STÁTNÍ ZKUŠEBNA ZEMĚDĚLSKÝCH,
POTRAVINÁŘSKÝCH
A LESNICKÝCH STROJŮ

163 04 PRAHA 6, ŘEPY

Report on test in accordance with the O. E. C. D. STANDARD CODE
for the Official Testing of Agricultural Tractors

CODE II

Restricted Code

Date of approval: 11th September 1992

O.E.C.D. No. 1392



Agricultural Tractor
ZETOR 5320 (2WD)

Manufactured by:
ZETOR s. p.
632 00 Brno, ČSFR

Report No. 10273
Date of test: February-June 1992

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Tractor manufacturer's name and address:	ZETOR s.p., 632 00 Brno, ČSFR
Location of tractor assembly:	Brno, ČSFR
Submitted for test by:	The manufacturer
Selected for test by:	The manufacturer
Place of running-in:	Brno, ČSFR
Duration of running-in:	60 hours
Location of test:	SZZPLS Praha 6 - Řepy, ČSFR

I. SPECIFICATIONS OF TRACTOR

TRACTOR

Make:	ZETOR
Model:	5320
Type:	Wheeled, unit construction, rear wheels drive
Number of driving wheels:	2
Serial No.:	058 782
1st Serial No.:	058 782

ENGINE

Make:	ZBROJOVKA
Model:	Zetor 7201
Type:	4-stroke diesel engine, direct injection, water cooled, naturally aspirated
Serial No.:	109 970

Cylinders

Number/disposition:	4, in-line, vertical
Bore/stroke:	102 mm/110 mm
Capacity:	3595 cm^3
Compression ratio:	17:1
Arrangement of valves:	Overhead
Cylinder liners:	Wet, replaceable

Supercharging	None
Fuel system	
Fuel feed system:	Lift pump piston-type, integral with fuel injection pump
Make, model and type of fuel filters:	AUTOBRZDY, 443 741 111 001, one-stage with paper cartridge
Capacity of fuel tank:	70 dm^3
Make, model and type of injection pump:	MOTORPAL, PP 4M 3145, in-line
Serial No.:	Tv 0936
Manufacturer's production setting of injection pump:	
Flow rate (rated engine speed and full load):	12.73±0.26 dm^3/h
Timing:	$25^{o}+1^{o}$ before TDC
Make, model and type of injection:	MOTORPAL, DOP 160S 430-1436, 4 holes
Injection pressure:	18.6-0.8 MPa
Governor	
Make, model and type:	MOTORPAL, RV 3M 350/1100-3303, centrifugal, variable speed
Governed range of engine speed:	700-2410 rev/min
Rated engine speed:	2200 rev/min
Air cleaner	
Make, model and type of pre-cleaner:	SANDRIK, PC 250, cyclon type
Location of air intake:	Under bonnet forward of radiator
Make, model and type of main cleaner:	SANDRIK, 9420.11, oil bath
Maintenance indicator:	None
Lubrication system	
Type of feed pump:	Gear
Type of filter:	Full flow, centrifugal
Number:	1

Cooling system

Type of coolant:	Water and anti-freeze
Type of pump:	Centrifugal, belt driven
Specification of fan:	Axial, belt driven
Number of blades:	6
Fan diameter:	380 mm
Coolant capacity:	11.6 dm^3
Type of temperature control:	Thermostat
Superpressure system:	40±10 kPa

Starting system

Make, model and type:	PAL, 443 115 144 722, electrical, solenoid engaged
Starter motor power rating:	2.9 kW
Cold starting aid:	None
Safety device:	Clutch pedal to be fully depressed

Electrical system

Voltage:	12 V, negative earth
Generator:	
Make, model and type:	PAL, 443 113 516 651, alternator, belt driven
Power:	770 W
Battery:	
Number:	1
Rating:	150 Ah at 20 hours

Exhaust system

Make, model and type:	ZETOR, 78.014.010, expansion and absorption muffler
Location:	Left-hand side of engine, vertical

TRANSMISSION TO WHEELS

Clutch

Make, model and type:	ZBROJOVKA, 7201 1100, dry for travelling and P.T.O.
Number of plates:	2
Diameter of plates:	280 mm

Method of operation:	Hydraulically by pedal for travelling and P.T.O. and pneumatically by hand lever for P.T.O.

Gear box

Make, model and type:	ZETOR, 60.121.000, mechanical
Arrangement:	Synchromesh gear box with 5 forward and 1 reverse speeds, group gear box with two speed ranges (T and R)
Number of gears:	10 forward and 2 reverse
Available options:	Alternative mounting of torque multiplier, creeper reduction gear or reverser

Rear axle and final drives

Make, model and type:	ZETOR, 6211 2800, crown wheel and bevel pinion differential and spur gear final drives
Differential lock:	
Type:	Mechanical
Method of engagement:	Mechanically by pedal
Method of disengagement:	Self-disengaging

Front axle

Make, model and type:	ZETOR, 7211 3300, telescopic with adjustable track

Total ratios and travelling speeds

Gear	Group	Number of engine revolutions for one revolution of the driving wheels	Nominal travelling speed at rated engine speed of 2200 rev/min km/h (*)
1	T	553.886	1.12
2		451.294	1.37
3		303.818	2.03
4		189.114	3.27
5		119.199	5.18
1	R	96.301	6.42
2		78.464	7.87
3		52.823	11.70
4		32.880	18.79
5		20.724	29.82
R	T	556.084	1.11
	R	96.683	6.39

T: Turtle range, R: Rabbit range

(*) Calculated with a tyre dynamic radius index of 745 mm (ISO 4251/1-1988).

POWER TAKE-OFF

Main power take-off

Type:	Independent, through second plate in main clutch
Method of engagement:	Pneumatically operated by hand lever or hydraulically by clutch pedal
Number of shafts:	1
Method of changing power take-off speeds:	Manually by exchanging shafts

Power take-off proportional to engine speed

Location: At rear of tractor

P.T.O.	Diameter of power take-off shaft end mm	Number of splines	In conformity with ISO 500/1991
540	34.9	6	Yes
1000	34.9	21	Yes

Height above ground: 752 mm

Distance from the median plane of tractor: 0 mm

Distance behind rear-wheel axis: 263 mm

P.T.O.	P.T.O. speed rev/min	Engine speed rev/min	Ratio of rotation speeds (engine/P.T.O.)	Power restriction kW
540	540	1994	3.6923	None
	596	2200		
1000	1000	2050	2.0500	None
	1073	2200		

Direction of rotation (viewed facing driving end): Clockwise

Power take-off proportional to ground speed

Indicate 540 or 1000 rev/min: The same

P.T.O. and range	Travelling distance for one revolution of P.T.O. shaft m	Number of P.T.O. shaft revolutions for one revol. of (rear) driving wheels
T	0.087	53.6395
R	0.502	9.3260

T: Turtle range, R: Rabbit range

Direction of rotation with forward gear engaged (viewed facing driving end): Clockwise

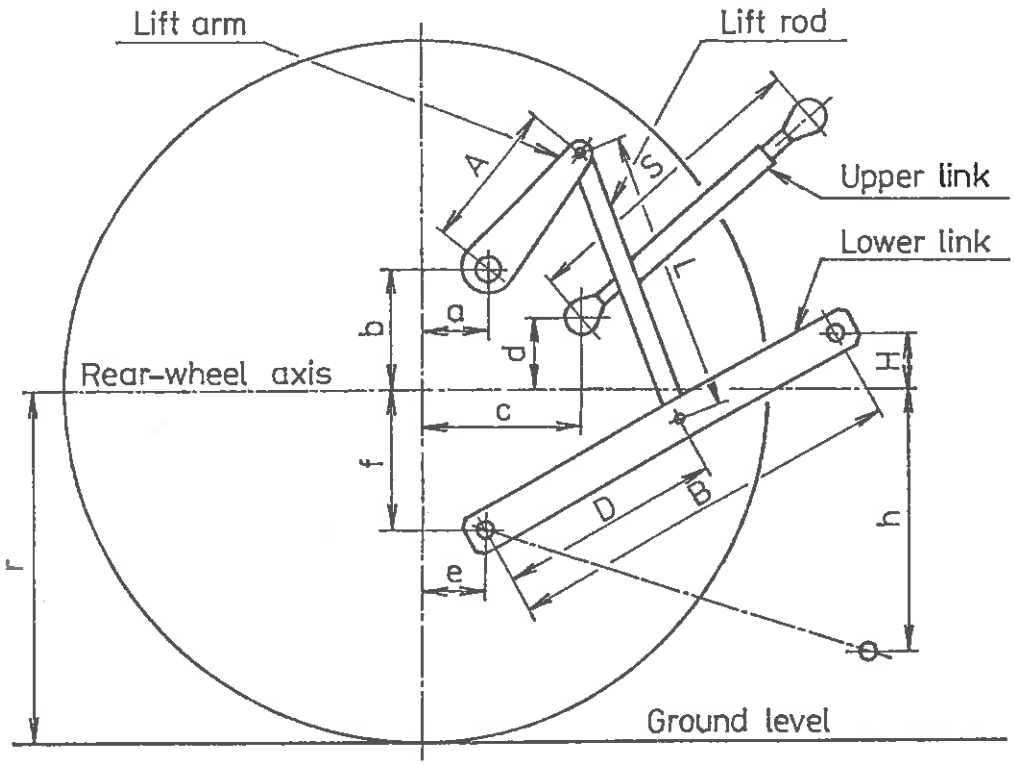
POWER LIFT

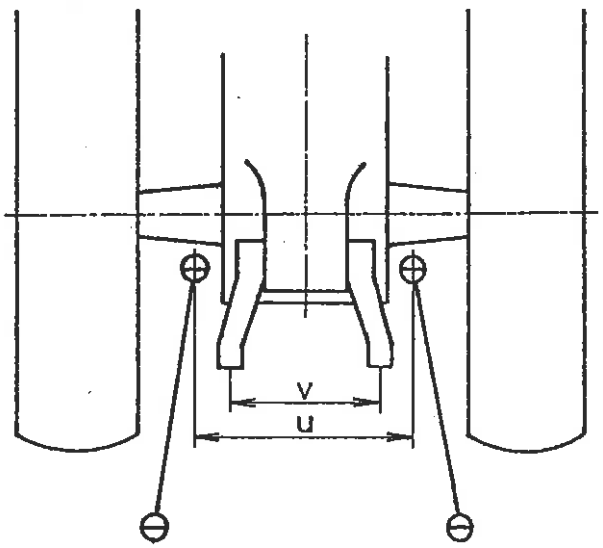
Make, model and type:	ZETOR, 7211 9485, hydraulic with mechanical position, draft or mixed control, top link sensing
Type of hydraulic system:	Open centre
Type and number of cylinders:	1 integral single-acting and 2 external single-acting
Type of linkage lock for transport:	Hydraulic
Relief valve pressure setting:	18.0+2.0 MPa
Opening pressure of cylinder safety valve:	21.0+2.0 MPa
Lift pump type:	Gear
Transmission between pump and engine:	Gear driven from engine
Type and number of filters:	1 magnetic, 1 screen and 1 filter with paper cartridge in delivery side of distributor
Site of oil reservoir:	Transmission housing
Type, number and location of tapping points:	2 pressure and 1 return, quick release at rear of tractor
Maximum volume of oil available to external cylinders:	10 dm^3

Three-point linkage

Category: 2, in conformity with ISO 730/1-1990

Category adapter: None





Linkage geometry dimensions:

		Dimension or range mm	Settings used in test mm
Lenght of lift arms	(A)	320	320
Length of lower links	(B)	857	857
Distance of lift arm pivot point from :horizontally	(a)	30	30
rear-wheel axis :vertically	(b)	362	362
Horizontal distance between the 2 lower link points	(u)	636	636
Horizontal distance between the 2 lift arm end points	(v)	450	450
Length of upper link	(S)	590 to 770	680
Distance of upper link pivot point from :horizontally	(c)	288	288
rear-wheel axis :vertically	(d)	182, 229, 276, 323	229
Distance of lower link pivot point from :horizontally	(e)	83	83
rear-wheel axis :vertically	(f)	138	138
Distance of lower link pivot points to lift rod pivot points on lower links	(D)	401	401
Length of lift rods	(L)	436 to 572	552
Height of lower hitch points relative to the rear-wheel axis:			
- in low position	(h)	271 to 605	545
- in high position	(H)	99 to 370	160
Height above ground of lower hitch points when locked in transport position (*)		Any height withing lift range	

(*) Assuming the tyre dynamic radius index r=745 mm of ISO 4251/1-1988

SWINGING DRAWBAR

Type:	Clevis on towing hook
Height above ground:	450
Type of adjustment:	None

Distance of hitch point from rear-wheel axis, horizontally:	663 mm
Distance of hitch point from power take-off shaft end:	
Vertically:	302 mm
Horizontally:	400 mm
Lateral adjustment:	
Right-hand:	0 mm
Left-hand:	0 mm
Diameter drawbar pin hole:	32 mm
Maximum vertical permissible load:	6 kN

TRAILER HITCH

Type:	Automatic clevis
Hole diameter:	35 mm
Height above ground:	777, 827, 877, 927 and 977 mm
Distance of hitch point from rear-wheel axis, horizontally:	628 mm
Distance of hitch point from power take-off shaft end:	
Vertically:	25, 75, 125, 175 and 225 mm
Horizontally:	365 mm
Maximum vertical permissible load:	10 kN

HOLED DRAWBAR

Number of holes:	7
Distance between holes:	80 mm
Hole diameter:	32 mm
Thickness/width of the drawbar:	2x20 mm/90 mm
Height above ground:	
Maximum:	905 mm
Minimum:	200 mm
Horizontal distance to power take-off shaft end:	677 mm

SEMI-TRAILER HITCH

Type:	Towing hook
Hole diameter:	47 mm
Height above ground:	523 mm
Distance of hitch point from rear-wheel axis, horizontally:	443 mm
Distance of hitch point from power take-off shaft end:	
Vertically:	229 mm
Horizontally:	180 mm
Maximum vertical permissible load:	15 kN

FRONT TOWING HITCH

Height above ground:	701 mm
Diameter of pin hole:	31 mm

STEERING

Make, model and type:	DANFOSS, OSPC 80 ON, hydrostatic
Method of operation:	Independent hydraulic circuit for steering
Pump:	Gear, driven from engine
Ram:	Double-acting cylinder on the front axle, symmetrical design
Working pressure:	8.0 MPa

BRAKES

Service brake

Make, model and type:	ZETOR, 7245 2600, dry disc, multiplate, 2 discs each side
Method of operation:	Hydraulically by pedals, coupled or independent
Trailer braking take-off:	Air brake operated by tractor pedals

Parking brake

Type:	Common with service brake
Method of operation:	Mechanical by hand lever with ratchet

WHEELS

Number:

Front: 2, steering

Rear: 2, driving

Wheelbase: 2256 mm

Track width adjustment:

	Minimum mm	Maximum mm	Adjustment method
Front	1420	1795	By extending of front axle
Rear	1420	1795	Reversing wheels and off-set lug rims

PROTECTIVE STRUCTURE

Make, model and type: ROSTROJ, BK 6245, cab with integrated safety frame

Manufacturer's name and address: ROSTROJ s.p., 683 01 Rousínov, ČSFR

Protective device: Cab, not tiltable

O.E.C.D. approval number: CSD 1363/8

DRIVER'S SEAT

Make, model and type: MARS, Zetor 5911-5400, upholstered seat

Type of suspension: Parallelogram linkage adjustable for driver's weight

Type of damping: Hydraulic

Range of adjustment:

Longitudinal: 150 mm

Vertical: 60 mm

MISCELLANEOUS

Additional seat:

Location: Right-hand side of driver

Number of places: 1

LIGHTING

	Height above ground of centre mm	Size mm	Distance from outside edge of lights to median plane of tractor mm
Headlights	1080	120x120	188
Sidelights	1560	60x65	655
Rearlights	1535	105x70	750
Reflectors	985	ϕ78	760

II. TEST CONDITIONS

Overall dimensions

Length mm	Width		Height at top of	
	minimum mm	maximum mm	protective structure mm	exhaust silencer mm
3755	1875	2250	2665	2650

Ground clearence
(unballasted tractor): 410 mm
Clearance-limiting part: Semi-trailer hitch

Tractor mass (with cab)

	Without driver kg	With driver kg
Front	1025	1035
Rear	2140	2205
Total	3165	3240

Tyre and track width specifications

	Front	Rear
Tyres:		
Make	BARUM	BARUM
Dimensions	7.50-20	16.9-34
Ply rating	6	8
Type	diagonal	diagonal
Maximum load (tyre manufacturer's)	8.75 kN	23.80 kN
Maximum load (tractor manufacturer's)	8.00 kN	18.00 kN
Inflation pressure (tyre manufac.)	280 kPa	170 kPa
Dynamic radius index	430 mm	745 mm
Chosen track width:	1420 mm	1420 mm

Oils and lubrication

Capacity and change interval:

	Capacity dm^3	Oil change h	Filter change h
Engine	12.0	200	-
Gear box	25.0	1200	600
Rear axle	Common with gear box		
Final drive (rear)	2x1.9	1200	-
Hydraulic system	Common with gear box		
Steering	4.6	1200	1200
Air cleaner	1.3	100	-

Specifications:

	Recommended	Used during test
Engine oil: Type Viscosity Classification	SAE 15W/50 16.5 cSt at 100 °C API SD/CB	As recommended
Transmission oils: Type Viscosity Classification	SAE 80W 7.5 cSt at 100 °C API GL-4	As recommended
Steering oil: Type Viscosity Classification	OH-HM 32 28.8 cSt at 40 °C ISO 6743 HM 32	As recommended

Hydraulic fluid: Same as transmission

Air cleaner filling: Same as engine

Grease:

Number of lubrication points: 24

Fuel

Type: Diesel fuel, in conformity with national standard ČSN 65 6506

Density at 15 °C: 0.835 g/cm^3 for P.T.O. tests
0.835 g/cm^3 for drawbar tests

III. TEST RESULTS

COMPULSORY TESTS RESULTS

1. MAIN POWER TAKE-OFF

Date and location of tests: 2nd March 1992, SZZPLS Praha

Type of dynamometer: FROUDE AG 400

Power	Speed		Fuel consumption			Specific energy
	Engine	P.T.O.	Hourly		Specific	
kW	rev/min		kg/h	l/h	g/kWh	kWh/l
1.1 MAXIMUM POWER - TWO-HOUR TEST						
44.5	2200	1073	10.53	12.61	237	3.53
1.2 POWER AT RATED ENGINE SPEED						
44.5	2200	1073	10.53	12.61	237	3.53
1.3 STANDARD POWER TAKE-OFF SPEED 1000 rev/min						
42.9	2050	1000	9.89	11.84	231	3.62
1.4 PART LOADS 1.4.1 the torque corresponding to maximum power at rated engine speed						
44.5	2200	1073	10.53	12.61	237	3.53
1.4.2 85 % of torque obtained in 1.4.1						
39.4	2292	1118	9.63	11.53	244	3.42
1.4.3 75 % of torque defined in 1.4.2						
30.0	2325	1134	7.72	9.25	257	3.24
1.4.4 50 % of torque defined in 1.4.2						
20.4	2372	1157	6.07	7.27	298	2.81
1.4.5 25 % of torque defined in 1.4.2						
10.3	2399	1170	4.44	5.32	431	1.94
1.4.6 unloaded						
-	2419	1180	2.99	3.58	-	-

Power	Speed		Fuel consumption			Specific energy
	Engine	P.T.O.	Hourly		Specific	
kW	rev/min		kg/h	l/h	g/kWh	kWh/l
1.5 PART LOADS AT STANDARD POWER TAKE-OFF SPEED 1000 rev/min						
1.5.1 the torque corresponding to maximum power						
42.9	2050	1000	9.89	11.84	231	3.62
1.5.2 85 % of torque obtained in 1.5.1						
37.1	2085	1017	8.68	10.40	234	3.57
1.5.3 75 % of torque defined in 1.5.2						
28.3	2118	1033	6.94	8.31	245	3.41
1.5.4 50 % of torque defined in 1.5.2						
19.1	2153	1050	5.37	6.43	281	2.97
1.5.5 25 % of torque defined in 1.5.2						
9.8	2191	1069	3.91	4.68	399	2.09
1.5.6 unloaded						
-	2214	1080	2.55	3.05	-	-

No load maximum engine speed: 2419 rev/min

Torque (equivalent crankshaft) at maximum power: 193.2 Nm

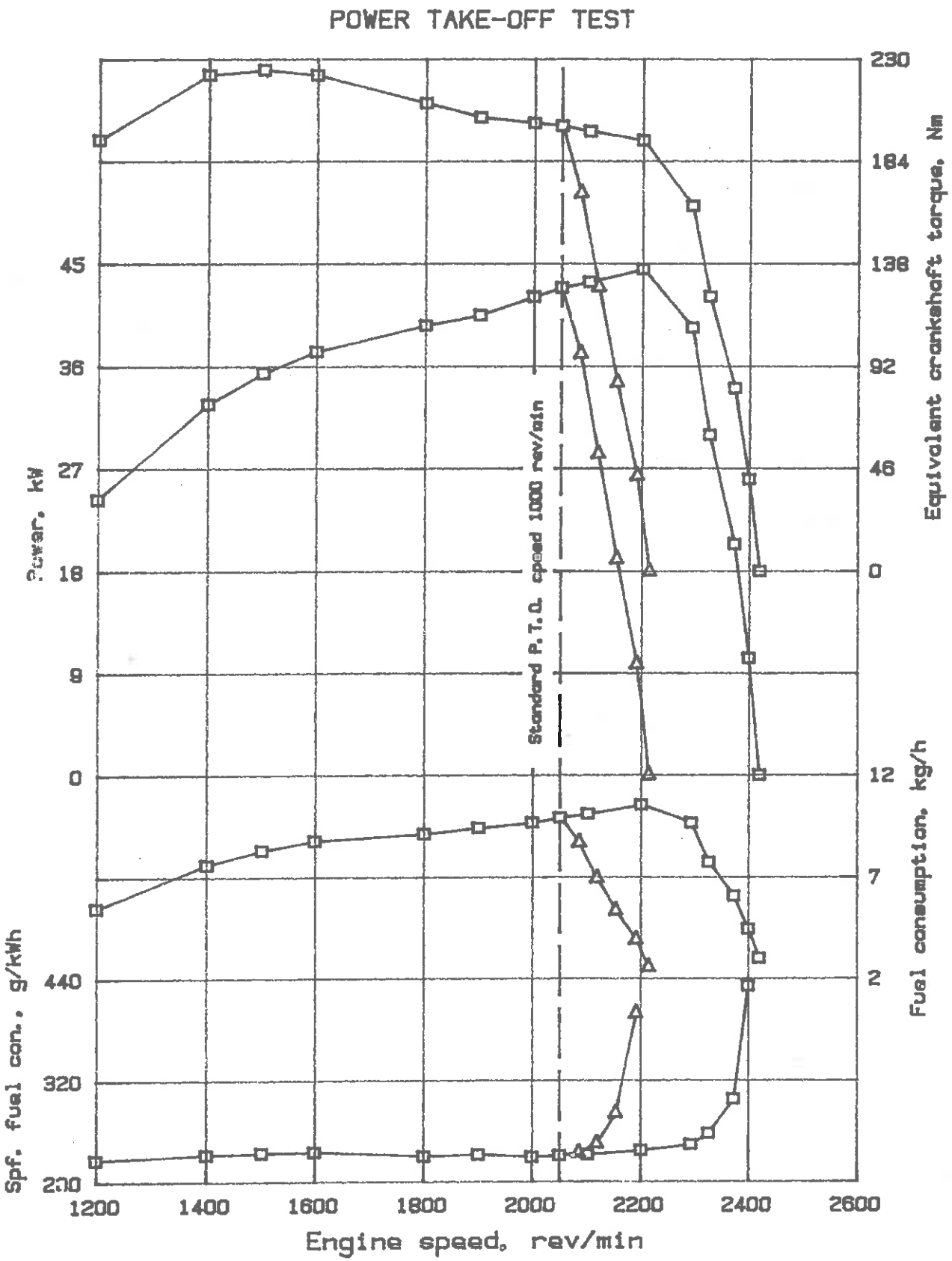
Maximum torque (equivalent crankshaft): 225.2 Nm
(engine speed: 1501 rev/min)

Mean atmospheric conditions:

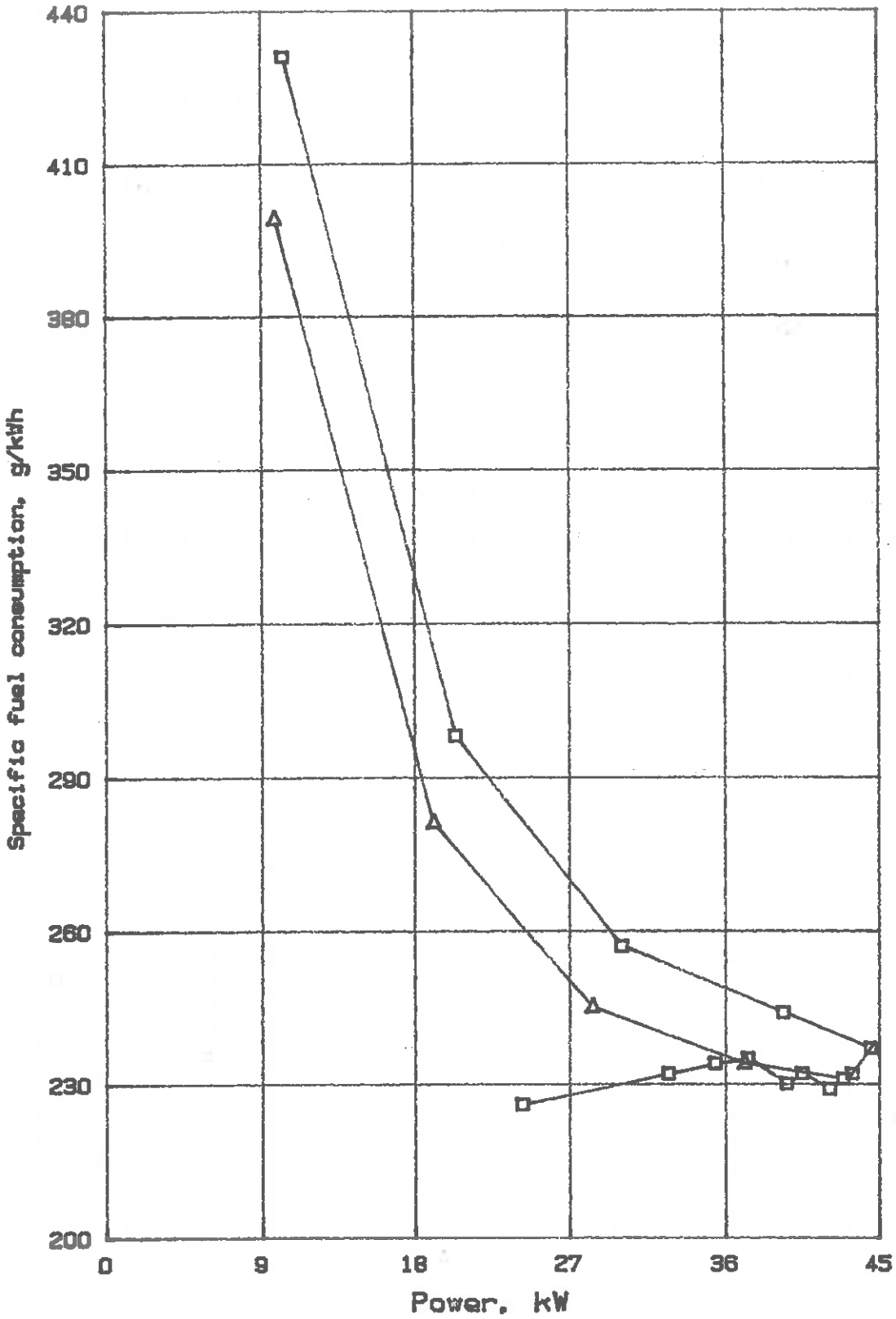
Temperature: 22 °C
Pressure: 99.6 kPa
Relative humidity: 63 %

Maximum temperatures:

Coolant: 82 °C
Engine oil: 103 °C
Fuel: 44 °C
Engine air intake: 25 °C


POWER TAKE-OFF TEST
Power, kW
45
36
27
18
9
0
Spf. fuel con., g/kWh
440
320
200
Standard P.T.O. speed 1000 rev/min
Equivalent crankshaft torque, Nm
230
184
138
92
46
0
Fuel consumption, kg/h
12
7
2
1200
1400
1600
1800
2000
2200
2400
2600
Engine speed, rev/min

POWER TAKE-OFF TEST



2. HYDRAULIC POWER AND LIFTING FORCE

Date of test: 9th June 1992

2.1 HYDRAULIC POWER TEST

Sustained pressure with relief valve open: 20.5 MPa

Pump delivery rate at minimum pressure: 41.0 l/min

	Flow rate l/min	Pressure MPa	Power kW
At 90 % of the actual relief valve pressure setting	31.7	18.5	9.8
At maximum hydraulic power	34.6	17.6	10.1

Tapping point used for test: External tapping

Temperature of hydraulic fluid: 69 °C

Opening and closing pressure of the unloading valve: Not applicable

2.2 POWER LIFT TEST

	At the hitch point	On the frame
Height of lower hitch points above ground in down position	200 mm	200 mm
Vertical movement	650 mm	885 mm
Maximum corrected force exerted through full range	36.2 kN	24.1 kN
Corresponding pressure of hydraulic fluid	17.6 MPa	17.6 MPa
Moment about rear-wheel axis	34.0 kNm	37.4 kNm
Maximum tilt angle of mast from vertical	-	11 degrees

Lifting heights relative to the horizontal plane including the lower link pivot points												
mm	-527	-500	-407	-300	-200	-100	0	+100	+200	+243	+300	+358
Lifting forces at the hitch points, corrected to 17.6 MPa												
kN	-	-	46.3	44.4	43.5	41.0	40.2	39.1	37.2	36.2	-	-
Lifting forces at the test frame, corrected to 17.6 MPa												
kN	39.2	38.4	36.4	35.1	33.1	31.5	29.4	28.4	26.5	-	25.2	24.1

3. DRAWBAR POWER AND FUEL CONSUMPTION (UNBALLASTED TRACTOR)

Date of test: 17th June 1992

Type of track: Bituminous-concrete surface

Height of drawbar above ground	Tyre inflation pressure	
	Front	Rear
450 mm	230 kPa	130 kPa

Gear and group	Power	Drawbar pull	Speed	Engine speed	Slip of wheels	Specific fuel consumption
	kW	kN	km/h	rev/min	%	g/kWh
3.1 MAXIMUM POWER IN TESTED GEARS						
1 T	6.0	20.3	1.06	2387	14.9	692
2 T	7.5	20.8	1.29	2371	15.0	581
3 T	11.2	21.0	1.92	2365	15.0	451
4 T	18.0	21.4	3.02	2339	15.0	372
5 T	27.7	21.1	4.72	2294	15.0	316
1 R	34.0	21.3	5.74	2264	15.0	307
2 R	36.5	18.1	7.26	2195	8.9	284
3 R	37.6	11.9	11.36	2207	5.1	282
4 R	34.7	6.7	18.63	2199	3.2	303
3.2 FUEL CONSUMPTION						
3.2.1 in selected gear, at maximum power at rated speed						
3 R	37.6	11.9	11.36	2207	5.1	282
3.2.1.1 75 % of pull at maximum power at rated speed						
3 R	29.5	8.8	12.08	2305	4.0	298
3.2.1.2 50 % of pull at maximum power at rated speed						
3 R	20.5	6.0	12.32	2328	2.8	337
3.2.1.3 next higher gear at reduced engine speed; same pull						
4 R	Out of measure					
3.2.1.4 next higher gear at reduced engine speed; same pull						
4 R	Out of measure					
3.2.2 in selected gear nearest to 7.5 km/h at rated speed						
2 R	36.5	18.1	7.26	2195	8.9	284
3.2.2.1 75 % of pull at maximum power at rated speed						
2 R	29.7	13.6	7.87	2298	6.9	296
3.2.2.2 50 % of pull at maximum power at rated speed						
2 R	20.7	9.1	8.20	2335	4.1	331
3.2.2.3 next higher gear at reduced engine speed; same pull						
3 R	29.2	13.5	7.79	1525	6.9	272
3.2.2.4 next higher gear at reduced engine speed; same pull						
3 R	21.0	9.1	8.29	1588	4.1	268

Specific energy	Temperature			Atmospheric conditions		
	Fuel	Coolant	Engine oil	Tempera-ture	Relative humidity	Pressure
kWh/l	°C	°C	°C	°C	%	kPa
1.21	33	65	82	22	57	100.1
1.44	33	66	84	22	57	100.1
1.85	30	65	85	22	57	100.1
2.24	32	66	88	22	55	100.1
2.64	38	69	90	22	55	100.1
2.72	41	71	92	22	55	100.1
2.94	40	71	92	22	55	100.1
2.97	40	70	89	22	53	100.1
2.76	36	68	88	22	50	100.1
2.97	40	70	89	22	53	100.1
2.81	36	68	90	24	46	100.1
2.48	35	68	91	24	46	100.1
and travelling speed as in 3.2.1.1						
and travelling speed as in 3.2.1.2						
2.94	40	71	92	22	55	100.1
2.82	40	70	88	23	50	100.1
2.52	38	68	90	23	50	100.1
and travelling speed as in 3.2.2.1						
3.07	42	74	89	23	48	100.1
and travelling speed as in 3.2.2.2						
3.11	39	69	88	23	48	100.1

OPTIONAL TEST RESULTS

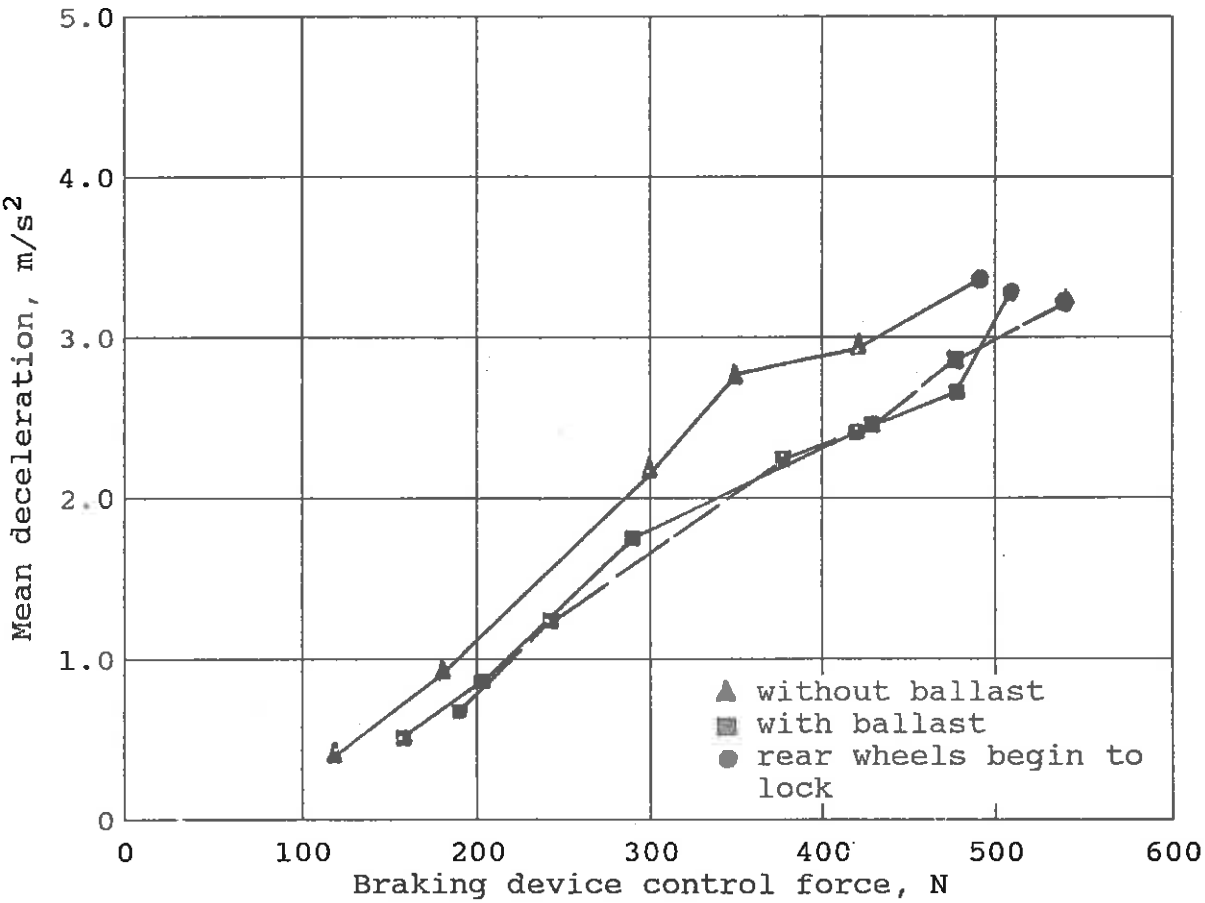
4. BRAKING

Date of test: 7th April 1992

	Tractor mass (with driver)			Speed before application of brakes
	Front kg	Rear kg	Total kg	km/h
Ballasted	1600	3600	5200	32.8
Unballasted	1035	2205	3240	33.2

4.1 COLD SERVICE BRAKING DEVICE TEST (————————)

4.2 FADE TEST (- - - - - -)



Maximum deviation of tractor from its original course:	Not significant
Abnormal vibration:	None
Brake heating method:	Driven with brakes applied for 1 km at 80 % of maximum speed with a pedal force corresponding to a deceleration of 1 m/s^2

4.3 PARKING BRAKING DEVICE TEST

	Ballasted tractor on 18 % - slope	
	Uphill	Downhill
Braking device control force	228 N	226 N

5. MEASUREMENT OF EXTERNAL NOISE LEVEL

Date of test:	15th June 1992
Make and model of sound level meter:	BRÜEL & KJAER, 2231
Type of track:	Bituminous-concrete surface
Gear number:	5 R
Travelling speed before acceleration:	24.9 km/h
Sound level:	83.5 dB(A)

6. REPAIRS — None

7. REMARKS — None

Test carried out by: Dipl. Ing. Peter Pernis

Head of the Tractor Department
Dipl. Ing. Peter Pernis

Director
Dipl. Ing. Vladimír Hanzlík