CAMTC

Report on test in accordance with the OECD STANDARD CODE FULL CODE (CODE I) for the official testing of agricultural tractors

OECD Approval No: 1482 Full Code
Approval Date: 10 SEP. 1993



SHANG HAI–504 tractor with 4WD

Manufactured by Shang Hai Tractor & Internal Combustion Engine Corporation
Shanghai, China

Test No: 93OS201

Date: May 1993

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

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SH-504 CAMTC OECD No. 1482 Full Code

Tractor manufacturer's name and address:	Shanghai Tractor & Internal combustion Engine corporation, Shanghai, China
- Location of tractor assembly:	The manufacturer
- Submitted for test by:	The manufacturer
- Selected for test by:	The manufacturer with the agreement of the CAMTC
- Place of running-in:	Shanghai Tractor & Internal combustion Engine corporation
- Duration of running-in:	40 h
- Location of tests:	CAMTC, Beijing, China

1. SPECIFICATIONS OF TRACTOR

TRACTOR

- Make / Model / Type:	Shanghai tractor & internal combustion engine corporation, Shanghai-504 (4WD)
- Number of driving wheels:	4
- Serial N^0:	001671
- First serial number:	2777

ENGINE

- Make / Model / Type:	Shanghai tractor & internal combustion engine corporation, 495A-18, 4 stroke, water cooling, naturally aspirated, indirect injection, spherical combustion chamber
- Serial number:	02814

Cylinders

- Number / disposition:	4 / Vertical, in-line
- Bore / stroke:	95 / 115 mm / mm
- Capacity:	3260 cm^3
- Compression ratio:	16.5 / 1
- Arrangement of valves:	Overhead, in line

– Cylinder liners:	Dry type

Fuel system

– Fuel feed system:	Forced feed type
– Make / Model / Type of fuel filter(s):	Huangpu Automobile Accessory Works C0708, replaceable paper cartridge
– Capacity of fuel tank:	62 dm^3
– Make / Model / Type of injection pump:	Shanghai Injector and plunger pump Works No.I, plunger pump, in line
– Serial number:	9211
– Manufacturer's production setting of injection pump:	
• Flow rate (rated engine speed and full load):	11.0 dm^3 / h
• Timing:	25°–27°before T.D.C.
– Model / Moder / Type of injectors:	Shanghai Injector and plumger pump Works, Long-neck closed single hole
– Injection pressure:	17.2 ± 5 MPa

Governor

– Make / Model / Type:	Shanghai Injector and plumger pump Works, steel-ball, all-speed, centrifugal, Incorporated into fuel injection pump
– Governed range of engine speed:	From 550 to 2160 rev / min
– Rated engine speed:	2000 rev / min

Air cleaner

– Pre-cleaner	
• Make / Model / Type:	Shanghai Automobile accessory Works, centrifugal
• Location of air intake:	Above bonnet
– Main cleaner	
• Make / Model / Type:	Shanghai Automobile Accessory Works, oil bath with mesh sereen.
– Maintenance indicator:	None

Lubrication system

– Type of feed pump:	Rotor

– Type of filter(s):	Full flow, paper, replaceable
– Number:	1

Cooling system

– Type of coolant:	Water
– Type of pump:	Centrifugal, belt driven
– Specification of fan or blower:	
• Number of fan blades:	4
• Fan diameter:	380 mm
– Coolant capacity:	5.7 dm^3
– Type of temperature control:	Thermostat
– Superpressure system:	None

Starting system

– Make / Model / Type:	Shanghai Automobile Electrical Machinery Factory 2Q2C D.C solenoid pre-engaged
– Starter motor power rating:	1.84 kW
– Cold starting aid:	Electrothermic plug
– Safety device:	Clutch disengaged position

Electrical system

– Voltage:	12 V
– Generator	
• Make / Model / Type:	Shanghai 2nd Automobile Electrical Machinery factory 2JF200, alternator, belt driven
• Power:	0.2 kW
– Battery (Number of accumulators):	3-Q(A)-150, 2
• Rating:	150 Ah at 20 hours

Exhaust system

– Make / Model / Type:	Own make, SH-504, expension type silencer
– Location:	Left-hand side of engine, Vertical or horizontal

TRANSMISSION TO WHEELS

Clutch

- Make / Model / Type:	Own make, Dry, dual-acting
- Mumber of plates:	2
- Diameter of plates:	295mm for travel / 246mm for P.T.O
- Method of operation:	Mechanically by pedal

Gear box

- Make / Model / Type:	Own make, planetary reduction Compound type, mechanical
- Arrangement:	GEAR BOX with 3 forward and 1 reverse speed GROUP GEAR with 2 ranges (Low and high)
- Number of gears:	6 forward and 2 reverses
- Available options:	Creeper device

Rear axle and final drives

- Make / Model / Type:	Rear central drive: spiral bevel gear Set Rear final drive: External spur gear fixed inside the latter box
- Differential lock:	
• Type:	Splined sleeve
• Method of engagement:	Manual contralled
• Method of disengagement:	Self-disengaging

Front axle and final drives

- Make / Model / Type:	Front central drive: spiral bevel gear Set Front final drive: straight bevel gear Dual-stage
- 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 2000 rev / min km / h
1	L1	226.50	2.13
2	L2	137.08	3.52
3	L3	72.33	6.67
4	H1	56.48	8.54
5	H2	34.23	14.09
6	H3	18.08	26.69
R1	L	171.09	2.82
R2	H	42.81	11.27

(*) Calculated with a tyre dynamic radius index of 640mm (ISO 4251 / 1-1984).

Number of revolutions of front wheels for one revolution of rear wheels: 1.56

POWER TAKE-OFF

Main power take-off

- Type: Semi-independent
- Method of engagement: By hand level
- Number of shafts: 1
- Method of changing power take-off shaft speeds: None

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 / 1979
- Height above ground: 612 mm
- Distance from the median plane of the tractor: 0 mm

– Distance behind rear wheel axis:	322 mm
– PTO speed at rated enging speed (2000 rev / min):	563 rev / min
– Engine speed at standard power take-off speed:	1919 rev / min
– Ratio of rotation speeds (enging speed / p.t.o speed):	3.5537
– Power restriction and maximum torque: (Manufacturers recommendation)	33 kW 655 N.m
– Direction of rotation (viewed from behind tractor):	lockwise
Power take-off proportional to ground speed:	540 rev / min
– Travelling distance for one revolution of power take-off shaft:	63～790 mm
– Number of power take-off shaft revolutions for one revolution of (rear) driving wheels:	5.1～63.8
– Direction of rotation with forward gear engaged (viewed from behind tractor):	Clockwise
Optional power take-off	None

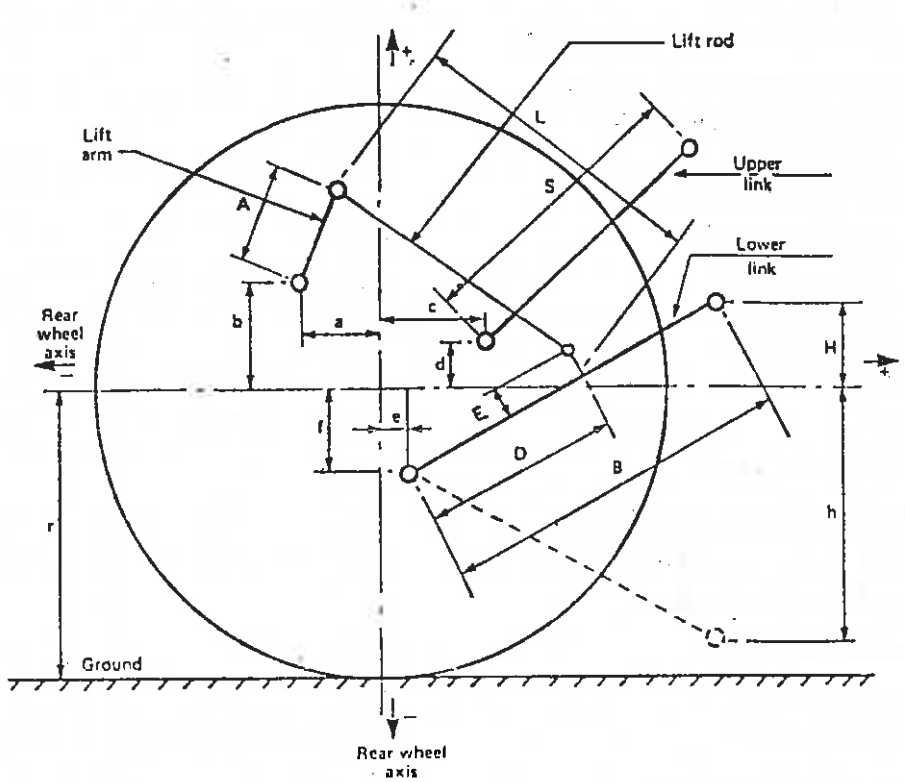
POWER LIFT

– Make / Model / Type:	Own make, Integral (with draft & position contral)
– Type of hydraulic system:	Integral, open centre system
– Type and number of cylinders:	1, Single-acting
– Type of linkage lock for transport:	Mechanical
– Relief valve pressure setting:	17.2 MPa
– Opening pressure of cylinder safety valve:	None
– Lift pump type:	4 plungers, double-row
– Transmission between pump and engine:	Driven from gear box
– Type and number of filters:	1, metal mesh filter
– Site of oil reservoir:	Common with rear axle
– Type, number and location of tapping points:	Thread, 1, on the hydraulic lift cover
– Maximum volume of oil available to external cylinders:	14 dm^3

Three−point linkage

− Category:	In conformity with categorie 1 of ISO. 730 / 1−1990
− Category adapter:	None

Linkage geometry:



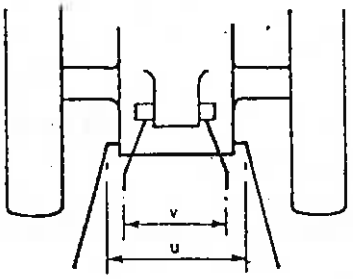


Table 1.1–Dimensions of linkage geometry (when connected to the standard frame)

		Dimension or range mm	Settings used in test mm
Length of lift arms	(A)	230	230
Length of lower links	(B)	808	808
Distance of lift arm pivot: horizontally	(a)	314	314
point from rear wheel axis: vertically	(b)	315	315
Horizontal distance between the two lower link points	(u)	526	526
Horizontal distance between the two lift arm end points	(v)	532	532
Length of upper link	(s)	from 660 to 900	703
Distace of upper link pivot point from rear : horizontally	(c)	120,126	126
wheel axis : vertically	(d)	278,348	348
Distance of lower link pivot point from rear : horizontally	(e)	22	22
wheel axis : vertically	(f)	136	136
Distance of lower link pivot points to lift rod pivot points on lower links	(D)	423	423
Length of lift rods	(L)	from 650 to 775	775
Height of lower hitch points relative to the rear wheel axis			
– in low position	(h)	from 85 to 458	440
– in high position	(H)	from 132 to 400	132
Height above ground of lower hitch points when locked in transport position(*)		from 850 to 1040	/

(*) Assuming (r) = tyre dynamic radius index of 640mm (ISO 4251 / 1–1984)

SWINGING DRAWBAR:	None
TRAILER HITCH	
− Type:	Fixed
− Hole diameter:	35 mm
− Height above ground:	550 mm
− Distance of hitch point from rear wheel axis, horizontally:	589 mm
− Distance of hitch point from power take−off shaft end	
• Vertically:	30 mm
• Horizontally:	267 mm
− Maximum vertical permissible load:	8.0 kN
HOLED DRAWBAR:	None
STEERING	
− Make / Model / Type:	Shanghai Gear Works, Separated type
− Method of operation:	Manual operated, Hydraulic power assistance
• Pump(s):	HLB−D8 / 312 steering overflow pump
• Ram(s):	Hole diameter: 40mm, stroke: 200mm
− Working pressure:	5～6.5 MPa
BRAKES	
Service brake	
− Make / Model / Type:	Own make, disc, double−plate, dry type
− Method of operation:	By pedals, coupled or independent
− Trailer braking take−off (hydraulic or air brake):	Air brake, operated by tractor pedals
Parking brake	
− Type:	Mechanical
− Method of operation:	Pedal locked by ratchet

WHEELS

- Number
  - Front: 2, driving
  - Rear: 2, driving
- Wheelbase: 1950 mm
- Track width adjustment:

	Minimum mm	Maximum mm	Adjustment method
Front	1450	1450	/
Rear	1500	1500	/

PROTECTIVE STRUCTURE: None

DRIVER'S SEAT

- Make / Model / Type: Own make, SH−504 suspension seat
- Type of suspension: Leaf spring
- Type of damping: spring
- Range of adjustment
  - Longitudinal: 28 mm
  - Vertical: 0 mm

MISCELLANEOUS

- Additional set
  - Location: On the left and right fender
  - Number of places: 2

LIGHTING

	Height above ground of centre mm	Size mm	Distance from outside side edge to median plane of tractor mm
Headlights	1350	135 × 87	238
Sidelights	Front:1224 Rear:1390	130 × 50 92 × 75	236 748
Rearlights	1580	160 × 120	736
Brakelight	1390	94 × 75	656

Ⅱ. TEST CONDITIONS

Overall dimensions

	Lenght	Width		Height at top of	
		minimum	maximum	protective structure	exhaust silencer
	mm	mm	mm	mm	mm
Ballasted	3280	1855	1855	/	2365
Unballasted	3280	1810	1810	/	2370

Ground clearance(unballasted tractor): 334 mm

- Clearance − limiting part: Under the front axle housing

Tractor mass

Without protective structure

	Ballasted		Unballasted	
	Without driver kg	With driver kg	Without driver kg	With driver kg
Front	1020	1031	1022	1031
Rear	1765	1829	1290	1356
Total	2785	2860	2312	2387

Ballast

	Weights		Water kg
	Number	Total mass kg	
Front	/	/	/
Rear	12	473	/
Optinal	/	/	/

Tyres and track width specifications

	Front	Rear
Tyres:		
• dimensions	8.3-20	11-32
• ply rating	4	6
• type	Cross ply	Cross ply
• maximum load (tyre maunfacturer's)	5.3 kN	9.8 kN
• inflation pressure (tyre manufacturer's)	147 kPa	137 kPa
• dynamic radius index	410 mm	640 mm
Chosen track width	1450 mm	1500 mm

Oils and lubrication

- Capacity and change interval:

	Capacity dm^3	Oil change h	Filter change h
Engine	10	125	125
Gear box	35	1000	
Front axle	26	1000	
Rear axle	common with gear box		
Final drive (front)	common with Front axle		
Final drive (rear)	common with gear box		
Hydraulic system	common with gear box		
Oil tank of steering	2.5	1000	

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

	Recommended	Used during test
Engine oil • Type: • Viscosity: • Classification:	SAE 10 W / 30 9.3-12.5 cst at 100℃ API CC	CA30 10.0-12.5 cst at 100℃ GB 5323-85
Trarsmission oil • Type: • Viscosity: • Classification:	SAE 80 W 90 13.5-24.0 cst at 100℃ API GL-4	Hyperbola gear oil No.18 18-22 cst at 100℃ SY8074-83 (China standard)
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: 23

Fuel

- Type: No.0, in conformity with national standard.

- Density at 15°C: 0.848 g / cm^3

Ⅲ • TEST RESULTS

COMPULSORY TESTS RESULTS

1. MAIN POWER TAKE-OFF

- Date and location of tests: MAY. 6, 1993, 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-HOUR TEST						
34.8	1987	559	9.32	11.10	268	3.13
1.2 POWER AT RATED ENGINE SPEED						
33.6	2000	563	8.90	10.60	265	3.17
1.3 STANDARD POWER TAKE-OFF SPEED (540 rev / min)						
33.8	1919	540	9.10	10.85	269	3.12
1.4 PART LOADS						
1.4.1 the torque corresponding to maximum power at rated engine speed						
33.6	2000	563	8.90	10.60	265	3.17
1.4.2 85% of torque obtained in 1.4.1						
28.9	2022	569	7.65	9.11	265	3.17
1.4.3 75% of torque defined in 1.4.2						
21.9	2040	574	6.06	7.23	276	3.04
1.4.4 50% of torque defined in 1.4.2						
14.7	2054	578	4.74	5.64	322	2.61
1.4.5 25% of torque defined in 1.4.2						
7.4	2072	583	3.49	4.16	472	1.78
1.4.6 unloaded						
0	2093	589	2.73	3.26	/	/

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						
33.8	1919	540	9.10	10.85	269	3.12
1.5.2 85% of torque obtained in 1.5.1						
28.9	1951	549	7.70	9.18	267	3.14
1.5.3 75% of torque defined in 1.5.2						
21.9	1969	554	6..05	7.21	276	3.04
1.5.4 50% of torque defined in 1.5.2						
14.8	1990	560	4.46	5.56	315	2.66
1.5.5 25% of torque defined in 1.5.2						
7.5	2008	565	3.36	4.00	447	1.88
1.5.6 unloaded						
0	2022	569	2.47	2.94	/	/

- No load maximum engine speed: 2093 rev / min
- Torque (equivalent crankshaft) at maximum power: 167.2 N.m
- Maximum torque (equivalent crankshaft): 189.1 N.m (engine speed: 1350 rev / min)
- Mean atmospheric conditions
  - Temperature: 20℃
  - Pressure: 100.9 kPa
  - Relative humidity: 83%
- Maximum temperatures
  - Coolant: 93℃
  - Engine oil: 98℃
  - Fuel: 19℃
  - Engine air intake: 20℃

2. HYDRAULIC POWER AND LIFTING FORCE

- Date of tests: MAY. 3, 1993

2.1 HYDRAULIC POWER TEST

- Sustained pressure with relief valve open: 18.0 MPa

- Pump delivery rate at minimum pressure: 19.92 l/min

	Flow rate	Pressure	Power
	l/min	MPa	kW
Flow rate corresponding to a hydraulic pressure equivalent to 90 per cent of the actual relief valve pressure setting and corresponding hydraulic power	17.90	16.2	4.83
Flow rate and hydraulic pressure corresponding to maximum hydraulic power	18.24	16.0	4.86

- Tapping point used for test: on the rockshaft housing
- Temperature of hydraulic fluid: 60℃
- 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 hicht points above ground in down position	200 mm	200 mm
Vertical movement	572 mm	634 mm
Maximum corrected force exerted through full range	9.7 kN	9.1 kN
Corresponding pressure of hydraulic fluid	16.2 MPa	16.2 MPa
Moment about rear wheel axis	7.9 kN.m	13.0 kN.m
Maximum tilt angle of mast from vertical	-	3.5 degrees

-Linkage setting for test: see above 2.1 table and figures 2.1

Lifting heights relative to the horizontal plane including the lower link pivot points											
mm	-315	-304	-300	-200	-100	0	+100	+200	+268	+300	+319
Lifting forces(the values measured are corrected to correspond to a hydraulic pressure equivalent to 90% of the actual relief valve pressure setting of the hydraulic lift system.)											
at the hitch point kN		13.0	13.1	13.6	14.2	14.4	14.2	12.5	9.7		
Corresponding pressure: 16.2 MPa											
at the frame kN	11.7		11.7	11.9	12.1	12.2	12.4	11.7		9.2	9.1
Corresponding pressure: 16.2 MPa											

3. DRAWBAR PERFORMANCE

-Date of tests: MAY. 7~12, 1993

-Type of track: Concrete

		Tyre inflation pressure	
	Height of drawbar above ground	Front	Rear
Unballasted	555 mm	147 kPa	137 kPa
Ballasted	550 mm	147 kPa	137 kPa

Gear and range	Power	Drawbar pull	Speed	Engine speed	Slip of wheels	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)													
1(L1)	8.70	16.32	1.92	2058	14.8	485.0	1.73	29	75	87	22	31	101.1
2(L2)	13.56	15.44	3.16	2050	15.1	405.0	2.07	29	76	87	22	31	101.1
3(L3)	25.40	15.74	5.81	2003	15.1	349.2	2.40	29	78	91	23	31	101.1
4(H1)	28.57	12.88	7.99	1991	8.6	322.3	2.61	29	83	96	25	31	101.1
3.2 MAXIMUM POWER IN TESTED GEARS(ballasted tractor)													
1(L1)	10.74	20.25	1.91	2050	14.9	440.2	1.91	26	75	89	25	52	100.5
2(L2)	16.86	19.77	3.07	2027	15.0	378.4	2.22	26	75	89	25	47	100.5
3(L3)	28.35	16.70	6.11	1985	8.0	322.0	2.61	32	79	94	26	41	100.4
4(H1)	28.93	12.87	8.09	1983	6.0	313.5	2.68	34	79	95	26	35	100.4
3.3.1 FIVE HOUR TEST at 75% of pull at maximum power													
4(H1)	23.20	9.98	8.37	2017	4.4	316.8	2.65	32	78	90	26	35	100.4
3.3.2 FIVE HOUR TEST at pull corresponding to 15% wheelslip, with ballast 300 kg													
2(L2)	17.74	20.02	3.19	2029	—	—	—	30	76	89	26	35	100.4

Oil consumption during ten hours duration of tests 3.3.1 and 3.3.2: 47 g / h

Note: At CAMTC the safety speed of drawbar testing is limited within 12km / h

4. TURNING AREA AND TURNING CIRCLE

Details of wheel eguipment:

	Tyre size	Track width
front:	8.3-20	1450
rear:	11-32	1500

	With brakes		Without brakes	
	Right hard	Left hand	Right hand	Left hand
	m	m	m	m
Radius of turning area	3.45	3.53	4.99	5.18
Radius of turning circle	3.30	3.38	4.84	5.03

5. LOCATION OF CENTRE OF GRAVITY

- Height above ground: 715 mm
- Distance forward from the vertical plane containing the axis of the rear wheels: 842 mm
- Distance from the median plane of the tractor: R 2 mm

6. BRAKING

- Date of tests: MAY. 7, 1993
- Speed before application of brakes: 28.0 km / h

6.1 COLD SERVICE BRAKING DEVICE TEST

Ballasted tractor	Braking device control force N	100	150	250	350	450	550	600
	Mean deceleration m / s^2	1.10	1.50	2.20	2.70	2.90	2.98	2.98
Unballasted tractor	Braking device control force N	100	150	250	350	450	550	600
	Mean deceleration m / s^2	0.85	1.20	1.85	2.35	2.70	2.77	2.77

6.2 FADE TEST

Ballasted tractor	Braking device control force, N	100	150	250	350	450	550	600
	Mean deceleration m/s^2	0.70	1.10	1.75	2.25	2.60	2.69	2.69

- Maximum deviation of tractor from its original course: 0
- Abnormal vibration: None
- The brakes were heated by (state method): Driving

6.3 PARKING BRAKING DEVICE TEST

	Up	Down
Braking device control force	228 kN	207 kN

7. MEASUREMENT OF EXTERNAL NOISE LEVEL

- Date of test: MAY. 8, 1993
- Sound level meter,Make / Model / Type: B & K 2235
- Type of track: Concrete
- Gear number: 6 (H3)
- Travelling speed before acceleration: 20.95 km / h
- Sound level: 83.1 dB(A)

Ⅳ. REPAIRS AND ADJUSTMENTS

DURING TESTS: None

Ⅴ. REMARKS: None

Test carried out by : Bai Yu Chun, Bu Yu Xiang

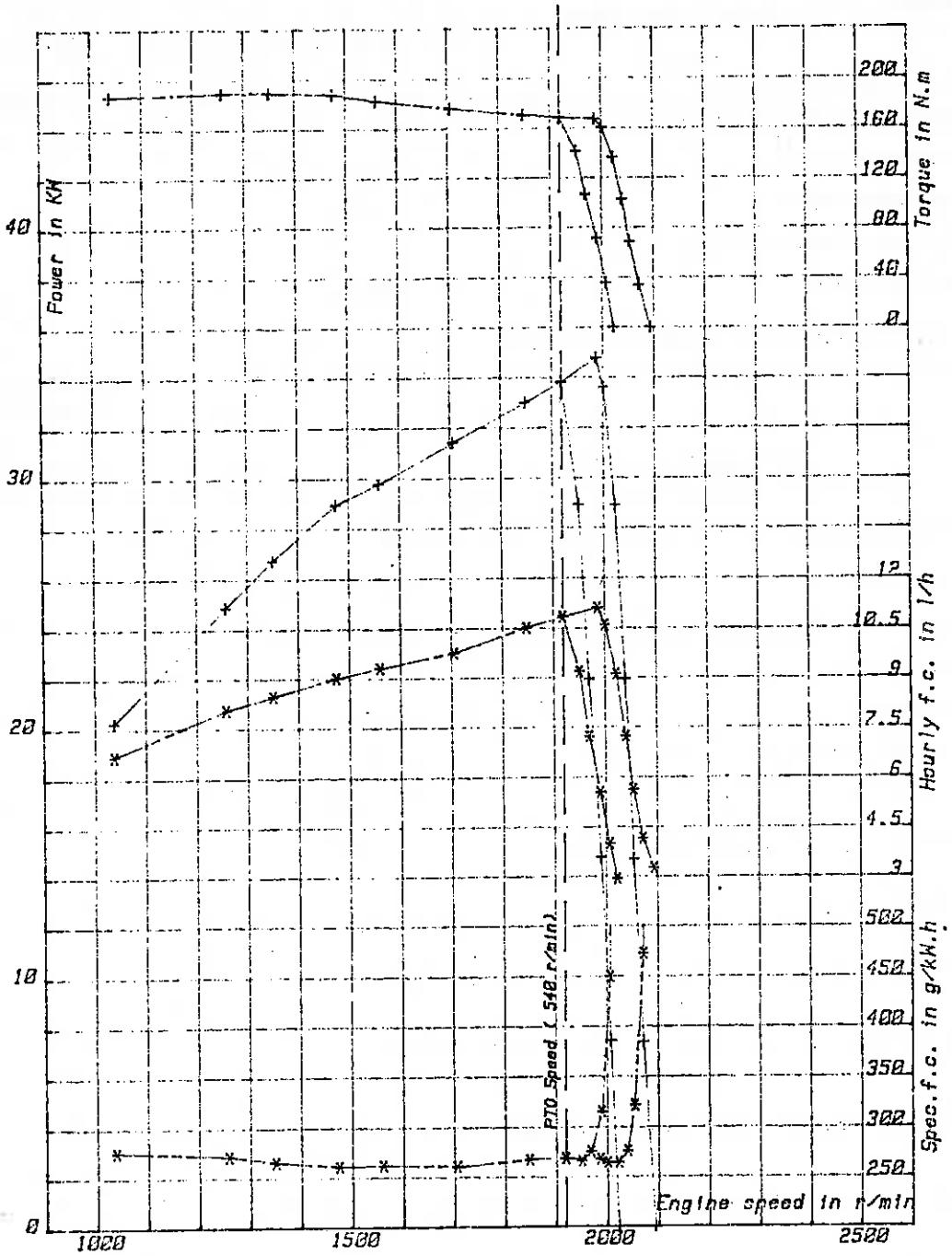
Officer in Charge : Wang Yuan Xiang

Chief of Tractor Testing Division : Li Xi Jiang

For the director : Wang Lian Sheng

ANNEX

MAIN POWER TAKE-OFF TEST CURVES



MAIN POWER TAKE-OFF TEST CURVES

