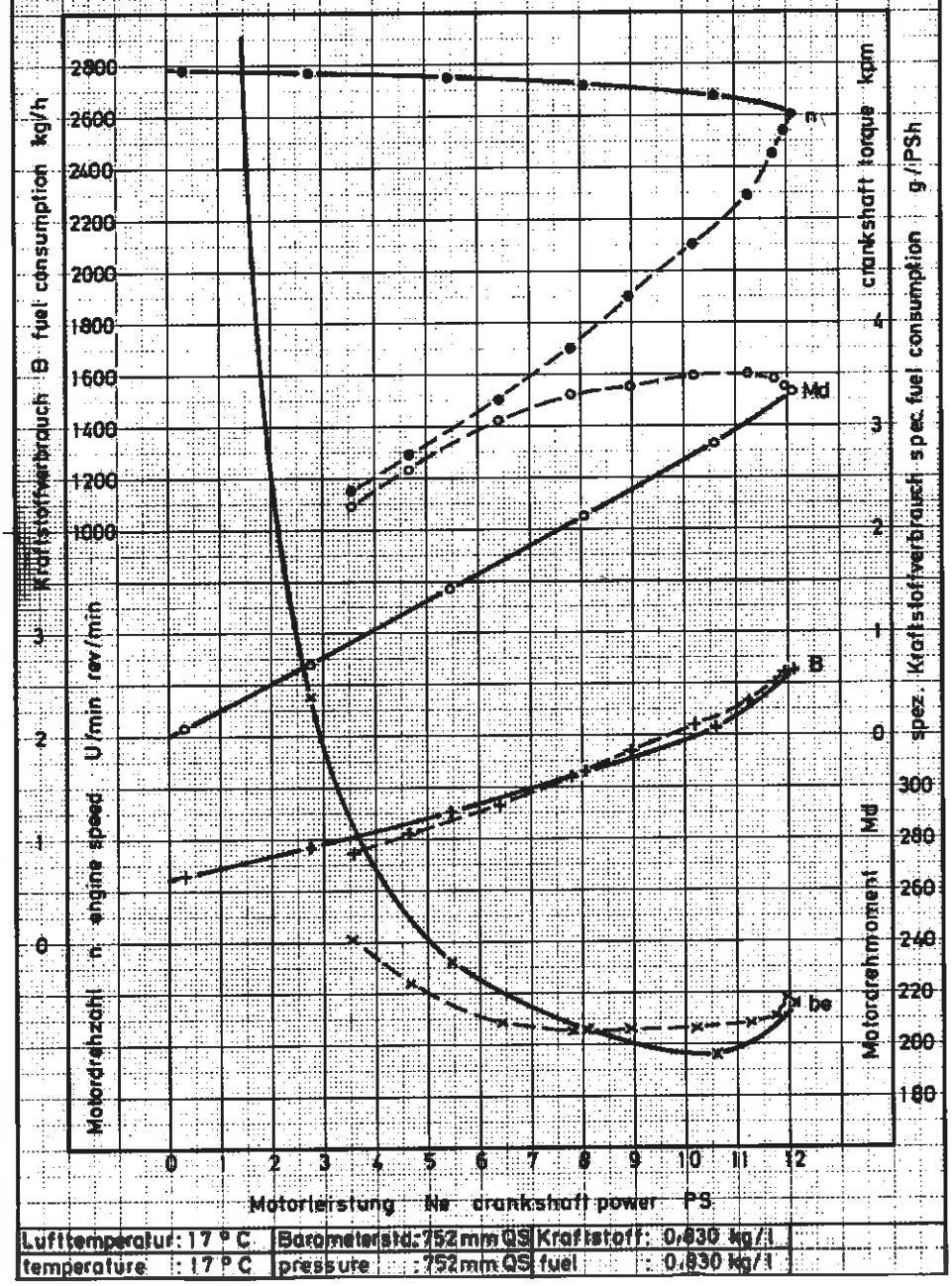


Lufttemperatur: 17 °C	Barometerstd.: 752mmQS	Kraftstoff: 0,830 kg/l	
temperature : 17 °C	pressure 752mmQS	fuel : 0,830 kg/l	

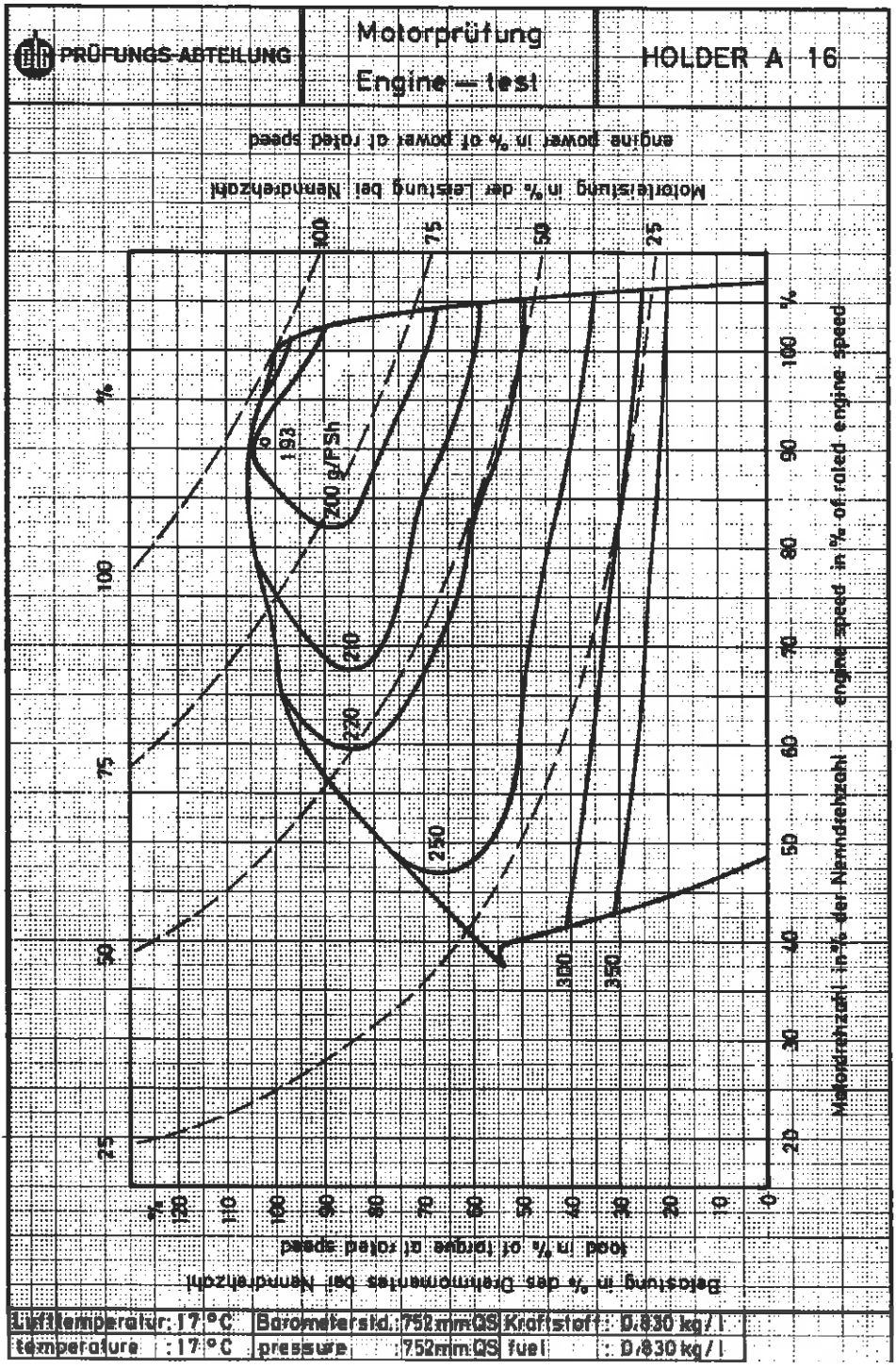
PRÜFUNGS-ABTEILUNG

Motorprüfung
Engine — test

HOLDER A 16



Lufttemperatur: 17 °C	Barometerstd: 752 mm QS	Kraftstoff: 0,830 kg/l
temperature : 17 °C	pressure : 752 mm QS	fuel : 0,830 kg/l


PRÜFUNGS-ABTEILUNG
Motorprüfung
Engine — test
HOLDER A 16
Motorleistung in % der Leistung bei Nenndrehzahl
engine power in % of power at rated speed
Belastung in % des Drehmomentes bei Nenndrehzahl
load in % of torque at rated speed
Motordrehzahl in % der Nenndrehzahl
engine speed in % of rated engine speed
193
200 g/PSh
220
230
250
350
380
Lufttemperatur: 17 °C
temperature : 17 °C
Barometerstd. 752 mm QS
pressure : 752 mm QS
Kraftstoff : D/830 kg/l
fuel : D/830 kg/l