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

O. E. C. D. Approval No. **1139**

Restricted Code

FORD 1520-H.S.T.(2WD)

Manufacturer

ISHIKAWAJIMA SHIBAURA MACHINERY Co.,Ltd.

Ishishiba 1-1-1 Matsumoto City, Nagano, Japan

Bio-oriented Technology Research Advancement Institution
(B R A I N)

1-40-2 Nisshin Omiya Saitama 331 JAPAN

This bulletin is based on engineering tests in accordance with the O.E.C.D. STANDARD CODE for the Official Testing of Agricultural Tractor Performance. It does not contain the evaluation of the tractor performance on practical work.
This report has been approved by the O.E.C.D. Coordinating Center (C.E.M.A.G.R.E.F., France) as being in accordance with the O.E.C.D. STANDARD CODE.

Test No.:	87002 /O.E.C.D.
Date of Test:	December, 1987
Date of Approval:	12th Apr., 1988

In this report all performance characteristics are given corresponding to the International System of Units.
The reference to the former used Technical System of Units is given by the following relations:

Forces	1 kgf	= 9.80665	N
Powers	1 PS	= 0.7355	kW
Pressures	1 kgf/cm^2	= 98.0665	kPa

Printed in JAPAN

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Tractor manufacturer's name and address:	ISHIKAWAJIMA SHIBAURA MACHINERY Co., Ltd. Ishishiba 1-1-1 Matsumoto City, Nagano, Japan
Location of tractor assembly:	Ishishiba 1-1-1 Matsumoto City, Nagano, Japan
Submitted for test by:	FORD NEW HOLLAND, Inc. PA 17557, U.S.A.
Selected for test by:	The manufacturer with agreement by BRAIN
Place of running-in:	ISHIKAWAJIMA SHIBAURA MACHINERY Co., Ltd. Matsumoto Plant
Duration of running-in:	Engine and tractor 75.0 h
Location of test:	BRAIN

I. SPECIFICATIONS OF TRACTOR

TRACTOR

Make:	ISHIKAWAJIMA SHIBAURA
Model:	FORD 1520-H.S.T.
Type:	Wheel tractor, unit construction, rear wheel driven.
Serial No.:	UH 21360
1st Serial No.:	UH 21001

ENGINE

Make:	ISHIKAWAJIMA SHIBAURA
Model:	J843
Type:	Water-cooled 4-stroke diesel-engine, in-direct injection
Serial No.:	J843-04317

Cylinders

Number/Disposition:	3 / vertical in line
Bore/stroke:	84/80 mm
Capacity:	1330 cm^3
Compression ratio:	23 : 1
Arrangement of valves:	Overhead
Cylinder liners (wet or dry):	Unreplaceable integral, dry

Fuel system

Fuel feed system:	Gravity feed
Filters	
Make:	TAIYO GIKEN
Model:	IK 12-100
Type:	Replaceable paper element with sediment bowl
Capacity of fuel tank:	27 l
Injection pump	
Make:	DIESEL KIKI
Model:	NP-PFR 3KD55/2NP18
Type:	In-line
Serial No.:	7490009

Manufacturer's production setting of injection pump	
Flow rate (rated engine speed):	5.4±0.2 l/h
(full load):	5.4±0.2 l/h
Timing:	22.5° before TDC
Injectors	
Make:	DIESEL KIKI
Model:	105148-1170
Type:	Throttle type
Injection pressure:	15±0.5 MPa

Governor

Make:	ISHIKAWAJIMA SHIBAURA
Model:	125206250
Type:	All speed mechanical governor
Governed range of engine speed:	From 800 to 2700 rev/min
Rated engine speed:	2500 rev/min

Air cleaner

Make:	NIPPON DENSO
Model:	114100-2420
Type:	Dry,paper element, cyclone type
Location of air intake:	Above the engine under the hood
Maintenance indicator:	Clogged indicator warning light

Lubrication system

Type of feed pump:	Forced feed with trochoid pump
Type of filter(s):	Full flow with by-pass valve and replaceable cartridge
Number:	1

Cooling system

Type of coolant:	50/50 solution of permanent antifreeze and clear water
Make of pump:	AISHIN SEIKI
Model of pump:	16100-6900
Type of pump:	Centrifugal
Specification of fan:	Axial
Number of fan blades:	5
Fan diameter:	340 mm
Coolant capacity:	4.0 l
Type of temperature control:	Thermostat
Superpressure system:	90 kPa

Starting system

Make:	MITSUBISHI
Model:	M002T54085
Type:	Magnetic shift reduction
Starter motor power rating:	12 V, 2.0 kW
Cold starting aid:	Electrical glow plug
Safety device:	Operable only with clutch pedal depressed and P.T.O. control lever in neutral position

Electrical system	
Voltage:	12 V
Generator:	Alternator
Make:	MITSUBISHI
Model:	A1T 25087
Type:	Three phase alternator
Power:	35A, 0.42kW
Battery(Number of accumulators):	1
Rating:	70 Ah at 20 hours rating
Exhaust system	
Make:	ISHIKAWAJIMA SHIBAURA
Type:	Multi-chamber absorption-expansion type
Location:	Vertical on the left side of tractor

TRANSMISSION TO WHEELS

Clutch(travel and power take-off).	
Make:	AISHIN SEIKI
Model:	32100-9N116-A
Type:	Dry disc
Number of plates:	1
Diameter of plates:	215 mm
Method of operation:	Pedal operated
Gear box	
Make:	ISHIKAWAJIMA SHIBAURA
Type:	H.S.T.
Arrangement:	Hydrostatic transmission with 3 ranges (L,M and H) L: From -3.44 to 4.95 km/h M: From -7.15 to 10.29 km/h H: From -13.80 to 19.82 km/h
Rear axle and final drives	
Make:	ISHIKAWAJIMA SHIBAURA
Type:	Bevel gear type differential; spur gear final drives
Differential lock	
Type:	Differential lock in rear axle (Mechanical)
Method of engagement:	Pedal operated
Method of disengagement:	Self disengaged
Front axle	
Make:	ISHIKAWAJIMA SHIBAURA
Type:	None-driven, extendible of tread setting

Total ratios and traveling speeds

Gear No.	Group	Number of engine revolutions for one revolution of the driving wheels	Nominal traveling speed at rated engine speed of 2500 rev/min km/h (*)
Forward			
	L	88.872	0 to 4.95
	M	42.790	0 to 10.29
	H	22.218	0 to 19.82
Reverse			
	L	88.872	0 to 3.44
	M	42.790	0 to 7.15
	H	22.218	0 to 13.80

(*)Calculated with a tyre dynamic radius index of 506 mm

POWER TAKE-OFF

Main power take-off

Type:	Not-independent P.T.O.
Method of engagement	Operable by clutch pedal
Number of shafts:	1
Method of changing power take-off shafts ends and speeds:	None

Power take-off proportional to engine speed

540 rev/min

Location:	At rear of tractor in tractor's median plane
Diameter of power take-off shaft end:	35mm
Number of splines:	6, in conformity with ISO 730/1979
Height above ground:	524 mm
Distance from the median plane of the tractor:	0 mm
Distance behind rear wheel axle:	209.3mm
P.T.O. speed at rated engine speed:	581 rev/min
Engine speed at standard power take-off speed:	2325 rev/min
Ratio of rotation speeds (engine speed/p.t.o. speed):	4.306
Power restriction and maximum	

torque:	25.0KW, 470N·m
Direction of rotation (viewed facing driving end):	Clockwise

Mid power take-off

Type:	Not-independent P.T.O.
Method of engagement:	Operable by clutch pedal
Number of shafts:	1
Method of changing power take-off shafts ends and speeds:	None

Power take-off proportional to engine speed

Location:	Under transmission case, in tractor's median plane
Diameter of power take-off shaft end:	25 mm
Number of splines	6, in conformity with ANSI B92.1
Height above ground:	317 mm
Distance from the median plane of the tractor:	0 mm
Distance behind rear wheel axle:	340.4 mm
P.T.O. speed at rated engine speed:	2189 rev/min
Ratio of rotation speeds (engine speed/p.t.o. speed):	1.142
Power restriction and maximum torque:	20.0 kW, 310 N·m
Direction of rotation (viewed facing driving end):	Clockwise

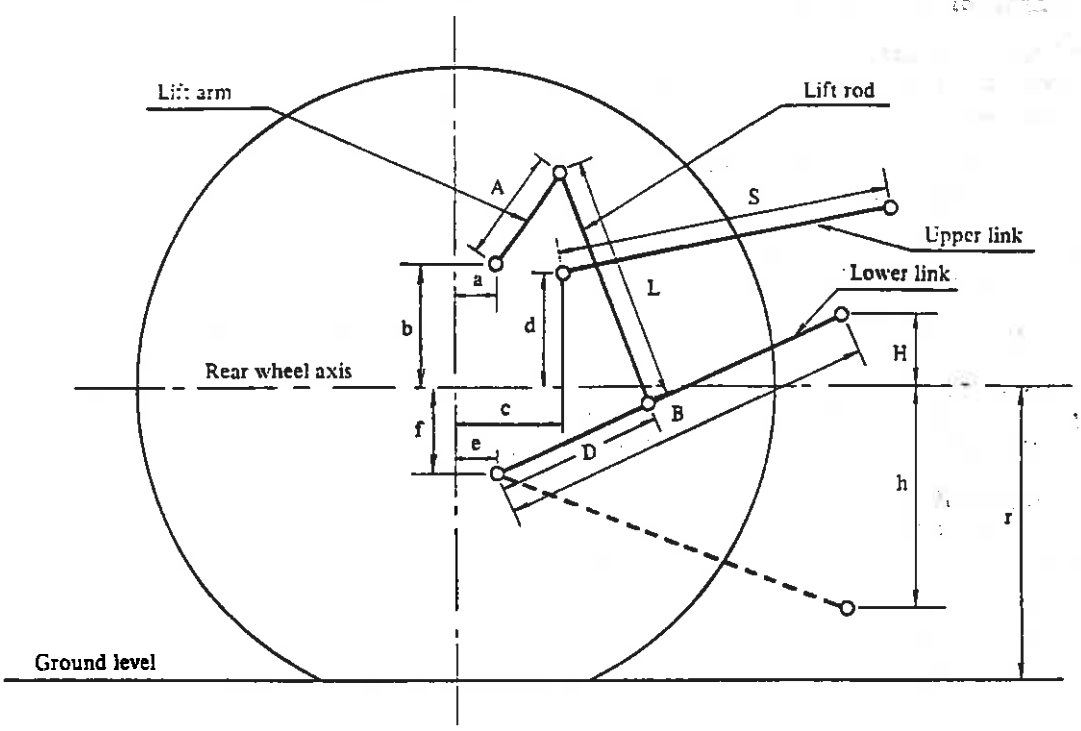
POWER LIFT

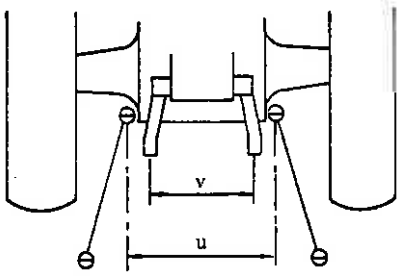
Make:	ISHIKAWAJIMA SHIBAURA
Type:	Hydraulic power lift in unit construction
Type of hydraulic system:	Open center, position control, floating position and flow control valve (two lever lift system with draft and position control: optional)
Type and number of cylinder:	Single acting, 1
Type of linkage lock for transport:	Hydraulically closed by flow control valve
Relief valve pressure setting:	14.7+0.6 MPa
Opening pressure of cylinder safety valve:	24.5+0.5 MPa
Lift pump type:	Gear pump
Transmission between pump and engine:	Directly driven by engine
Type and number of filters:	Replaceable cartridge, 1
Site of oil reservoir:	In rear transmission case
Type, number and location of tapping points:	NPTF 3/8 tapping, 1, at right

Maximum volume of oil available to external cylinders: 22 l

Three-point linkage

Category: In conformity with categories 1 in ISO 730/3-1982





Lift test – Linkage geometry

Dimensions of linkage geometry (when connected to the standard frame)

			Dimension or range mm	Settings used in test mm
Length of lift arms		(A)	260	
Length of lower links		(B)	706	
Distance of lift arm pivot point from rear wheel axis	horizontally	(a)	0	
	vertically	(b)	270	
Horizontal distance between the 2 lower link points		(u)	460	
Horizontal distance between the 2 lift arm end points		(v)	489	
Length of upper link		(S)	from 440 to 700	545
Distance of upper link pivot point from rear wheel axis	horizontally	(c)	190	
	vertically	(d)	235, 270	270
Distance of lower link pivot point from rear wheel axis	horizontally	(e)	18	
	vertically	(f)	97	
Distance of lower link pivot points to lift rod pivot points on lower links		(D)	356	
Length of lift rods		(L)	from 400 to 475	438
Height of lower hitch points relative to the rear wheel axis				
in low position		(h)	from 116 to 390	305
in high position		(H)	from 203 to 330	267
Height above ground of lower hitch points when locked transport position(*)			from 105 to 825	from 190 to 762

(*) Assuming r = dynamic radius index (ISO 4251/1-1984). 495 mm

SWINGING DRAWBAR Optional, not fitted on tested tractor

TRAILER HITCH

Type: Extension type

Hole diameter:	26 mm
Height above ground:	345 mm
Distance of hitch point from rear wheel axis, horizontally:	From 392 to 572 mm
Distance of hitch point from power take-off shaft end	
Vertically:	186 mm
Horizontally:	From 183 to 363 mm
Maximum vertical permissible load:	4.91 kN

HOLED DRAWBAR

Number of holes:	7
Distance between holes:	80 mm
Hole diameter:	22 mm
Thickness/width of the drawbar:	25/75 mm
Height above ground	
Minimum:	125 mm
Maximum:	834 mm
Horizontal distance to power take-off shaft end (rear):	509 mm

STEERING

Make:	SUMITOMO EATON
Model:	UAS 100B08A2A
Type:	Hydrostatic steering
Method of operation:	Steering wheel operated hydraulically
Pump:	Gear type
Ram:	One double acting cylinder
Working pressure:	9.8 MPa

BRAKES

Service brake	
Make:	ISHIKAWAJIMA SHIBAURA
Type:	Wet disc, internal sliding mechanically
Method of operation:	Pedal operated, divided pedal of service brake, for normal use locked together
Trailer braking take-off:	None
Parking brake	
Type:	In common with service brake
Method of operation:	Depressed by brake pedals and latched by hand lever

WHEELS

Number	
Front:	2, steering
Rear:	2, driving
Wheelbase:	1600 mm

Track width adjustment

	Minimum mm	Maximum mm	Adjustment method
Front	995	1270	Extending front axle and interchanging right and left wheels
Rear	995	1345	Interchanging right and left wheels, and/or resetting rim and disc

PROTECTIVE STRUCTURE

Make:	ISHIKAWAJIMA SHIBAURA
Model:	FORD 19SA 9071
Type:	2-post frame of steel tube
Manufacturer's name and address:	ISHIKAWAJIMA SHIBAURA MACHINERY Co., Ltd. Ishishiba 1-1-1 Matsumoto City, Nagano, Japan
Protective device:	Frame, not tiltable
O.E.C.D. approval number:	None

DRIVER'S SEAT

Make:	BOSTROM
Type of suspension:	Coil spring
Type of damping:	Rubber
Range of adjustment	
Longitudinal:	120 mm
Vertical:	30 mm

LIGHTING

	Height above ground of center mm	Size mm	Distance from outside edge of tractor to median plane mm
Headlights	1055	108x65	509
Flashers	1354	ø119	112
Rearlights	1212	56.5x56.5	193
Reflectors	1010	64.5x45	189

TEST CONDITIONS

Overall dimensions

Length:	2829 mm
Width	
Minimum:	1227 mm
Maximum:	1577 mm
Height	
Top of protective structure:	2143 mm
Top of exhaust:	2000 mm

Ground clearance (unballasted tractor): 273 mm

Clearance-limiting part: Mid P.T.O. housing

Tractor mass (with frame)

		Without driver kg	With driver kg
Unballasted	Front	419	432
	Rear	573	635
	Total	992	1067
Ballasted	Front	421	434
	Rear	1016	1078
	Total	1437	1512

Ballast

	Number of weights	Mass (total) kg	Water kg
Front	–	–	–
Rear	10	300	145
Additional	–	–	–

Tyres and track width specifications

	Front wheels	Rear wheels
Tyres		
Dimensions	5.00 -15	9.5 - 24
Ply rating	4	4
Type	Cross - ply	Cross - ply
Maximum load (tyre manufacturer's):	3.58	7.26 (kN)
Inflation pressure (tyre manufacturer's):	280	140 (kPa)
Dynamic radius index:	308	495 (mm)
Chosen track width:	995	1070 (mm)

Oils and lubrication

Capacity and change interval

	Capacity l	Oil change h	Filter change h
Engine	4.5	100	200
Gear box	22.0	300	300
Front axle	—	—	—
Rear axle	In common with gear box		
Final drive (rear)	In common with gear box		
Hydraulic system	In common with gear box		
Steering:	1.8	600	—

Specifications (SAE, API)

	Recommended	Used during test
Engine oil		SAE 10W/30
Type:	Below 0°C SAE 10W or SAE 10W/30 From 0°C to 25°C SAE 20 or SAE 10W/30 Over 25°C SAE 30 or SAE 10W/30	
Viscosity:	68.2 cSt at 40°C 11.4 cSt at 100°C	
Classification:	API CC or CD	
Transmission oils		As recommended
Type:	SAE 80	
Viscosity:	72.27 cSt at 40°C 9.30 cSt at 100°C	
Classification:	API GL-4	
Hydraulic fluid		As recommended
Type:	In common with transmission oils	
H.S.T oil		As recommended
Type:	SAE 80W	
Viscosity:	53.47 cSt at 40°C 8.98 cSt at 100°C	
Classification:	API GL-3	
Steering oil		As recommended
Type:	SAE 32	
Viscosity:	32.0 cSt at 40°C 5.5 cSt at 100°C	
Classification:	API GL-3	
Grease		
Number of lubrication points:	15	

Fuel

Type:	Diesel fuel, No.2 in conformity with JIS(Japanese Industrial Standard)
Density at 15°C:	0.835 g/cm^3

TEST RESULTS

COMPULSORY TESTS RESULTS

(1) MAIN POWER TAKE-OFF

Date and location of tests: 10th Dec., 1987, BRAIN, Omiya
Type of dynamometer: DC electrical, MEIDENSHA EB-DH1

Power	Speed		Fuel consumption			Specific energy
	Engine	P.T.O.	Hourly		Specific	
kW	rev/min	rev/min	kg/h	l/h	g/kW·h	kW·h/l
1.1 Maximum power - 2-hour test						
15.30	2500	581	4.53	5.45	296	2.80
1.2 Power at rated engine speed						
15.30	2500	581	4.53	5.45	296	2.80
1.3 Standard power take-off speed(540 rev/min)						
14.36	2325	540	4.22	5.07	293	2.83
1.4 Part loads						
1.4.1 The torque corresponding to maximum power at rated engine speed						
15.30	2500	581	4.53	5.45	296	2.80
1.4.2 85 % of torque obtained in 1.4.1						
13.41	2586	601	4.10	4.93	306	2.72
1.4.3 75 % of torque defined in 1.4.2						
10.15	2608	606	3.39	4.07	332	2.49
1.4.4 50 % of torque defined in 1.4.2						
6.85	2631	611	2.75	3.30	400	2.08
1.4.5 25 % of torque defined in 1.4.2						
3.42	2654	616	2.14	2.57	626	1.33
1.4.6 Unloaded						
0.0	2670	619	1.61	1.93	—	0.0

1.5 Part loads at standard power take-off speed (540 rev/min)

Power	Speed		Fuel consumption			Specific energy
	Engine	P.T.O.	Hourly		Specific	
kW	rev/min	rev/min	kg/h	l/h	g/kW·h	kW·h/l
1.5.1 The torque corresponding to maximum power						
14.36	2325	540	4.22	5.07	293	2.83
1.5.2 85 % of torque obtained in 1.5.1						
12.61	2403	558	3.80	4.57	302	2.76
1.5.3 75 % of torque defined in 1.5.2						
9.54	2424	563	3.13	3.76	328	2.54
1.5.4 50 % of torque defined in 1.5.2						
6.43	2450	569	2.52	3.02	391	2.13
1.5.5 25 % of torque defined in 1.5.2						
3.25	2476	575	1.94	2.33	596	1.40
1.5.6 Unloaded						
0.0	2497	580	1.39	1.67	–	0.0

No load maximum engine speed: 2670 rev/min

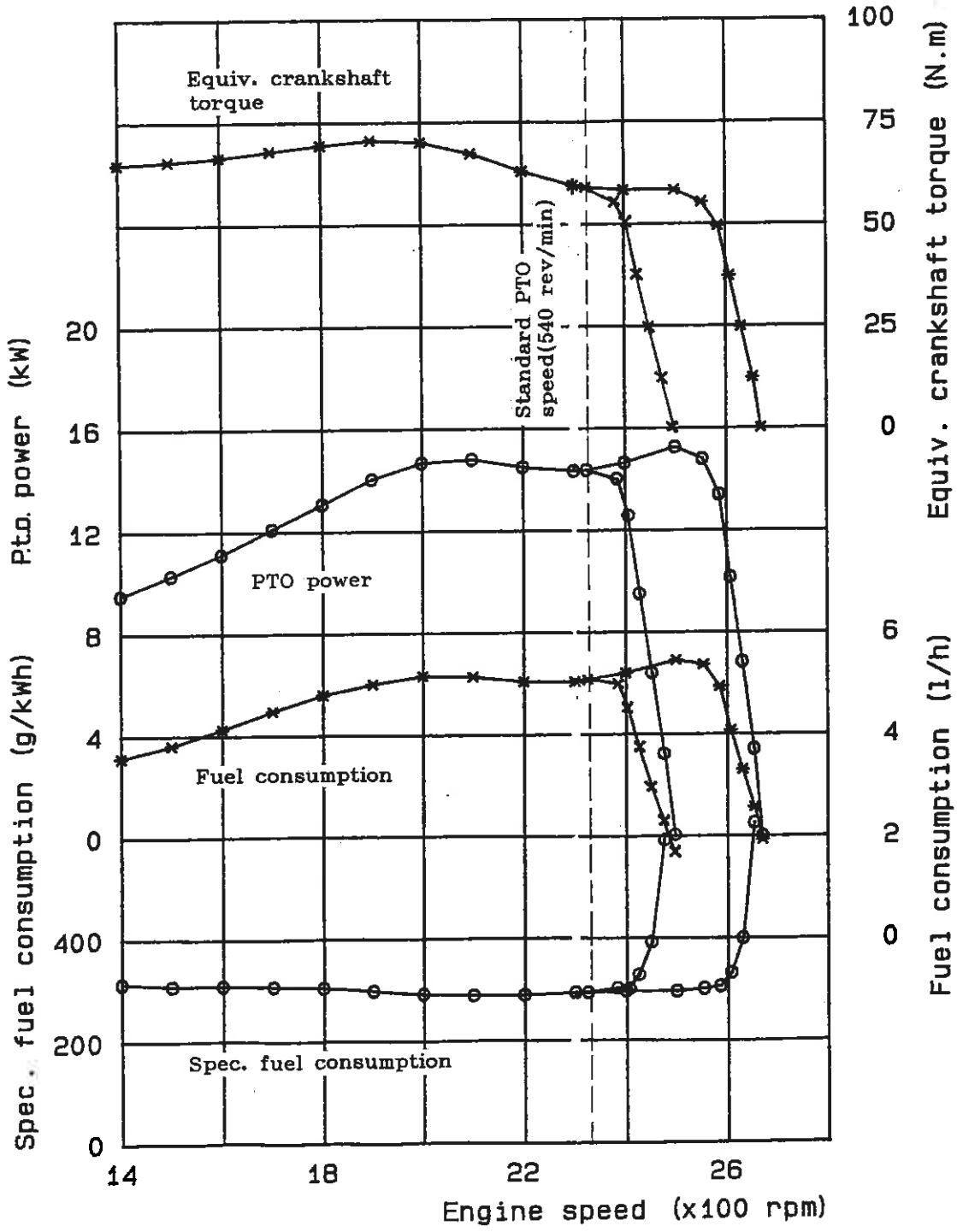
Torque (equivalent crankshaft) at maximum power: 58.3 N·m

Maximum torque (equivalent crankshaft): 70.6 N·m
(engine speed: 1900 rev/min)

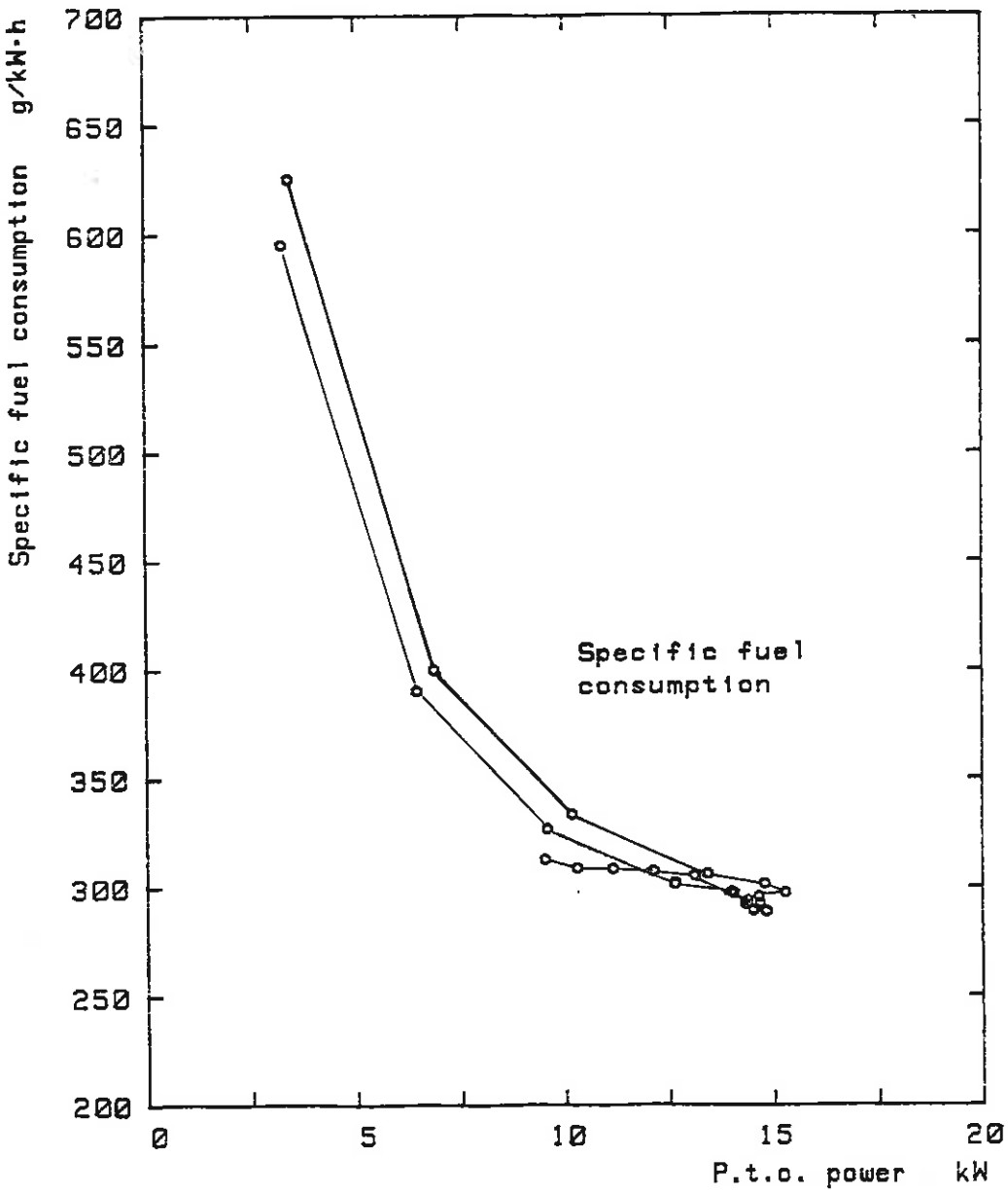
Mean atmospheric conditions
- Temperature: 20 °C
- Pressure: 102.5 kPa
- Relative humidity: 36 %

Maximum temperatures
- Coolant: 109 °C
- Engine oil: 115 °C
- Fuel: 36 °C
- Engine air intake: 52 °C

P.T.O. PERFORMANCE



P.T.O. PERFORMANCE



(2) HYDRAULIC POWER AND LIFTING FORCE

Date of tests: 10th Dec., 1987

2.1 HYDRAULIC POWER TEST

Sustained pressure with relief valve open: (pump not stalled)	15.0 MPa
Pump delivery rate at minimum pressure:	27.30 l/min

Flow rate corresponding to a hydraulic pressure equivalent to 90 percent of the actual relief valve pressure setting and corresponding hydraulic power

Flow rate:	21.98 l/min
Pressure:	13.54 MPa
Power:	4.96 kW

Flow rate and hydraulic pressure corresponding to maximum hydraulic power

Flow rate:	25.21 l/min
Pressure:	13.14 MPa
Power:	5.52 kW

Tapping point used for test: At right side of clutch housing

Opening pressure of the unloading valve:	Not applicable
Closing pressure of the unloading valve:	Not applicable

2.2 Power lift test

	Height of lower hitch points above ground in down position mm	Vertical movement mm	Maximum corrected force exerted through full range kN	Corresponding pressure of hydraulic fluid MPa	Moment about rear wheel axle kN·m	Maximum tilt angle of mast from vertical Degrees
At hitch points	190	572	8.56	13.1	—	—
On the frame	145	765	7.28	13.1	9.71	14

Linkage setting for test - see page 7 and 8.

Lifting heights relative to the horizontal plane including the lower link pivot points.

mm	-277	-208	-200	-100	0	100	200	300	364	400	457

Lifting forces at hitch points (corresponding pressure 13.1 Ma)

kN	—	8.56	9.05	10.12	10.89	11.37	11.81	12.55	10.66	—	—

Lifting forces at test frame (corresponding pressure 13.1 MPa)

kN	7.71	—	8.07	8.42	8.66	8.37	8.16	7.82	—	7.46	7.28

(3) DRAWBAR POWER AND FUEL CONSUMPTION (UNBALLASTED TRACTOR)

Date of tests: 17th Dec., 1987
Type of track: Concrete
Height of drawbar above ground: 337 mm

Tyre size and pressure:
Front: 5.00-15 280 kPa
Rear: 9.5-24 140 kPa

Gear	Power	Drawbar pull	Speed	Engine speed	Slip of wheels	Specific fuel consumption	Specific energy	Temperature			Atmospheric conditions		
								Fuel	Coolant oil	Engine	Temperature	Relative humidity	Pressure
	kW	kN	km/h	rev/min	%	g/kW·h	kW·h/l	°C	°C	°C	°C	%	kPa
1. Maximum power in tested gears													
L	4.22	6.08	2.5	2629	15.0	652.5	1.271	18	74	91	7	57	102.6
L	5.91	6.08	3.5	2620	15.0	550.1	1.508	17	74	93	7	57	102.6
M	8.44	6.08	5.0	2591	15.0	476.4	1.741	16	75	94	7	57	102.6
M	10.09	5.59	6.5	2519	12.6	453.7	1.828	14	73	92	7	57	102.6
M	10.02	4.51	8.0	2506	10.1	460.9	1.800	13	73	90	7	57	102.6
H	8.39	2.75	11.0	2507	6.1	502.2	1.652	12	72	92	7	57	102.6

2. Maximum power, fuel consumption, and corresponding speed

	Gear	Maximum power kW	Fuel consumption g/kW·h	Corresponding speed km/h
Unballasted	L	8.16	510.2	4.0
	M	10.13	453.7	6.4
	H	9.56	465.8	14.0

3. Maximum power and corresponding drawbar pull with travelling speed control and engine governor control in the position giving maximum speed.

	Maximum power kw	Drawbar pull kN
Unballasted	9.56	2.45

OPTIONAL TEST RESULTS

(4) DRAWBAR PERFORMANCE(BALLASTED TRACTOR)

Date of tests: 18th Dec., 1987
Type of track: Concrete
Height of drawbar above ground: 317 mm

Tyre size and pressure:
Front: 5.00-15 280 kPa
Rear: 9.5-24 140 kPa

Gear	Power	Drawbar pull	Speed	Engine speed	Slip of wheels	Specific fuel consumption	Specific energy	Temperature			Atmospheric conditions		
								Fuel	Coolant oil	Engine	Temperature	Relative humidity	Pressure
	kW	kN	km/h	rev/min	%	g/kW·h	kW·h/l	°C	°C	°C	°C	%	kPa
1. Maximum power in tested gears (with ballast)													
L	6.47	9.32	2.5	2612	15.0	533.4	1.555	17	70	90	6	70	103.6
L	8.96	9.22	3.5	2565	14.6	526.7	1.575	23	70	93	6	70	103.6
M	8.17	5.88	5.0	2598	8.6	537.0	1.545	19	74	95	6	70	103.6
M	10.09	5.59	6.5	2536	8.2	482.5	1.719	20	73	94	6	70	103.6
M	10.02	4.51	8.0	2525	6.6	490.7	1.690	20	74	94	6	70	103.6
H	8.09	2.65	11.0	2567	3.8	575.2	1.442	23	74	96	6	70	103.6

2. Maximum power, fuel consumption, and corresponding speed

	Gear	Maximum power kW	Fuel consumption g/kW·h	Corresponding speed km/h
Ballasted	L	9.83	489.1	3.9
	M	10.19	480.7	7.1
	H	9.30	528.0	15.5

3. Maximum power and corresponding drawbar pull with travelling speed control and engine governor control in the position giving maximum speed.

	Maximum power kw	Drawbar pull kN
Ballasted	9.30	2.16

(5) NOISE MEASUREMENT AT THE DRIVER'S EAR

Date of tests: 19th Dec., 1987
Sound level meter
Make: RION
Model:Impulse sound level meter
Type: NA-61
Type of track:Concrete

Gear number	Drawbar pull	Measured travelling speed	Sound level
	kN	km/h	dB(A)
Unloaded test in the gear giving the speed nearest to 7.5 km/h			
H	light load	7.49	90.5
Unloaded test in the gear giving the maximum speed			
H	light load	21.42	92.0
Test with the drawbar pull for which the tractor gives the maximum sound level [combination of gear giving the nearest nominal speed to 7.5 km/h and also in any gear with a sound level increase of at least 1 dB(A)]			
M	3.82	7.49	91.0
L	7.06	3.64	92.0

REPAIRS AND ADJUSTMENTS DURING TESTS None

REMARKS None