CAMTC

Report on test in accordance with the OECD STANDARD CODE I for the Official Testing of Agricultural Tractors Performance

OECD Approval No.: 1651 FULL CODE

Approval Date: 18.Mar.1997



BenYe-284 (4WD) 30 km / h Version

Manufactured by: Ningbo Zhongce Tractor & Automobile Co. Ltd
Ningbo, Zhejiang, China

Test No.: 96OS204

Date of test: Sep. 1996

China Agricultural Machinery Testing Centre
40 Shi Li He Donghuan Nanlu
100021, Beijing, China

BY-284 CAMTC OECD No. 1651 Full Code

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- Tractor manufacturer's name and address:	Ningbo Zhongce Tractor & Automobile Co.Ltd No 81 Daqing Nanlu,Ningbo city,Zhejiang
- Location of tractor assembly:	The manufacturer
- Submitted for test by:	The manufacturer
- Selected for test by:	The manufacturer by the agreement of the CAMTC
- Place of running—in:	CAMTC,Beijing,China
- Duration of running—in:	48 h
- Location of test:	CAMTC,Beijing,China

I. SPECIFICATIONS OF TRACTOR

TRACTOR

- Make:	BEN YE
- Model:	284-30 km / h version
- Type:	4WD,unit construction
- Number of driving wheels:	4
- Serial No :	1659
- 1st serial No :	001

ENGINE

- Make / Model / Type:	Longxi Machinery Works,SL2100T,4 stroke, water cooling,swirl combustion chamber, indirect injection,naturally aspirated
- Serial No:	608242

Cylinders

- Number / disposition:	2,Vertical, in-line
- Bore / stroke:	100 / 110 mm / mm
- Capacity:	1728 cm^3
- Compression ratio:	19.5 / 1
- Arrangement of valves:	Overhead Valves
- Cylinder liners:	Wet liners

Fuel system

- Fuel feed system:	Forced feed by pump
- Make / Model / Type of fuel filter(s):	Zhejiang Linhai jiangnan Filter Works,0708, Paper cartridge,replaceable

– Capacity of fuel tank:	30 dm^3
– Make / Model / Type of injection pump:	Wuxi Weifu Stock Co.Ltd, 2I69, 2-cylinder plunger
– Manufacturer's production setting of injection pump:	
– Serial number:	960838
• Flow rate (rated engine speed and full load) :	6.40 dm^3 / h
• Timing:	18 ° ~23 ° before T.D.C.
– Make / Model / Type of injectors:	Wuxi Weifu Stock Co.Ltd,P662,single hole nozzle
– Injection pressure:	12.75~13.20 MPa

Governor

– Make / Model / Type:	Wuxi Weifu Stock Co.Ltd,T7A-00, variable speed,centrifugal,mechanically acting
– Governed range of engine speed:	From 600 to 2400 rev / min
– Rated engine speed:	2200 rev / min

Air cleaner

– Pre-cleaner	None
– Main cleaner	
• Make / Model / Type:	Linhai Jiangnan Cleaner Works, C0506,paper cartridge,replaceable
– Location of air intake:	Inside the bonnet,in front of the radiator
–Maintenance indicator:	None

Lubrication system

– Type of feed pump:	Single-acting piston pump
– Type of filter(s):	J0810H,Paper element,replaceable
– Number:	1

Cooling system

– Type of coolant:	Water
– Type of pump:	Centrifugal,belt driven
– Specification of fan or blower:	Axial flow type,belt driven
– Number of fan blades:	7
– Fan diameter:	330 mm
– Coolant capacity:	8 dm^3

− Type of temperature control:	Thermostat
− Superpressure system:	None

Starting system

− Make / Model / Type:	Fujian Quanzhou Electrical Machinery Works,QD132,Electrical solenoid engaged
− Starter motor power rating:	2 kW
− Cold starting aid:	Electrothermal plug
− Safety device:	Main shift lever in neutral position

Electrical system

− Voltage:	12 V (Negative earth)
− Generator	
• Make / Model / Type:	Ningbo Cixi Automobile Electrical Machinery Factory,JF131,Alternator,belt driven
• Power:	0.35 kW
− Battery (number of accumulators):	2
• Rating:	3−QA−120
• Model:	120 Ah at 20 hours

Exhaust system

− Make / Model / Type:	Ningbo Cijiang Electrical Machinery Works, expension type silencer,vertical
− Location:	Right−hand side of engine

TRANSMISSION TO WHEELS

Clutch

− Make / Model / Type:	Own make,dry single function,constant engaging
− Number of plates:	1
− Diameter of plates:	228 mm
− Method of operation:	Operated by pedal

Gear box

− Make / Model / Type:	Own make,BY−284,mechanically acting gear box
− Arrangement:	1 level for group gears(Low and High) 1 level for the 4 speed gears(1～4)and reverse gear

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- Number of gears: 8 forward and 2 reverse gears
- Available options: None

Rear axle and final drives

- Make / Model / Type: Own make,crown wheel and pinion bevel gear differential,spur gear final drives

Front axle and final drives

- Make / Model / Type: Own make,bevel gear differential and bevel gear final drives
- Differential lock: None

Total ratios and travelling speeds

Gear No	Group or range	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	L	238.69	1.72
2	L	189.19	2.17
3	L	116.96	3.51
4	L	73.71	5.57
5	H	56.59	7.26
6	H	44.43	9.24
7	H	27.24	15.07
8	H	17.20	23.87
R1	L	256.59	1.60
R2	H	60.20	6.82

(*) Calculated with a tyre dynamic radius index of 495 mm (ISO 4251 / 1—1992).
Number of revolutions of front wheels for one revolution of rear wheels: 1.41

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POWER TAKE—OFF

Main power take—off

– Type:	Not independent
– Method of engagement:	By hand lever,driven by sliding gear
– Number of shafts:	1
– Method of changing power take-off shaft ends and speeds:	Changing speed by lever

Power take—off proportional to engine speed

540 rev / min

– Location:	At rear of the tractor
– Diameter of power take—off shaft end:	35 mm
– Number of splines:	6,in conformity with ISO 500 / 1991
– Height above ground:	492 mm
– Distance from the median plane of the tractor:	0 mm
– Distance behind rear wheel axis:	285 mm
– PTO speed at rated engine speed (2200 rev / min):	655 rev / min
– Engine speed at standard power take—off speed:	1814 rev / min
– Ratio of rotation speeds (engine speed / p.t.o speed):	3.3588
– Power restriction and maximum torque:	19.3 kW 281.5 N. m
– Direction of rotation (viewed form behind tractor):	Clockwise

1000 rev / min

– Location:	At rear of tractor
– Diameter of power take—off shaft end:	35 mm
– Number of splines:	6, in conformity with ISO 500 / 1991
– Height above ground:	492 mm
– Distance from the median plane of the tractor:	0 mm

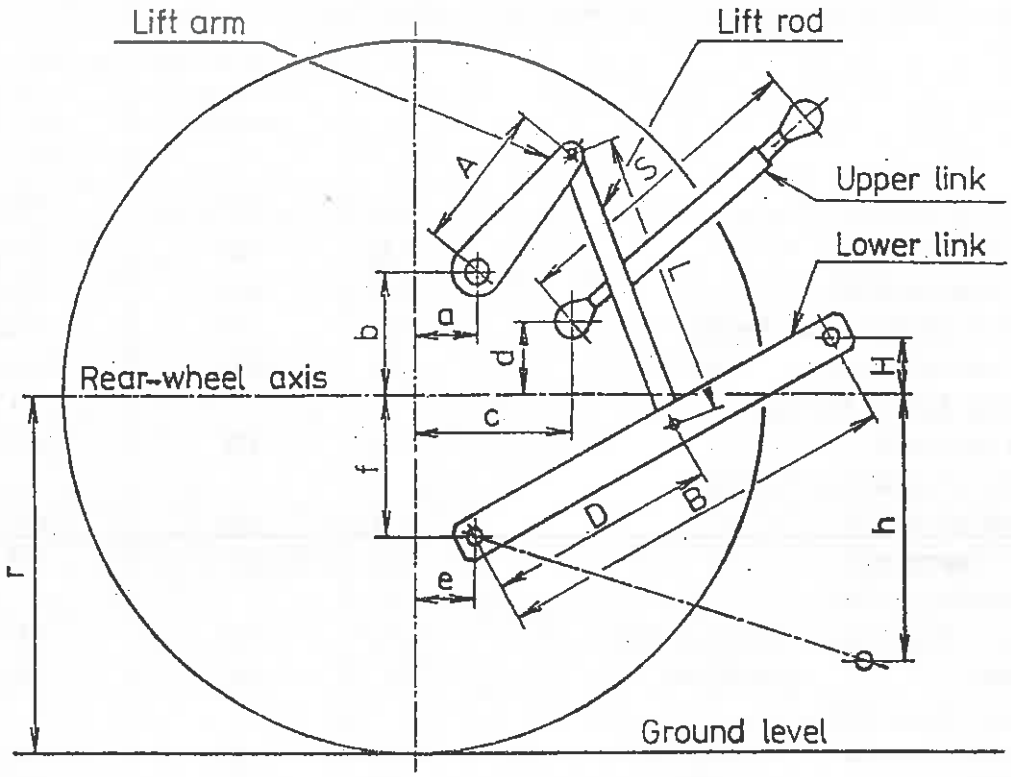
– Distance behind rear wheel axis:	285 mm
– PTO speed at rated engine speed(2200rpm):	1241 rev / min
– Engine speed at standard PTO speed:	1772 rev / min
– Ratio of rotation speeds (engine speed / p.t.o speed):	1.7728
– Direction of rotation (viewed from behind tractor):	Clockwise

POWER LIFT

– Make / Model / Type:	Own make
– Type of hydraulic system:	Partial separated units, open centre system
– Type and mumber of cylinders:	Single acting,1
– Type of linkage lock for transport:	Hydraulic lock
– Relief valve pressure setting (tolerance):	15.6 MPa
– Opening pressure of cylinder safety valve (if fitted):	16.6 MPa
– Lift pump type:	CBN310 gear pump
– Transmission between pump and engine:	Gear driven from gear box
– Type and number of filters:	Metal screen, 1
– Site of oil reservoir:	In the hydraulic power lift housing
– Type, number and location of tapping points:	Thread,1,Right side of hydraulic power lift housing
– Maximum volume of oil available to external cylinders:	6.0 dm^3

Three—point linkage

– Category:	1 in conformity with categories 1 of ISO 730 / 1—1990
– Category adapter:	None


Lift arm
Lift rod
Upper link
Lower link
Rear-wheel axis
Ground level
A
S
L
a
b
d
c
f
H
D
B
h
e
r

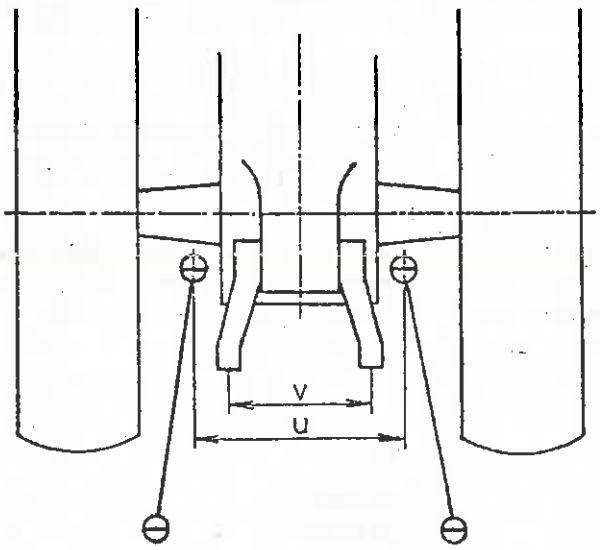

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u

Table 1.1—Dimensions of linkage geometry (when connected to the standard frame)

		Dimension or range mm	Settings used in test mm
Length of lift arms	(A)	240	240
Length of lower links	(B)	816	816
Distance of lift arm pivot : horizontally	(a)	−68	−68
point from rear wheel axis : vertically	(b)	304.5	304.5
Horizontal distance between the 2 lower link points	(u)	478	478
Horizontal distance between the 2 lift arm end points	(v)	460	460
Length of upper link	(S)	from 450 to 550	495
Distance of upper link pivot point from rear : horizontally	(c)	286	286
wheel axis: vertically	(d)	342	342
Distance of lower link pivot point from rear : horizontally	(e)	−25	−25
wheel axis: vertically	(f)	97	97
Distance of lower link pivot points to lift rod pivot points on lower links	(D)	445	445
Length of lift rods	(L)	from 380 to 480	430
Height of lower hitch points relative to the rear wheel axis:			
− in low position	(h)	from 180 to 240	200
− in high position	(H)	from 298 to 453	437
Height above ground of lower hitch points when locked in transport position(*)		Any height within lift range	

(*)Assuming (r) = tyre dynamic radius index of 495 mm (ISO 4251 / 1−1992).

TRAILER HITCH

− Type:	Fixed
− Hole diameter:	35 mm
− Height above ground:	335 mm

- Distance of hitch point from rear wheel axis,horizontally: 318 mm
- Distance of hitch point from power take-off shaft end
  - Vertically: 122.5 mm
  - Horizontally: 33 mm
- Maximum vertical permissible load: 10.0 kN

STEERING

- Make / Model / Type: Ningbo steering works,spherical worms and rooler
- Method of operation: Manual operated

BRAKES

Service brake

- Make / Model / Type: Own make,shoe-type
- Method of operation: Operated by pedals,coupled or independent
- Trailer braking take-off: Air brake,operated by tractor pedals

Parking brake

- Type: Mechanical
- Method of operation: Pedal locked by ratchet

WHEELS

- Number
  - Front: 2 driving and steering
  - Rear: 2 driving
- Wheelbase: 1550 mm
- Track width adjustment:

	Minimum mm	Maximum mm	Adjustment method
Front	1200	1200	None
Rear	1000	1400	Reversing wheels and off-set lug rims

DRIVER'S SEAT

– Make / model / Type:	Ningbo wuxiang xinlu polyester Works
– Type of suspension:	None
– Type of damping:	Spring
– Range of adjustment	
• Longitudinal:	50 mm
• Vertical:	0 mm

LIGHTING

	Height above ground of centre mm	Size mm	Distance from outside side edge to median plane of tractor mm
Headlights	1100	140 × 90	120
Sidelights	910	130 × 50	268
Rearlights	1275	D135	460
Reflectors	1110	D75	40

Ⅱ. TEST CONDITIONS

Overall dimensions

	Length	Width		height at top of	
		minimum	maximum	Protective structure	exhaust silencer
	mm	mm	mm	mm	mm
Ballasted	2890	1365	1425	/	2010
Unballasted	2890	1365	1425	/	2010

Ground clearance(unballasted tractor): 262 mm

- Clearance-limiting part: Under the front axle housing

Tractor mass

without frame:

	Ballasted		Unballasted	
	Without driver kg	With driver kg	Without driver kg	With driver kg
Front	673	675	685	689
Rear	922	995	778	849
Total	1595	1670	1463	1538

Ballast

	Weights		Water kg
	Number	Total mass kg	
Front	/	/	/
Rear	4	132	/

Tyres specifications

	Front	Rear
Tyres:		
• dimensions	6.00-16	9.50-24
• ply rating	6	6
• type	Cross ply	Cross ply
• maximum load (tyre manufacturer's)	4.60 kN	9.16 kN
• maximum load (tractor manufacturer's)	3.22 kN	8.85 kN
• inflation pressure (tyre manufacturer's)	200～230 kPa	80～120 kPa
• dynamic radius index	350 mm	495 mm
Chosen track width:	1200 mm	1000～1400 mm

Oils and lubrication

-Capacity and change interval

	Capacity dm^3	Oil change h	Filter change h
Engine	6.0	250	250
Gear box	18.5	500	—
Front axle	6.6	500	—
Rear axle	Common with gear box		—
Final drive (front)	Common with front axle		—
Final drive (rear)	Common with gear box		—
Hydraulic system	11.5	500	—
Steering	0.9	—	—

-Specifications(SAE, API, MiL.L, ISO)

	Recommended	Used during test
Engine oil • Type: • Viscosity: • Classification:	SAE 10 W / 30 11.4 cst at 100℃ API CC	HC-11 11 cst at 100℃ SY1152-79
Transmission oils • Type: • Viscosity: • Classification:	N-100 90~110 cst at 100℃ API GL-4	HC-11 11 cst at 100℃ SY1152-79
Hydraulic fluid • Type: • Viscosity: • Classification:	Same as trans.oil	Same as trans.oil
Steering oil • Type: • Viscosity: • Classification:	Same as trans.oil	Same as trans.oil

Grease:
• Number of lubrication points: ZFD-12 Complex calcium base grease
27

Fuel

- Type: Standard diesel fuel in conformity with national standard GB10327-89

- Density at 15℃ 0.835 g / cm^3

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Ⅲ. TEST RESULTS

COMPULSORY TESTS RESULTS

1. MAIN POWER TAKE-OFF

- Date and location of tests: 19. Sep. 1996, CAMTC
- Type of dynamometer: SCHENCK eddy-current brake W400

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 HOURS TEST						
19.48	2199	655	5.3711	6.43	276	3.03
1.2 POWER AT RATED ENGINE SPEED						
19.48	2199	655	5.3711	6.43	276	3.03
1.3 STANDARD POWER TAKE-OFF SPEED (540 ± 10 rev / min)						
18.04	1813	540	4.8868	5.85	271	3.08
1.4 PART LOADS 1.4.1 the torque corresponding to maximum power at rated engine speed						
19.48	2199	655	5.3711	6.43	276	3.03
1.4.2 85% of torque obtained in 1.4.1						
17.09	2273	677	4.8241	5.77	282	2.96
1.4.3 75% of torque defined in 1.4.2						
12.93	2289	682	3.9292	4.70	304	2.75
1.4.4 50% of torque defined in 1.4.2						
8.72	2310	688	3.1429	3.76	360	2.32
1.4.5 25% of torque defined in 1.4.2						
4.35	2323	692	2.3572	2.82	542	1.54
1.4.6 unloaded						
0	2333	695	1.5682	1.88	/	/

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 (540 rev / min) 1.5.1 the torque corresponding to maximum power						
18.04	1813	540	4.8868	5.85	271	3.08
1.5.2 85% of torque obtained in 1.5.1						
15.61	1846	550	4.2097	5.04	270	3.10
1.5.3 75% of torque defined in 1.5.2						
11.86	1873	558	3.3327	3.99	281	2.97
1.5.4 50% of torque defined in 1.5.2						
7.98	1880	560	2.5653	3.07	321	2.60
1.5.5 25% of torque defined in 1.5.2						
4.03	1900	566	1.8935	2.27	470	1.78
1.5.6 unloaded						
0	1927	574	1.1969	1.43	/	/

- No load maximum engine speed: 2333 rev / min
- Torque (equivalent crankshaft) at maximum power: 84.6 N • m
- Maximum torque (equivalent crankshaft): 99.2 N • m
  (engine speed: 1638 rev / min)
- Mean atmospheric conditions
  - Temperature: 23℃
  - Pressure: 101.0 kPa
  - Relative humidity: 36.4%
- Maximum temperatures
  - Coolant: 80℃
  - Engine oil: 96℃
  - Fuel: 24℃
  - Engine air intake: 25℃

2. HYDRAULIC POWER AND LIFTING FORCE

- Date of tests: 20.Aug. 1996

2.1 HYDRAULIC POWER TEST

- Sustained pressure with relief valve open: 17.0 MPa
- Pump delivery rate at minimum pressure: 18.96 l / min

	Flow rate	Pressure	Power
	l / min	MPa	kW
Flow rate corresponding to a hydraulic pressure equivalent to 90 percent of the actual relief valve pressure setting and corresponding hydraulic power	16.80	15.6	4.37
Flow rate and hydraulic pressure corresponding to maximum hydraulic power	18.72	14.0	4.37

- Tapping point used for test: At rear of the tractor
- Temperature of hydraulic fluid: 60℃～68℃
- Opening pressure of the unloading valve: None
- Closing pressure of the unloading valve: None

2.2 POWER LIFT TEST

	at the hitch point	on the frame
Height of lower hitch points above ground in down position	295mm	295mm
Vertical movement	637mm	757mm
Maximum corrected force exerted through full range	10.220 kN	4.743 kN
Corresponding pressure of hydraulic fluid	15.6 MPa	15.3 MPa
Moment about rear wheel axis	9.772kN・m	12.602 kN・m
Maximum tilt angle of mast from vertical	/ degrees	16 degrees

-Linkage settings for test-see Table 1.1 and Figures 1.1

Lifting heights relative to the horizontal plane including the lower link pivot point											
mm	-161	-103	-100	0	+100	+200	+300	+400	+500	+534	+596
Lifting forces (the values measured are corrected to correspond to a hydraulic pressure equivalent to 90% of the actual relief valve pressure setting or to maximum power delivered by the hydraulic system,which is lower)											
at the hitch point kN		11.500	11.510	11.620	11.680	11.480	11.170	10.770	10.370	10.220	
Corresponding pressure: 15.3 MPa											
at the frame kN	10.240		9.747	8.685	7.623	6.624	5.913	5.355	4.977		4.743
Corresponding pressure: 15.3 MPa											

3. DRAWBAR PERFORMANCE

- Date of tests: 23~27. Sep. 1996
- Type of track: Concrete

		Tyre inflation pressure	
	Height of drawbar above ground	Front	Rear
Unballasted	345 mm	215 kPa	100 kPa
Ballasted	340 mm	215 kPa	100 kPa

Gear and range	Power	Drawbar Pull	Speed	Engine speed	Slip of wheels or tracks	Specific fuel consumption	Specific energy	Temperature			Atmospheric conditions		
								Fuel	Coolant	Engine oil	Temperature	Relative humidity	Pressure
	kW	kN	km / h	rev / min	%	g / kWh	kWh / l	℃	℃	℃	℃	%	kPa
3.1 MAXIMUM POWER IN TESTED GEARS (unballasted tractor)													
2(L2)	5.43	9.973	1.96	2312	15	480.3	1.76	26	58	84	26	67	101.7
3(L3)	9.75	11.177	3.14	2292	15	382.2	2.21	26	60	84	26	67	101.7
4(L4)	14.14	9.716	5.24	2220	7	373.8	2.26	26	62	90	26	67	101.7
5(H1)	15.58	7.889	7.11	2216	5	339.1	2.49	26	67	92	26	67	101.7
6(H2)	15.64	6.186	9.10	2210	3	334.9	2.52	26	69	92	26	67	101.7
3.2 MAXIMUM POWER IN TESTED GEARS (ballasted tractor)													
1(L1)	4.85	11.201	1.56	2313	15	532.9	1.59	26	60	85	26	67	101.7
2(L2)	6.49	11.989	1.95	2305	15	478.0	1.77	26	63	86	26	67	101.7
3(L3)	10.51	12.171	3.11	2283	15	419.5	2.01	26	67	91	26	67	101.7
4(L4)	14.35	9.856	5.24	2199	6	376.3	2.25	26	69	92	26	67	101.7
5(H1)	15.56	8.012	6.99	2193	2	366.8	2.30	26	70	93	26	67	101.7
6(H2)	15.56	6.205	9.03	2208	2	363.1	2.33	26	72	93	26	67	101.7
3.3.1 FIVE HOUR TEST at 75 percent of pull at maximum power													
5(H1)	11.70	4.654	9.05	2215	1	364.7	2.32	27	71	93	26	67	101.7
3.3.2 FIVE HOUR TEST at pull corresponding to 15 percent wheelslip													
3(L3)	10.72	12.171	3.17	2283	*	*	*	27	70	92	26	67	101.7

Oil consumption during ten hours duration of tests 3.3.1 and 3.3.2: 15.2 g / h

(*)Those figures not quoted are irrelevant due to the additional ballast

4. TURNING AREA AND TURNING CIRCLE

Details of wheel equipment:

	Tyre size	Track width
front:	6.00-16	1200
rear:	9.50-24	1050

	With brakes		Without brakes	
	Right hand	Left hand	Right hand	Left hand
	m	m	m	m
Radius of turning area	3.07	3.12	3.62	3.51
Radius of turning circle	2.95	3.00	3.50	3.39

5. LOCATION OF CENTRE OF GRAVITY

Height above ground: 564.8 mm

Distance forward from the vertical plane containing the axis of the rear wheels: 694.4 mm

Distance from the median plane of the tractor: To the left 0.78mm

6. BRAKING

- Date of tests: 23. Sep. 1996

6.1 COLD SERVICE BRAKING DEVICE TEST

Speed before application of brakes: 24.6 km / h

Ballasted tractor	Braking device control force N	150	250	350	450	500
	Mean deceleration m/s^2	1.50	2.05	2.60	3.05	3.20
Unballasted tractor	Braking device control force N	150	250	350	450	500
	Mean deceleration m/s^2	1.45	2.00	2.55	3.00	3.16

6.2 FADE TEST

Speed before application of brakes: 24.6 km / h

Ballasted tractor	Braking device control force N	150	250	350	450	500
	Mean deceleration m / s^2	1.40	1.95	2.50	2.98	3.14

Maximum deviation of tractor from its original course: 0

Abnormal vibration: None

Brakes were heated by: Driving

6.3 PARKING BRAKING DEVICE TEST

	Up	Down
Braking device control force N	297	402

7. MEASUREMENT OF EXTERNAL NOISE LEVEL

- Date of test: 26. Sep. 1996
- Type of sound level meter: B & K 2235
- Type of track: Concrete
- Gear number: 8(H4)
- Travelling speed before acceleration: 18.45 km / h
- Sound level: 82.5 dB(A)

IV. REPAIRS AND ADJUSTMENTS DURING TESTS: None

V. REMARKS: None

Test carried out by: Baiyuchun, Gengzhanbin, Zhangmenghua
Tianli, Liuqin, Chenxinghe, Xiongjinxuan

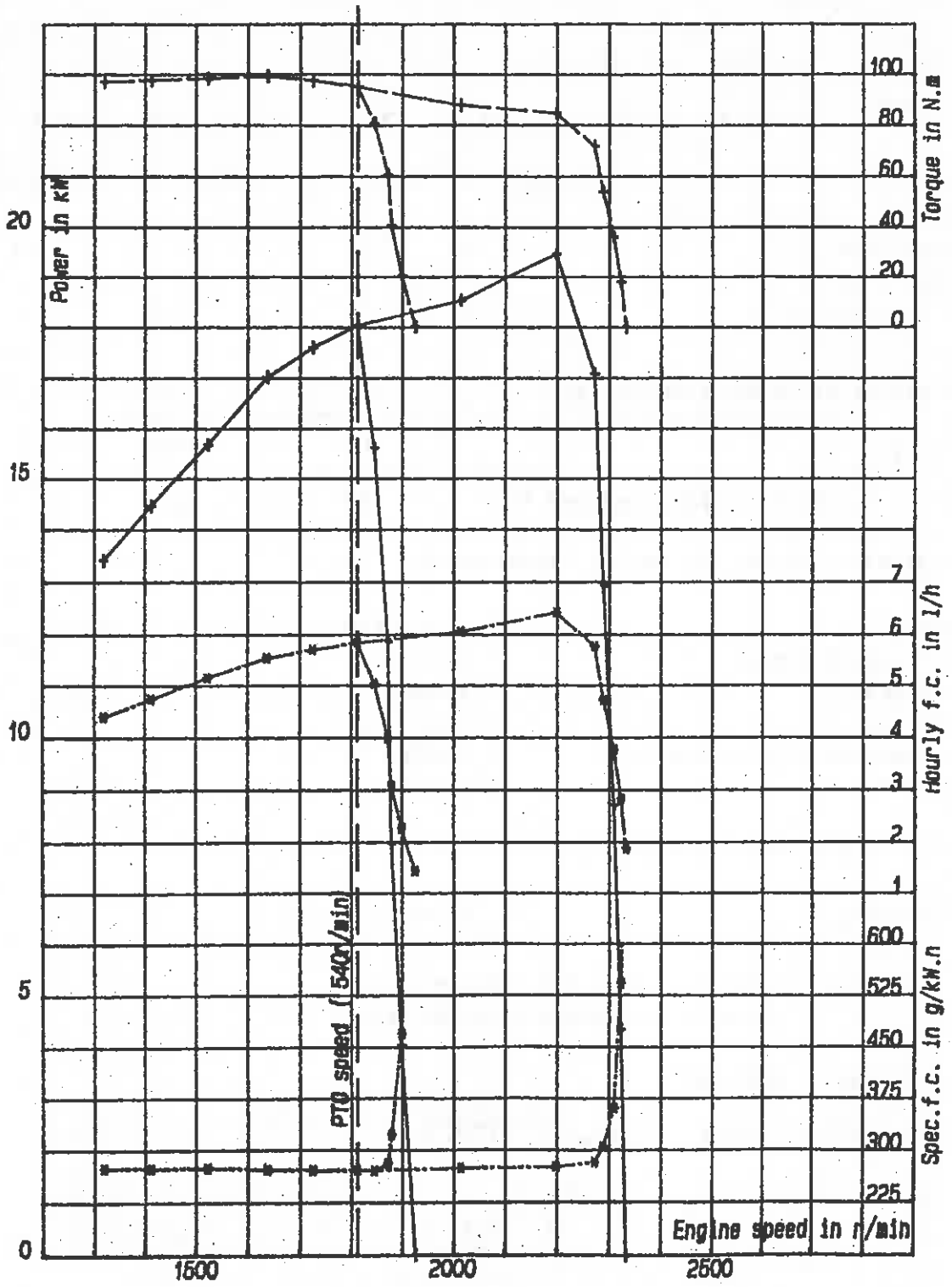
Officer in Charge: Gengzhanbin

Chief of Tractor Testing Division: Lixijiang

For the director: Wangliansheng

ANNEX

MAIN POWER TAKE-OFF TEST CURVES



ANNEX

MAIN POWER TAKE–OFF TEST CURVES

