SOCIALISTIC REPUBLIC OF CROATIA
INSTITUTE FOR MECHANIZATION, TECHNOLOGY AND BUILDINGS IN AGRICULTURE
Z A G R E B

TEST BULLETIN: O. E. C. D. No. 870

Report on test in accordance with O. E. C. D. Standard Code for the official testing of Agricultural Tractors

Date of approval: 8th June 1983



TOMO VINKOVIĆ TV 522

ARTICULATED FOUR—WHEEL—DRIVE TRACTOR

Manufactured by: TOMO VINKOVIĆ, Tvornica traktora i ljevaonica, 43000 Bjelovar, Yugoslavia

Date of tests: July 1981. — December 1982.

This report has been approved by the O. E. C. D. Coordinating Centre (C. N. E. E. M. A., Antony, France) as being in accordance with the O. E. C. D. Standard Code.

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This bulletin is based on engineering tests in accordance with O. E. C. D. Tractor Code. It does not contain evaluation of the performance of the tractor on practical farm work.

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In this report all measurements are given in SI units.

The relation with former Technical System of Units is given by the following relations:

Forces: 1 N = 0.102 kp or 1 kp = 9.81 N

Powers: 1 kW=1.36 hp or 1 hp = 0.736 kW

Pressures: 100 kPa = 1.02 kp/m^2 = 750.1 mm Hg or 1 kp/m^2 = 98.1 kPa

Tractor manufacturer:	TOMO VINKOVIĆ, Tvornica traktora i ljevaonica, Bjelovar
Submitted for test by:	Manufacturer
Selected by:	Manufacturer in agreement with the Institute
Place of running-in:	Zagreb
Duration of running-in:	50 hours

SPECIFICATION OF TRACTOR

Tractor	
Make:	TOMO VINKOVIĆ
Model:	TV 522
Type:	Articulated four-wheel-drive design
Serial No.:	308
Engine	
Make:	LOMBARDINI — DMB
Model:	LDA — 820
Type:	4 — stroke diesel engine, air cooled, direct injection
Serial No.:	0005887
Cylinders:	1 cylinder, vertical, bore 102 mm, stroke 100 mm, capacity 817 cm^3; compression ratio 17,5:1; overhead valves
Fuel system:	Gravity type fuel feed; FIAAM FNA 32/01 fuel filter with replaceable cartridge; capacity of fuel tank 8.5 l; IPM type YPFR 170 YS 6459/311 piston injection pump serial No. 03890/81; manufacturer's production setting 52 mm^3 per cycle at rated engine speed and full load, BOSCH type KBL 86S26 injection nozzle; injection pressure 20.6 MPa, injection 29^0 before TDC.
Governor:	LOMBARDINI, mechanical, centrifugal, variable speed type governor, governed range of engine speed 1000 rev/min to 3200 rev/min; rated engine speed 3000 rev/min.
Air cleaner:	FRAD oil bath type with pre-cleaner incorporated, oil capacity 0,3 l.
Exhaust silencer:	Expansion type silencer, vertical 95×75 mm oval, 300 mm long, mouth on the right-hand side of the tractor, 300 mm above ground.
Lubrication system:	Forced feed from gear type pump; FIAAM oil filter with replaceable cartridge; oil capacity (engine sump) 2.6 l, oil change period 100 hours, oil filter change period 300 hours; Recommended oil quality MIL-L-45199 A. Recommended oil viscosities: below 0^0C SAE 10 below 20^0C SAE 20 above 20^0C SAE 40
Cooling system:	Air cooling from flywheel blower; fan 308 mm dia with 28 blades
Starting system:	Electrical pre-engaged-drive starting motor, ISKRA type AZJ 0102 12 V, 1.4 kW
Aid for cold starting:	Mechanical, incorporated in fuel pump
Electrical equipment:	Voltage 12 V DUCATI, 3 phase alternator 12 V, 190 W MUNJA lead-acid battery 12 V, 70 Ah at 20 hours rating

Transmission:

Clutch: Make: POBEDA Nivi Sed. dry single plate clutch, 190 mm dia plate, pedal operated

Gearbox: Own make; sliding gear type with 3 forward speeds plus a 2 forward and 1 reverse range transfer box at the input end; total number of speeds 6 forward + 3 reverse

Axle and final drive: Own make; crown and pinion with differential; differential lock fitted on front axle, not self-disengaging; operated by hand lever

Transmission lubrication: Gearbox and front housing 8 l; rear axle housing 6 l; recommended oil changing period 500 hours. Recommended oil type acc. API service classification: service GL 3; viscosity SAE 90

Total ratios and speeds

Speed range	Gear	Number of engine revolutions for one revolution of driving wheel	Nominal traveling speed for rated speed of engine 1) 3000 rev/min (km/h)
low	1	235.7	1.68
	3	87.09	4.55
	5	32.45	12.20
high	2	160.7	2.46
	4	59.38	6.67
	6	22.12	17.90
reverse	1	160.7	2.46
	2	59.38	6.67
	3	22.12	17.90

1) Calculated with a tyre dynamic radius index of 350 mm

Power take-off

Main power take-off: Non independent proportional to engine speed; p. t. o. directly driven from the transfer box output
Location: at rear of tractor in median plane 275 mm above ground, 155 mm behind rear axle centre.
21.5 mm dia with 10 splines (not ISO standard).
Anticlockwise: 2 speeds (727.3 rev/min and 1403.2 rev/min at rated engine speed); clockwise and anticlockwise 2 speeds (1063.7 rev/min and 2057.6 rev/min at rated engine speed)
540 p. t. o. rev/min at 2228 engine rev/min
1000 p. t. o. rev/min at 2813 engine rev/min

Power lift: Make: PRVA PETO ET A, Test ni ; dig t g at d construction; type 311-5-422-29 gear type pump directly driven by engine supplies oil to a single ram cylinder; maximum oil pressure 11.8 MPa; separate hydraulic oil reservoir with 8 l capacity;
Recommended oil type: oil for hydraulic circuits, viscosity 6 750E 50°C; oil change period 500 hours
Oil filter with replaceable cartridge, filter change interval 1000 hours
Position control: Hydraulic linkage lock for transport.

Implement linkage: Two point linkage not standardized, controlled by power lift; lift height; above ground from 90 mm to 430 wer lift; height above ground from 90 mm to 430 plane to: rear axle centre 410 mm; to p. t. o. shaft end 255 mm.

The length of: Lower links 350 mm
Lift chains 370 mm

Lift range: 343 mm

Hitch: Height above ground 290 or 400 mm, pin dia 20 mm, horizontal distance from rear axis 220 mm; 0 or 110 mm above the p. t. o.; 65 mm behind p. t. o.
Maximum permissible vertical load 300 kg.

Steering: Own make screw and nut steering operated by hand wheel.

Brakes

Service brake: Own make, internal expanding brakes, mechanically acting on rear wheels, operated by foot pedal. All four wheels are always mechanically engaged.

Parking brake: Lever operated service brakes.

Wheels: Two at front, two at rear, all tyres 6.00 — 16 TR, diagonal 4 — ply pneumatic; maximum permissible weight on each tyre 3.75 kN at 150 kPa; track width 610 or 840 mm by shifting the hub on the axle shaft.

Wheelbase: 1085 mm

Lighting

	Height from ground to centre mm	Dimensions mm	Distance from outside edge of tractor to centre* mm
Headlights	810	100 Ø	215
Side lights	785	50 Ø	60
Rear lights	785	100 × 95	95

*At track setting 840 mm

Unrestricted beam angle of headlight in plan wiew 29°.

Number of grease points: 12 (whole tractor)

Overall dimensions:

	Length	Width m		Maximum height* m
		max.	min	
With ballast	2.30	1.05	0.82	1.15
Without ballast	2.30	1.05	0.82	1.15

* To the top of the seat

Ground clearance: 210 mm (at brakes' drums).

Seat: Make: AGIS, Ptuj, upholstered seat with back rest. Mechanical suspension adjustable to driver's mass. Damping by hydraulic shock absorber. Range of vertical adjustment 70 mm.

CONDITIONS DURING TEST

Masses:

Tractor without driver but with tanks full

	Front kg	Rear kg	Total kg
Without ballast	529	223	752
With ballast	617	311	928

Ballast

	No. of weights	Total mass kg	Water kg
Front	2	88	—
Rear	2	88	—

Track setting

During tests front & rear 840 mm

FUELS AND LUBRICANTS USED IN TESTS:

Laboratory and track tests:

Fuel:	INA D-2	
	Density at 15°C	0.835 kg/l
	Viscosity at 50°C	2.6 cSt
	Cetane number	53
	Conforms to standard	JUS. B. H2. 411
Engine oil:	INA Super 3 SAE 30	
	Viscosity at 50°C	8° E
Transmission oil:	INA Hypenol 90 (SAE 90)	
	Viscosity at 50°C	15° E
Hydraulic oil:	INA Hydraol 70°	
	Viscosity at 50°C	6.8° E

COMPLUSORY TESTS

(1) Main power take off performance (540 rev/min)
Date and location of tests: 1982. 10. 07., Zagreb
Type of dynamometer: SCHENK hydraulic dynamometer U1 40

Power kW	Speed Engine rev/min	Speed p. t. o. rev/min	Fuel consumption hourly 1/h	Fuel consumption specific kg/kWh	Specific energy kWh/l
Maximum power — 2 hour test					
10.32	2780	674	4.33	0.350	2.39
The speed recommended by manufacturer for drawbar work					
10.32	2780	674	4.33	0.350	2.39
Part loads — at rated engine speed					
(i) 85 per cent of the torque obtained at maximum power					
9.44	3028	734	4.29	0 379	2.20
(ii) unloaded					
0	3279	795	1.52	—	—
(iii) half the torque defined in (i)					
5.03	3209	778	2.79	0.462	1.81
(iv) the torque corresponding to maximum power					
10.32	2780	674	4.33	0.350	2.39
(v) one — quarter of the torque defined in (i)					
2.54	3234	784	2.06	0.680	1.23
(vi) three — quarters of the torque defined in (i)					
7.45	3168	768	3.51	0.393	2.12
Standard speed of p. t. o. (540 rev/min) (i) 85% of the torque obtained at maximum power					
9.32	2409	584	3.33	0.299	2.79
(ii) unloaded					
0	2698	654	1.00	—	—
(iii) half the torque defined in (i)					
5.13	2615	634	2.23	0.362	2.31
(iv) the torque corresponding to maximum power available					
10.16	2228	540	3.77	0.310	2.69
(v) one — quarter of the torque defined in (i)					
2.58	2681	650	1.58	0.511	1.63
(vi) three — quarters of the torque defined ni (i)					
7.36	2533	614	2.81	0.319	2.62

STANDARD SPECIFIC FUEL CONSUMPTION (kg/kWh):

a (i)	0.350
a (iii)	0.462
b (i)	0.299
b (iii)	0.362

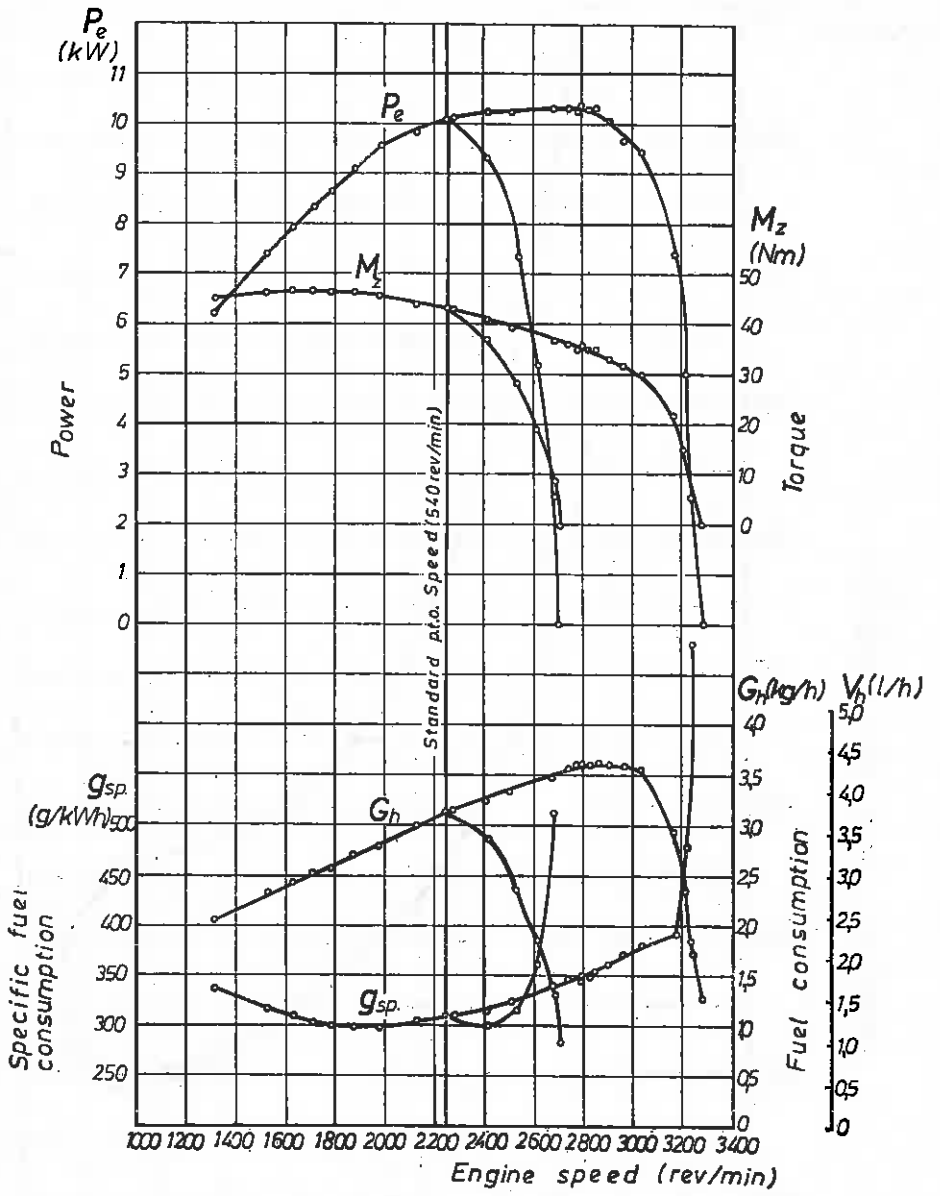
No load maximum engine speed 3279 rev/min

Equivalent crankshaft torque at maximum power 35.5 Nm

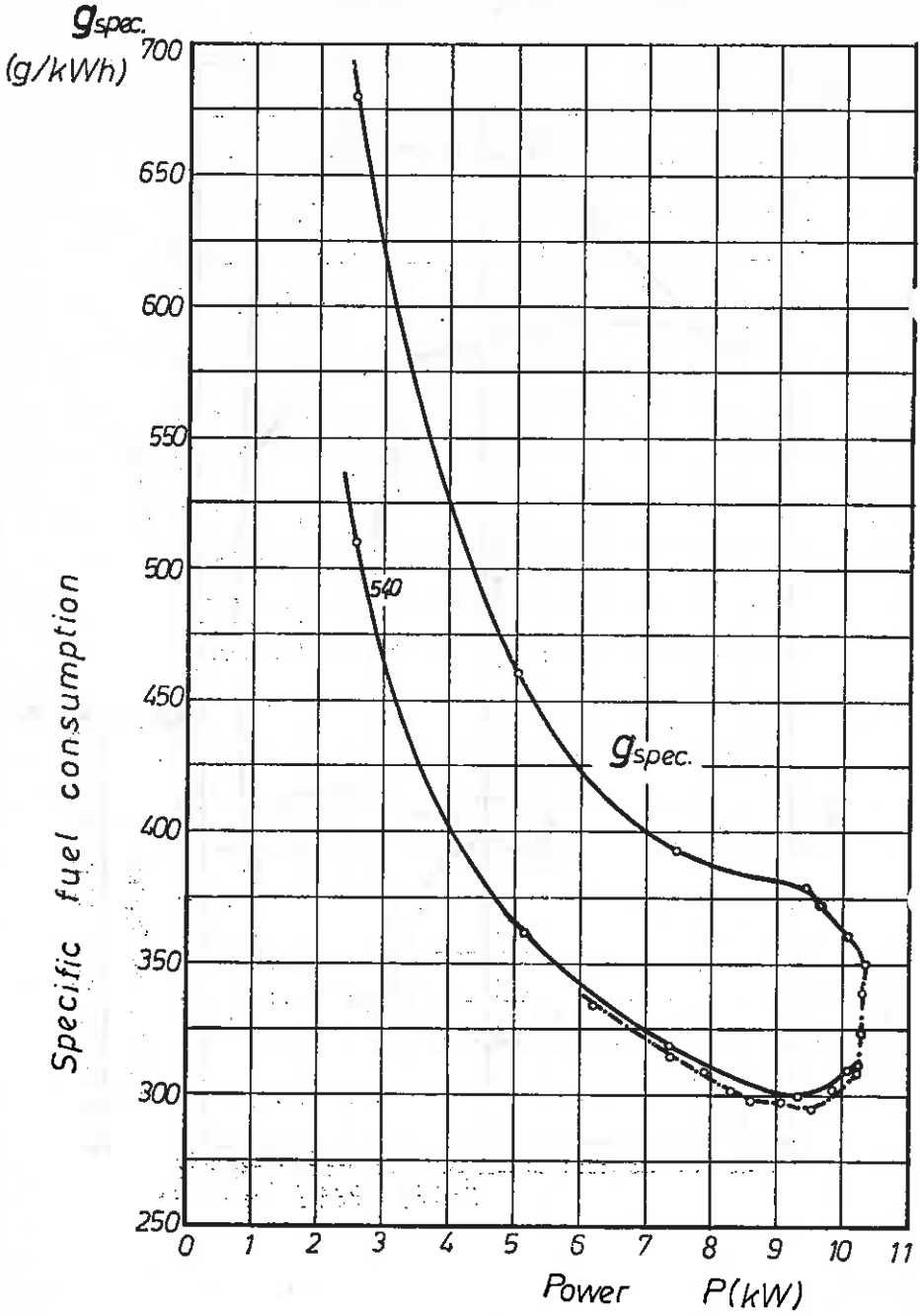
Maximum torque 46.6 Nm at 1625 rev/min of the engine

Mean atmospheric conditions:	temperature:	22°C
	pressure:	99.6 kPa
	relative humidity:	52 per cent
Maximum temperatures:	cylinder head:	102°C
	engine oil:	128°C
	fuel:	23°C
	engine air intake:	42°C

Tractor „TOMO VINKOVIĆ" TV-522



Tractor „TOMO VINKOVIĆ" TV-522



(2) DRAWBAR PERFORMANCE
Date of tests: 1982. 11. 22.—26.
Type of track: tarmacadam

Height of hitch above ground ballasted/unballasted: 290 mm
Tyre inflation pressure front/rear: 150 kPa

Gear	Speed	Power	Drawbar pull	Engine speed	Wheelslip	Specific fuel consumption	Specific energy	Temperature			Atmospheric conditions		
								Fuel	Coolant	Oil	Temp.	Relative humidity	Pressure
	km/h	kW	N	rev/min	per cent	kg/kWh	kWh/l	°C	°C	°C	°C	per cent	kPa
	(i) Maximum power (unballasted)												
1	1.57	2.92	6671	3163	14.9	0.720	1.16	5	—	78	8	70	101.4
2	2.31	4.34	6770	3155	15.6	0.613	1.36	6	—	82	9	67	101.4
3	4.12	7.86	6667	3071	15.0	0.402	2.08	7	—	84	10	65	101.4
4	5.86	9.52	5886	2825	9.5	0.385	2.17	7	—	82	10	65	101.4
5	9.89	9.84	3581	2810	4.2	0.370	2.26	8	—	88	11	65	101.4
6	13.85	9.81	2551	2790	2.8	0.365	2.29	8	—	86	11	65	101.4
	(ii) Maximum power (ballasted)												
1	1.59	3.46	7843	3172	14.6	0.710	1.18	8	—	84	11	65	101.4
2	2.28	5.03	7946	3033	15.2	0.568	1.47	9	—	86	12	65	101.4
3	3.93	8.67	7946	2976	14.9	0,380	2.20	9	—	89	12	65	101.4
4	5.71	9.97	6278	2890	9.2	0.365	2.29	10	—	87	12	65	101.4
5	9.84	10.06	3679	2834	4.8	0.355	2.35	10	—	92	11	65	101.4
6	13.53	9.96	2649	2820	2.9	0.360	2.32	10	—	90	11	69	101.4
	(iii) Five hour test at 75 per cent of pull at maximum power												
4	6.74	8.82	4710	3010	6.7	0.375	2.30	15	—	92	16	51	100.9
	(iv) Five hour test at pull corresponding to 15 per cent wheelslip in test (ii)												
3	3.92	8.65	7946	—	—	—	—	9	—	94	10	66	100.6

Oil consumption during ten hours' testing (iii) and (iv): 10 g/h

TOMO VINKOVIĆ TV 522

(3) TURNING SPACE AND TURNING CIRCLE

Details of wheel equipment: tractor with ballast
Tyres: 6.00—16 4 ply
Track of wheels: front/rear: 840 mm

	Without brakes	
	Right hand m	Left hand m
Radius of turning space	2.28	2.32
Radius of turning circle	2.17	2.21

Separate braking of wheels is not possible.

(4) LOCATION OF CENTRE OF GRAVITY

Height above ground: 488 mm
Distance forward from vertical plane containing the axis of rear wheels: 690 mm
Distance from median plane: 4 mm to left
Distance from vertical plane containing the mid points of front and rear axes with maximum articulation (33°): to left: 7 mm to left; to right: 7 mm to right

(5) BRAKING

Date of tests: 1982. 11. 24.
Tractor masses during brake tests

	Front kg	Rear kg	Total kg
Ballasted	622	400	1022
Unballasted	538	312	850

Type 0 (ordinary cold service braking device performance) test
Speed before aplication of brakes 18.6 km/h

Ballasted	Braking device control force N	180	255	285	325	Locked 375
	Mean deceleration m/s^2	2.65	3.92	4.90	5.20	7.35
Unballasted	Braking device control force N	140	235	310	360	Locked 400
	Mean deceleration m/s^2	2.45	3.53	4.02	4.81	5.69

Type I (fade) test

Braking device control force N	160	235	305	353	Locked 415
Mean deceleration m/s^2	2.45	3.92	5.10	5.69	6.67

Maximum deviation of tractor from itf original course: 0 m
Abnormal vibration: None
The brakes were heated by: The first method

Parking braking device test

Braking device control force N	18 per cent slope		12 per cent slope with trailer of 1.0 tone	
	Up	Down	Up	Down
	220	230	215	225

(6) MEASUREMENT OF EXTERNAL NOISE LEVEL

Date of tests:	1982. 11. 24.
Type of sound level meter:	Brüel & Kjaer type 2203
Type of track:	Tarmacadam
Results of tests:	
Gear:	6.
Travelling speed before acceleration:	14.0 km/h
Sound level:	97.6 dB (A)

(7)NOISE MEASUREMENTS AT THE DRIVER'S EAR

Date of tests:	1982. 11. 24.
Type of sound level meter:	Brüel & Kjaer type 2203
Type of track:	Tarmacadam
Cab fitted:	No
Results of tests:	

Gear	Drawbar pull at which the tractor develops the maximum sound level kN	Measured traveling speed km/h	Sound level dB (A)
4*	5.9	5.71	99.4
4*	Light load	6.9	94.0
6	Light load	18.6	94.6

* The 4th gear corresponds to the nominal travelling speed nearest to 7.5 km/h.

(8)POWER LIFT AND HYDRAULIC PUMP PERFORMANCE

Date and location of tests:	1982. 12. 08., Zagreb
Hydraulic fluid	
Make and type:	INA Hidraol 70
Viscosity:	6.6 — 6.9° E/50°C
Viscosity Index:	min 100
Type of linkage lock for transport:	Hydraulic

Power lift

	Height of hitch point above ground in down position mm	Vertical movement mm	Maximum force exerted trough full range kN	Corresponding pressure of hidraulic fluid MPa	Moment about rear axle kNm	Maximum tilt angle of implement linkage over range of lift degrees
At hitch point	74 mm	343	7.2	11.6	2.96	31

Temperature of hydraulic fluid at start of test: 64°C

Hydraulic pump performance:

Opening pressure of relief valve:	11.77 MPa
Sustained pressure with relief valve open:	11.58 MPa
Pump delivery rate at minimum pressure, the governor control lever being set for maximum power:	17.0 l/min
Hydraulic power at 90 per cent of relief valve setting:	1.98 kW
Corresponding delivery rate	11.4 l/min
pressure	10.4 MPa
Temperature of hydraulic fluid	66°C

LINKAGE GEOMETRY

Projected length in side view:

Lower links	350 mm
Lift arms	214 mm
Lift chains	370 mm
Top link	—
Distance of lift rod connection point from pivot point of lower link	260 mm

The following dimensions are given relative to the rear wheel centre line, situated 335 mm above the ground level

Lower link pivot point	68.5 mm behind, 118.5 mm below
Top link pivot point	—
Lift arm pivot point	69 mm behind, 203 mm above
Maximum and minimum height of hitch point	62 mm above, 261 mm below
Height of hitch point above ground when locked in transport position	417 mm

Date: 10th March 1983.

Head of Testing Division: Dr Ivan Piria

Director: Dr Ivo Todorić