



NATIONAL SWEDISH TESTING INSTITUTE FOR AGRICULTURAL MACHINERY

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TEST BULLETIN: OECD No. 605

Date of approval 1979-01-31

**REPORT ON TEST IN ACCORDANCE WITH OECD TEST CODE FOR
THE OFFICIAL TESTING OF AGRICULTURAL TRACTORS**

VOLVO BM T 700 diesel tractor

Manufactured by:

VOLVO BM AB, S-631 85 Eskilstuna, Sweden

TEST BULLETIN: OECD No. 605

VOLVO BM T 700 diesel tractor



This Bulletin is based on engineering tests in accordance with OECD Tractor Code.

It does not contain an evaluation of the performance of the tractor on practical farm work.

Tractor manufacturer's name and address:	Volvo BM AB, S-631 85 Eskilstuna, Sweden
Submitted for test by:	The manufacturer
Selected by:	The manufacturer
Place of running in:	Volvo BM AB, Eskilstuna
Duration of running in:	150 h, p t o 110 h, transmission 40 h

Specification of tractor

Tractor

Make:	Volvo BM
Model:	T 700
Type:	Four wheel, rear wheel driven, diesel
Serial No:	1576

Engine

Make:	Volvo BM
Model:	TD 42
Type:	Turbo charged, 4-stroke, direct injection diesel engine
Serial No:	35303
Cylinders	
Number:	4
Disposition:	Vertical, in line
Bore/stroke:	105.57 mm/120 mm
Capacity:	4.202 dm ³
Compression ratio:	16.5:1
Arrangement of valves:	Overhead
Cylinder liners:	Wet, replaceable, centrifugally cast iron liners

Fuel system

Type of fuel feed:	AC-Delco mechanical diaphragm feed pump, type VP E/FP 64385 C
Make, type and model of fuel filters:	Twin bowl, series flow filter, CAV 2 FS 584 400. Replaceable paper filter elements
Capacity of fuel tank:	95 dm ³
Make, type and model of injection pump:	In line pump, CAV Minimec, P 5371/1. Serial No.: None
Manufacturer's production setting:	Fuel delivery 13.0—13.5 kg/h at 1 800 r/min engine speed. Fuel density 0.83 g/cm ³ at 15°C. Injection timing 20° before T.D.C.
Make, type and model of injectors:	CAV nozzle BDLL 150 S 6718 CF in nozzleholders BKBL 112 S 5314 B
Manufacturer's production setting:	20,1—20.9 MPa

Governor

Make:	CAV
Type:	Mechanical, incorporated in fuel injection pump
Range of speed:	Governed range of engine speed 625—2 500 r/min

Air cleaner**Main****Make:****Type:**

Own

Dry replaceable paper element filter. Filter element Mann & Hummel C 17225/3 and CF 800 (safety cartridge)

Pre-cleaner**Make:****Type:**

Donaldson

Centrifugal type. Model PBH 00-0253

Turbocharger

AiResearch T04B J1 A/R 0.70

Lubrication system**Type:****Type and number of filters:****Oil capacity:****Changing period:****Recommended oil:**

Forced feed from gear type pump with metal strainer in oil sump

One full flow replaceable paper element filter.

12 dm³ including oil filter

125 h

Engine oil according to API CD (MIL-L 2104 C) SAE 20 W/30

Cooling system**Type:****Coolant capacity:****Means of temperature control:****Pressure details:**

Water cooled, impeller assisted with 480 mm dia., belt driven 6 blade fan

16 dm³ including cabin heater

Thermostat

42—53 kPa

Starting system**Make:****Type:****Aids for cold starting:**

Bosch

J D 12 V 4 (3 kW) Electrical, solenoid engaged starter

Automatic excess fuel device.

CAV Thermostart in inlet manifold

Electrical system**Voltage:****Generator****Make:****Type:****Battery****Make:****Type:****Capacity and rating:**

12 V

S.E.V. Alternateurs

Alternator 70220402 14 V 35 A 490 W

Tudor

3 Ex 11. Lead-acid, two batteries 6 V in series

160 Ah, 20 hours rating

Transmission**Clutch****Make:****Type and diameter of disc****Method of operation:**

Borg and Beck

Single plate dry clutch, 13 in (330 mm) diameter with 2×6 sintered friction pads

Foot pedal

Gearbox**Make:****Type:**

Own

Sliding gear and constant mesh. Gearbox with 4 forward speeds and 1 reverse. Reduction gear box with 2 ranges.

High-low torque amplifier

Rear axle and final drive

Make:

Own

Type:

Crown wheel and pinion, differential and spur gear final drive.
Pedal operated differential lock.

Oil capacity:

Gear box, rear axle and final drive: 91 dm³.

Change period: 1 000 h or once a year.

Recommended oil API-GL-I SAE 80/90

Gear number	Number of engine revolutions for one revolution of driving wheels	Nominal travelling speed for rated speed of engine km/h*
Forward		
1L	304.32	2.1
1H	236.49	2.7
2L	202.58	3.2
2H	157.43	4.1
3L	135.44	4.8
3H	105.25	6.2
4L	103.42	6.3
4H	80.38	8.1
5L	94.85	6.8
5H	73.71	8.8
6L	63.14	10.3
6H	49.07	13.2
7L	42.21	15.3
7H	32.81	19.7
8L	32.23	20.1
8H	25.05	25.9
Reverse		
1L	247.86	2.6
1H	192.62	3.4
2L	77.26	8.4
2H	60.04	10.8

* Calculated with tyre rolling radius of 747 mm.

Power take off

Main:

At rear of tractor. 6 splines, 1 3/8 in (34.9 mm). Height above ground 687 mm. Proportional engine speed 698 r/min at 2 300 r/min engine speed. Engine speed 1 780 r/min at standard p t o speed 540 r/min. Direction of rotation: Clockwise viewed facing driving end. Independent, mechanically operated multidisc clutch, handlever operated.

Ground speed:

Proportional ground speed: Distance travelled for 1 revolution of p t o 136 mm. Number of p t o revolutions for one revolution of driving wheel 34.5. Direction of rotation: Clockwise viewed facing driving end with tractor in forward gear.

Belt pulley

(not fitted for test)

Rear mounted and p t o driven. Dimensions: 300/170 mm diameter and width of face. Linear speed 1 235 m/min and 1 309 r/min at rated engine speed 2 300 r/min. Engine speed 1 780 r/min at standard linear speed 960 m/min. Direction of rotation: Optional.

Power lift

Own make, single acting. Gear type pump. Independent pump drive. Working pressure 15.7—16.2 MPa. One ram cylinder. Inde-

external hydraulics. Recommended oil, hydraulic oil according to API-SC-CC SAE 10W/30. Category 2 implement linkage with lower link sensing. Draught control, position or combined position and draught control. One selecting lever and one operating lever.

Vertical lift movement above ground: Max 465 mm to 1 240 mm, min 90 to 865 mm.

Alternative external connections:

- 1 single and 1 double acting
- 2 double acting

Drawbar

Swinging drawbar. Height above ground 403 mm.* Horizontal distance from rear axle 810–910 mm, position relative to p t o 255–355 mm. Lateral adjustment 244–274 mm with distance from rear axle 810 and 910 mm respectively. Pivot position relative to rear wheel centre 186 mm forward.

* With tyre rolling radius of 747 mm.

Hitch

Height above ground 455 mm.* Distance from rear axle 480 mm, position relative to p t o 40 mm forward.

* With tyre rolling radius of 747 mm.

Steering

Make Danfoss Orbitrol.

Type hydrostatic power assisted, single cylinder acting on centre steering arm. Adjustable steering column inclination.

Brakes

Make Girling, triple dry disc type mounted on differential half shafts. Independent or combined pedal operated. Hand-operated parking brake connected to left and right steering brake.

Wheels

Steering wheels:

Two at front. Type: Pneumatic, multi rib, 10.00–16/8 ply rating. Maximum permissible mass on each tyre 1 190 kg at 275 kPa pressure. Track width 1 570 mm.¹

Driving wheels:

Two at rear. Type: Pneumatic 18.4/15–34/8 ply rating. Maximum permissible mass on each tyre 2 565 kg at 140 kPa pressure. Track width 1 625, 1 745, 1 875 or 1 990 mm, changed by reversing wheel centres and off-set lugs on rims.

Wheelbase:

2 440 mm

Seat

Make: Bostrom, model XL 101 Argus de Luxe. Torsion bar suspension, adjustable to driver's mass. Damping by hydraulic shock absorber. Range of adjustment 150 mm fore and aft and 62 mm up and down.

Number of grease points (Whole tractor)

23

Overall dimensions

	Length, m	Width, m ²	Height, m ¹
With ballast	4.26	2.10	2.65
Without ballast	3.99	2.10	2.65

¹ Measured to top of exhaust

² With track width of 1 625 mm

Lighting

The lighting system is in accordance with the national Swedish regulations for road traffic (FK 20 §)

	Height above ground of centre, mm	Diameter mm	Distance from outside edge of tractor to centre, mm ²
Head lights	1 040	120	880
Side lights	1 640	70×160 ¹	390
Rear lights	1 650	70×160 ¹	350
Reflectors	590	80	490

¹ Rectangular

² With track width of 1 625 mm

Conditions during tests

Masses

Tractor without driver but with tanks full

Without ballast

Part of mass on front wheels 1 270 kg

Part of mass on rear wheels 2 880 kg

Total mass 4 150 kg

With ballast

Part of mass on front wheels 1 350 kg

Part of mass on rear wheels 5 060 kg

Total mass 6 410 kg

Ballast

Front: Frame and front weights, total 80 kg

Rear: Weights, total 1 410 kg

Liquid, total 770 kg

Track setting during test

Front: 1 570 mm

Rear: 1 745 mm

Fuel and lubricants used in tests

Laboratory and track tests

Fuel: Diesel oil, density 0.830 g/cm³ at 20°C, cetane number 50 (SIS 15 54 32)

Engine oil: Shell Rimula CT SAE 20 W

Transmission oil: Shell SAE 90

Compulsory Tests

1. Main power take-off performance

Date of tests: 1977-11-15/16
 Location of tests: Ultuna, S-750 07 UPPSALA 7, Sweden
 Type of dynamometer: Eddy current, make Zöllner

Power kW	Speed		Fuel consumption			Percent of torque obtained at maximum power
	Engine r/min	P.t.o. r/min	l/h	g/MJ	MJ/l	
Maximum power-2 hour test						
59.5	2 300	698	20.03	77.5	10.7	100
Standard p.t.o. speed (540 r/min)						
53.6	1 780	540	15.86	68	12.2	116
Part loads						
51.9	2 363	717	18.82	83.5	9.9	85
0.4	2 443	741	7.30	—	—	0.5
26.8	2 428	737	13.35	115	7.2	42.5
59.6	2 303	699	19.90	77	10.8	100
13.3	2 436	739	10.25	177	4.7	21
39.9	2 397	727	16.00	92.5	9.0	64

No load maximum engine speed 2 450 r/min

Equivalent crankshaft torque at maximum power 247 Nm

Maximum equivalent crankshaft torque 290 Nm at 1 676 r/min engine speed.

Mean atmospheric
conditions:

Temperature 16°C
 Pressure 96,8 kPa (726 mm Hg)
 Relative humidity 50 %

Maximum temperatures:

Coolant 81°C
 Engine oil 101°C
 Fuel 17°C

2. Drawbar performance

Date of tests: 1978-01-11- -02-02
 Type of track: Drum dynamometer with concrete surface
 Tractor mass,
 unballasted,
 with driver: 4 220 kg
 Tractor mass,
 ballasted,
 with driver: 6 480 kg
 Height of drawbar
 above ground: unballasted 465 mm
 ballasted 470 mm

Results see table 1

Engine oil consumption during ten hours duration of test (ii) and test (iii) was 64 g/h. Test (iii) was carried out with additional ballast. Power, speed, slip, and fuel consumption do not correspond to test (i) gear 2L.

3. Turning space and turning circle

Details of wheel

equipment:

As in specification, without ballast

Track of wheels:

Front 1 570 mm

Rear 1 745 mm

	With brakes		Without brakes	
	Left-hand m	Right-hand m	Left-hand m	Right-hand m
Radius of turning space	4.15	4.18	4.62	4.72
Radius of turning circle	3.99	4.02	4.46	4.56

4. Location of centre of gravity

Height above ground	987 mm
Distance forward from the vertical plane containing the axis at rear wheels	746 mm
Distance from the median plane	0 mm

5. Braking

Date of tests:

1977-10-12

Type of track:

Tarmacadam

Cold brakes

Stopping performance

Travelling speed of the tractor 25 km/h		Unballasted tractor	Ballasted tractor
Deceleration	m/s²	4.6	4.7
Stopping distance	m	5.2	5.1
Force on pedal	N	265	540
Force on pedal to achieve a deceleration of 2,5 m/s ²	N	167	235

Parking brake

Tractor facing up 16 % slope: Force on lever 235 N
tractor does not move

Tractor facing down 16 % slope: Force on lever 245 N
tractor does not move

Hot brakes

Brake fade characteristics

Travelling speed of the tractor 25 km/h	Unballasted tractor	Ballasted tractor
Deceleration hot/cold %	95	94
Stopping distance cold/hot %	95	94
Force on pedal cold/hot %	52	81

6. Measurement of ambient noise

Date of test: 1977-10-04
Type of sound level meter: Brüel & Kjær, type 2204
Type of track: Tarmacadam
Results of tests
Travelling speed: 22.2 km/h, gear 16
Sound level: 87 dB(A)

7. Noise measurement at the driver's ear level

Date of tests: 1977-10-04
Type of sound level meter and octave filter: Brüel & Kjær, type 2204
Type of track: Tarmacadam

Results of tests

Gear	Travelling speed km/h	Sound level dB(A)
5L	6.6	86.5
2L	4.2	87.5

8. Power lift and hydraulic pump performance¹

Date of tests: 1976-03-09 -15
Hydraulic fluid: Hydraulic oil SAE 10 W/30
Type of linkage lock for transport: Hydraulic, separate manually operated valve
Cylinder over pressure relief valve: non-fitted.

Pump characteristics

- Opening pressure of the relief valve 14,5 MPa. Sustained pressure by the open relief valve 16,0 MPa.
- Pump delivery rate at minimum pressure and rated speed 36.4 l/min.
- Pump delivery rate: 0.59 l/s (35.5 l/min)
Delivery pressure: 14.7 MPa
Hydraulic power: 8.7 kW.

¹ The results are excerpt from Report OECD No. 397-a which concerns the tractor VOLVO BM T 650. The hydraulic and lifting systems are identical on model T 650 and model T 700.

Lifting forces

At the hitch points

Lifting heights in relation to a horizontal line through the lower links pivoting points in mm.

-350	-300	-200	-100	0	+100	+200	+283	+300	+371	
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Maximum mechanical advantage

*24.8	25.7	26.1	26.6	26.9	25.9	26.1	26.1	—	—	Lifting force in kN ¹
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Minimum mechanical advantage

*20.5	21.2	22.1	22.5	23.0	22.8	22.8	—	22.8	23.5	Lifting force in kN ¹
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* Maximum force exerted throughout whole range indicated.

Force at which front of tractor is calculated to lift with maximum allowable front ballast is in excess of measured values.

¹ Values calculated for the pressure at maximum hydraulic power (14.7 MPa) from measurements made at maximum pressure 16.0 MPa.

At the standard frame — Maximum mechanical advantage

Lifting heights in relation to a horizontal line through the lower links pivoting points in mm.

— 363	— 250	— 200	— 100	0	+ 100	+ 200	+ 298	—	At the hitch points
— 296	— 213	— 172	— 86	0	+ 96	+ 194	+ 296	—	At the frame

Lifting force in kN¹

30.9	29.1	28.5	27.4	26.4	25.3	24.0	23.5*	—	
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At the standard frame — Minimum mechanical advantage

Lifting heights in relation to a horizontal line through the lower links pivoting points in mm.

— 363	— 300	— 200	— 100	0	+ 100	+ 200	+ 300	+ 390	At the hitch points
— 292	— 250	— 182	— 83	0	+ 94	+ 194	+ 297	+ 397	At the frame

Lifting force in kN¹

27.0	26.1	25.1	24.3	23.6	22.8	21.7	21.2	21.0*	
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¹ Values calculated for the pressure at maximum hydraulic power (14,7 MPa) from measurements made at maximum pressure 16.0 MPa.

* Maximum force exerted throughout whole range indicated.

Force at which front of tractor is calculated to lift with maximum allowable front ballast is in excess of measured values.

Linkage geometry when connected to the standard frame

	Maximum mechanical advantage	Minimum mechanical advantage
Projected length in side view		
Lower links	938 mm	938 mm
Lift arm	250 mm	250 mm
Lift rods	750 mm	715 mm
Top link	752 mm	750 mm
Distance of lift rod connection point from pivot point of lower link	487 mm	420 mm
Dimensions relative to rear axle center line 747 mm above ground		
Lower link pivot point	160 mm behind, 228 mm below	160 mm behind, 228 mm below
Top link pivot point	345 mm behind, 274 mm above	345 mm behind, 274 mm above
Lift arm pivot point	196 mm behind, 455 mm above	196 mm behind, 455 mm above
Max and min height of lower hitch points at tests	70 mm above, 590 mm below	162 mm above, 590 mm below
Max and min height of lower hitch points by adjustment of lift rods	339 mm above, 590 mm below	389 mm above, 687 mm below
Height of lower hitch points when locked in the highest transport position	1 086 mm above ground	1 136 mm above ground

Optional engine tests

9. Performance at the engine crankshaft

Date of tests: 1977-03-24- -31

Location of tests: ULTUNA, S-750 07 UPPSALA 7, Sweden

Type of dynamometer: Eddy current, make Zöllner

Power kW	Engine speed r/min	Fuel consumption			Percent of torque obtained at maximum power
		l/h	g/MJ	MJ/l	
Maximum power — 2 hour test					
67.5	2 300	19.94	68	12.2	100
Part loads					
59.4	2 368	18.57	72	11.5	85
3.6	2 451	6.95	—	—	5
30.3	2 427	12.68	96.5	8.6	42.5
66.7	2 296	19.76	68	12.2	100
15.2	2 436	9.23	140	5.9	21
45.1	2 403	15.55	79.5	10.4	64

No load maximum engine speed 2 475 r/min. Crankshaft torque at maximum power 280 Nm.
Maximum crankshaft torque 313 Nm at 1 600 r/min engine speed.

Mean atmospheric conditions

Temperature	18°C
Pressure	102.7 kPa (770 mm Hg)
Relative humidity	35 %

Maximum temperatures

Coolant	80°C
Engine oil	98°C
Fuel	22°C

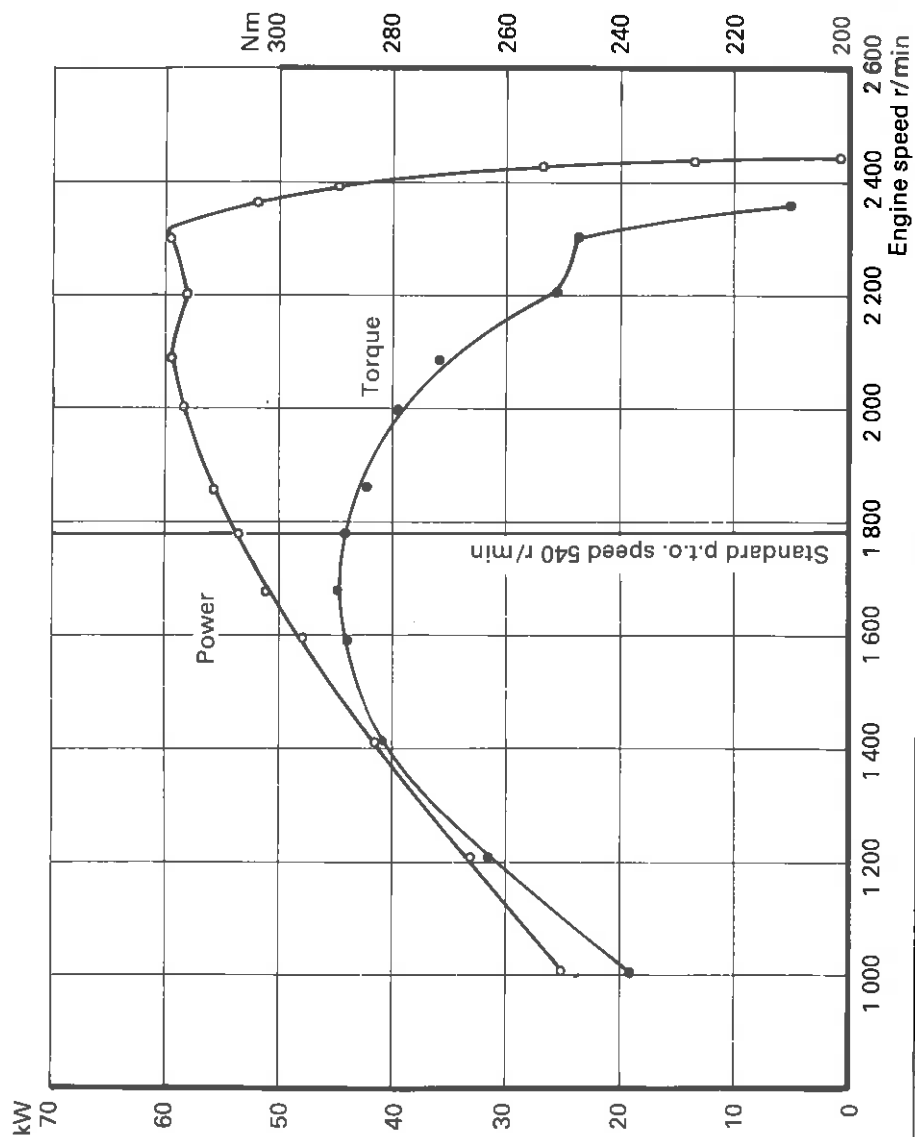
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Atmospheric conditions

	Temperature °C	Relative humidity %	Pressure kPa (mm Hg)
Maximum power (ballasted tractor)	15—19	35—40	100.9 (757)
Five hour test at 75 % pull at max power	15—20	35—40	100.9 (757)
Five hour test at max pull	15—17	35—40	100.1 (751)
Maximum power (unballasted tractor)	15—17	35—40	101.9 (764)

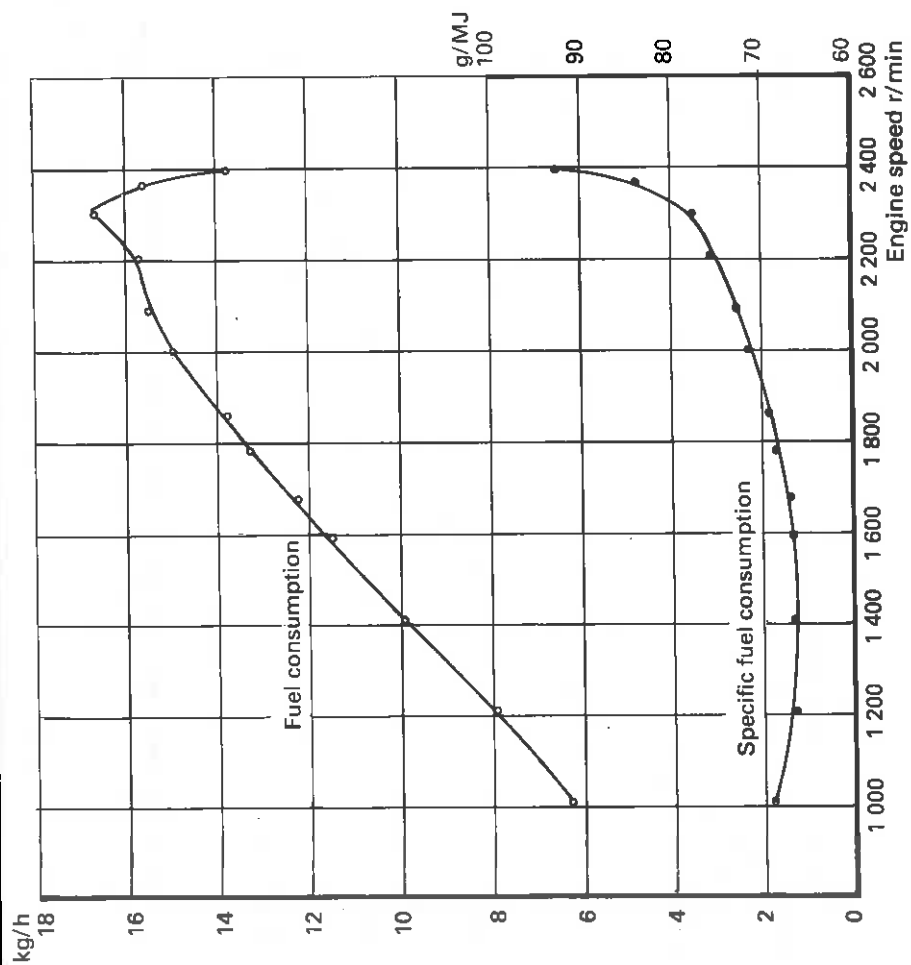
Power take-off test VOLVO BM T 700

Figure 1



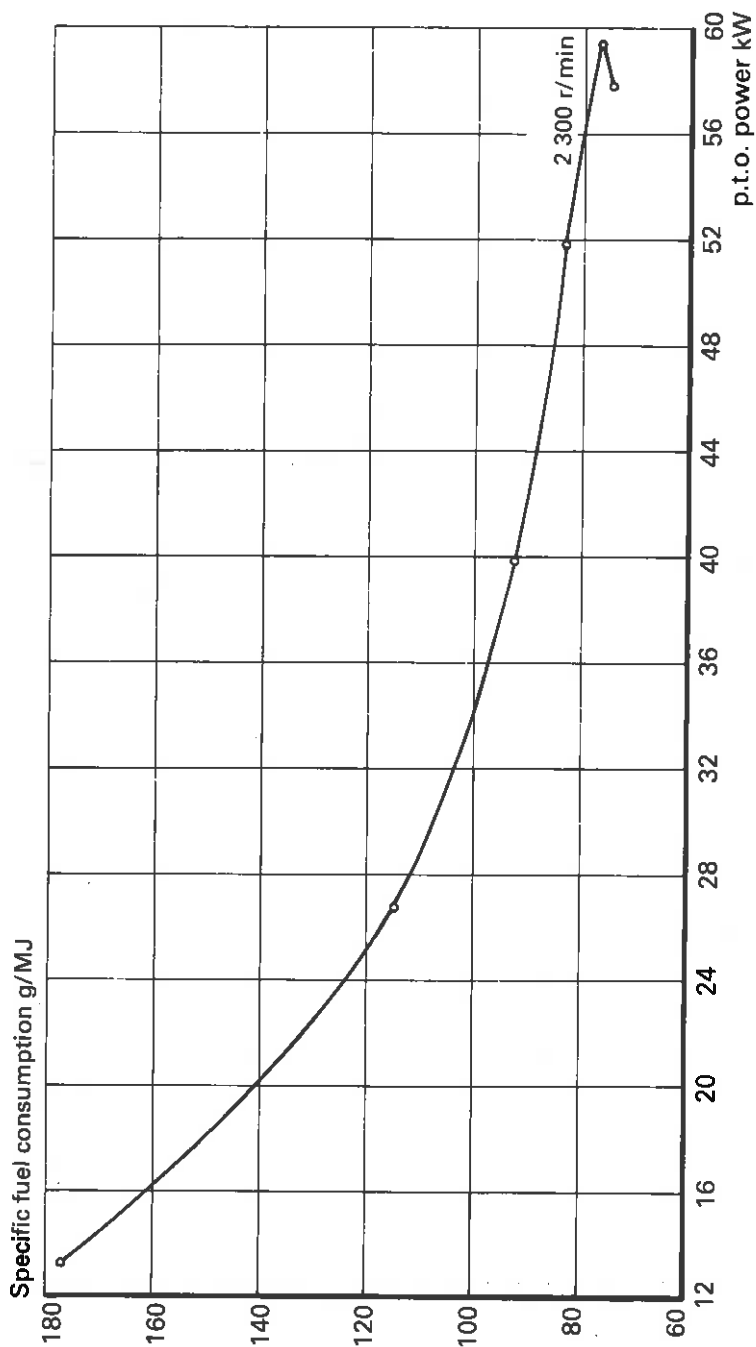
**Power take-off test
VOLVO BM T 700**

Figure 2



**Power take-off test
VOLVO BM T 700**

Figure 3



Engine test VOLVO BM T 700

Figure 4

