

VOLVO BM 616 B/646



Specification Volvo BM Excavator-Loader 616B/646

PRODUCTIVE

The 616B and 646 offer the choice of 2- or 4-wheel drive with differential locks, large wheels and good weight distribution. These qualities are the pre-requisite for efficient-operation in general construction and roadworks, cross-country power line erection, plus all trenching and ditching duties.

RELIABLE

Mounted on Volvo BM's well proven loader chassis, giving extensive component co-ordination, the 616B and 646 are sturdy and reliable in both quality and performance.

ECONOMICAL

The machines' versatility is due to their off-road mobility and to the availability of a wide range of attachments. These factors make the 616B and 646 efficient specialist machines for a wide variety of jobs.



ENGINE

The D45B/TD45B is a 4-cylinder direct-injection 4-stroke diesel engine, with overhead valves and replaceable wet cylinder linings, plus a balancing unit for vibration-less operation.

Flywheel rating
DIN 70020

Gross rating
SAE J270

Max torque
DIN 70020

Max torque
SAE J270

No of cylinders

Bore

Stroke

Displacement

616 B

Volvo BM D45B
54 kW at 38 rps
(73 hp at 2300 rpm)

62 kW at 38 rps
(84 hp at 2300 rpm)

288 Nm at 20 rps
(212 lbf ft at 1200 rpm)

300 Nm at 20 rps
(221 lbf ft at 1200 rpm)

4

105.57 mm (4.2 in)

128.0 mm (5.0 in)

4.48 litres (273 in³)

646

Volvo BM TD45B Turbo
62 kW at 38 rps
(84 hp at 2300 rpm)

70 kW at 38 rps
(95 hp at 2300 rpm)

340 Nm at 27 rps
(250 lbf ft at 1600 rpm)

354 Nm at 27 rps
(261 lbf ft at 1600 rpm)

4

105.57 mm (4.2 in)

128.0 mm (5.0 in)

4.48 litres (273 in³)

The engine's air-intake cleaning system is of the 2-stage type.
1. Precleaner of cyclone type (only 616B) 2. Cyclone cleaner with paper filter and catch-all filter; 3. Indicator lamp on instrument panel warns when filter should be cleaned or replaced.



ELECTRICAL SYSTEM

Battery	2 x 12 V (connected in series)
Voltage	24 V
Battery capacity	105 Ah
Alternator	1200 W (43 A)
Starter motor	3 kW (4 hp)

The batteries are located on the right-hand side of the machine behind a lockable security door. The well-protected fuses are mounted in two boxes to the left and in front of the cab instrument panel.



TORQUE CONVERTER

Single-stage converter with free-wheel stator.

Torque multiplication ratio 3.25:1



TRANSMISSION

Volvo BM hydromechanical gearbox with power shift.

The Volvo BM transmission has two forward gears and two reverse in one low and one high gear range.

Speeds:
(tyres 18.4—34/14)

- 0—4.5 mph (0—7 km/h)
- 0—7.5 mph (0—12 km/h)
- 0—12 mph (0—19 km/h)
- 0—19 mph (0—30 km/h)



AXLES

Type Volvo BM
Drive axle with final drives in central final drive housing.

Differential lock 100% lock-up (dog clutch)
616B: Front axle: box construction.
Oscillation ± 14° (410 mm)

646: Front axle: drive axle with differential, sealed spherical steering joints and planetary type hub reduction. Drive shafts are fully floating. The motive power is transmitted from the hydraulic gearbox and dropbox via the propeller shaft.
Oscillation ± 10° (320 mm)



BRAKES

Fully enclosed disc brakes, located before the final drives. Hydraulic operation by foot pedal. Steering brake operated by lever

with automatic return selector valve. Parking brake: mechanically operated by lever.



TYRES

616B	front	12.5—20/10
	front	14.5—20/10
646	rear	18.4—34/14
	front	14.9—24/14
	rear	18.4—34/14



STEERING SYSTEM

Hydrostatic with twin cylinders on steering axle.

The machine can still be steered in the event of a pressure loss.

Pump: Gear pump

Output at
940—2300 rpm
(15.7—38.3 rps)

Relief pressure

17 l/min (3.74 UK gal/min)

9 MPa (1305 psi)



HYDRAULIC SYSTEM

Common for loader and excavator unit

Pump: Gear pump

Pump capacity
at 29.6 rps
(1775 rpm)

Relief pressure

Oil filter

113 l/min (24.9 UK gal/min)

17 MPa (2465 psi)

Full-flow filtration through filter cartridge with magnetic core.

Safety pressure relief valve located in loader valve; opening pressure 17 MPa (2465 psi).

There is a transport by-pass between the pump and the loader's control valve consisting of a flow regulator and selector valve. This limits the oil flow to 60 l/min (13 UK gal/min) when the transport gear is engaged. When the working gear is engaged for excavation, the capacity of the pump at 1775 rpm is 113 l/min — 25 UK gal/min.

Hydraulic system — excavator

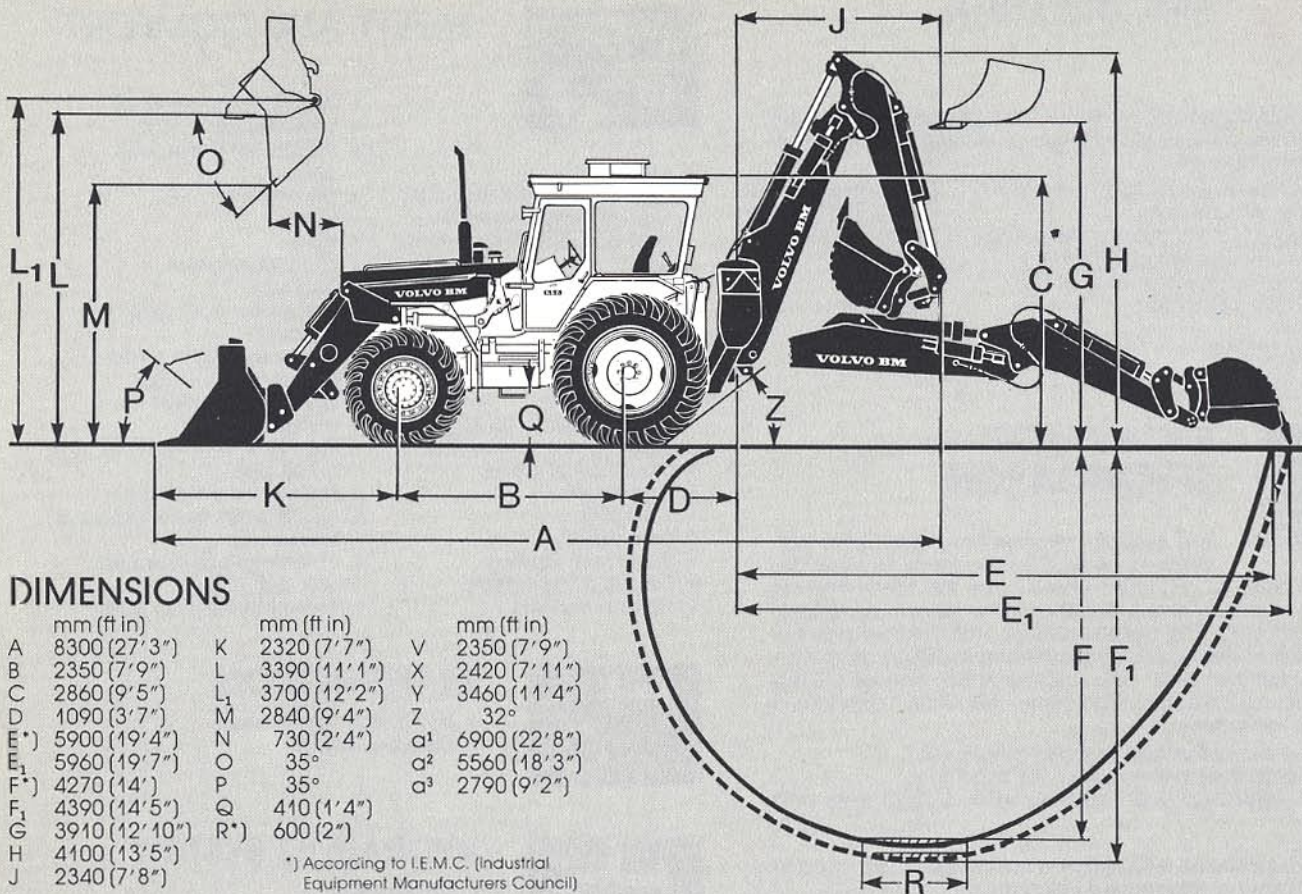
The control valve for the excavator unit incorporates a shock valve for the boom, excavating, slewing and bucket cylinders. A throttle check valve is connected to the piston-rod side of the boom and excavator cylinders. This limits the rate of descent, but allows full flow during lifting. The excavator unit is operated by two levers. Lateral angulation of the bucket arm is controlled by a foot pedal (left foot). The control valve has 7 functions: two outriggers, slew, boom, bucket arm, bucket and lateral angulation.

Cylinder dimensions	Bore mm (in)	Piston rod dia mm (in)	Stroke mm (in)
Slewing cylinders	100 (3.9)	45 (1.8)	366 (14.4)
Boom cylinder	140 (5.5)	80 (3.1)	927 (36.5)
Bucket arm cylinder	125 (4.9)	70 (2.8)	845 (33.3)
Bucket cylinder	110 (4.3)	60 (2.4)	740 (29.1)
Lateral angulation cylinder	110 (4.3)	60 (2.4)	250 (9.8)
Outrigger cylinders	110 (4.3)	60 (2.4)	436 (17.2)

Hydraulic system — loader

The loader is operated by a single lever located to the right of the operator's seat. The hydraulic system is double-acting: the loader can relieve the load on the front end during excavation work to maintain machine stability. The lifting arm is equipped with a bucket indicator to show the angle of the bucket in relation to the ground. Third hydraulic function and single-acting lift function (float position) are available as optional extras.

Cylinder dimensions	Bore mm (in)	Piston rod dia mm (in)	Stroke mm (in)
Lift cylinders	110 (4.3)	50 (2.0)	525 (20.7)
Tilt cylinders	100 (3.9)	45 (1.8)	366 (14.4)



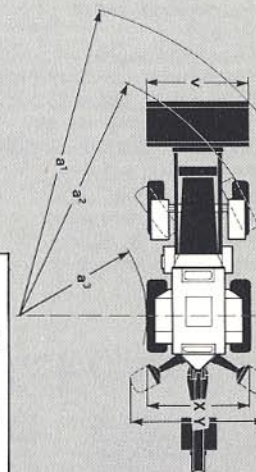
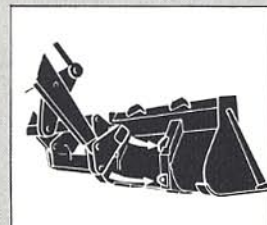
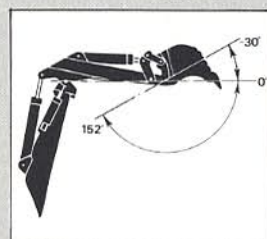
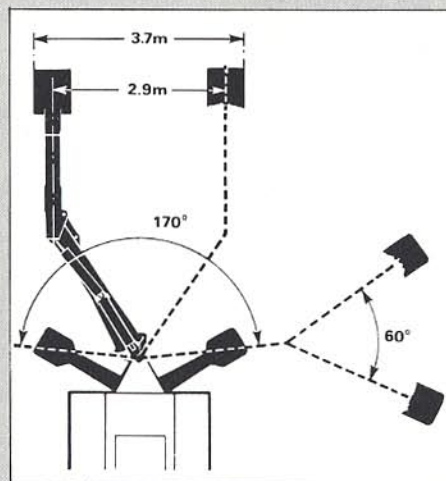
DIMENSIONS

	mm (ft in)		mm (ft in)		mm (ft in)
A	8300 (27'3")	K	2320 (7'7")	V	2350 (7'9")
B	2350 (7'9")	L	3390 (11'1")	X	2420 (7'11")
C	2860 (9'5")	L ₁	3700 (12'2")	Y	3460 (11'4")
D	1090 (3'7")	M	2840 (9'4")	Z	32°
E*	5900 (19'4")	N	730 (2'4")	α ¹	6900 (22'8")
E ₁	5960 (19'7")	O	35°	α ²	5560 (18'3")
F*	4270 (14')	P	35°	α ³	2790 (9'2")
F ₁	4390 (14'5")	Q	410 (1'4")		
G	3910 (12'10")	R*	600 (2')		
H	4100 (13'5")				
J	2340 (7'8")				

*) According to I.E.M.C. (Industrial Equipment Manufacturers Council)

Lateral angulation of the bucket arm makes the 616B & 646 into a highly versatile excavator. The dimensions given on the drawing show the range of movement possible by using the hydraulic lateral angulation system. As both the excavator and loader units are fitted with snap-on couplings, the appropriate attachment for each job can be fitted quickly.

Total weight:
616B 8 950 kg (19 731 lb)
646 9 750 kg (21 495 lb)



CAPACITIES

	Litres	UK gal	US gal
Cooling system	16	3.5	4.2
Oil volume, engine	10.5	2.3	2.8
Oil volume in gear box incl. converter	22	4.8	5.8
Final drive and differential housing	50	11.0	13.2
Fuel tank	96	21.0	25.4
Hydraulic system	190	41.8	50.2
Oil tank volume	110	24.2	29.1
646 differential housing	6	1.3	1.6
Planetary gear	2x5	2x1.1	2x1.3



COMFORT

The operator is well protected. The robust cab has been approved in accordance with impact test specifications and is safe and roomy, with good visibility. The low noise level provides a pleasant working environment especially desirable during long shifts.

The cab has a door on each side and an opening rear window. The right-hand door window can also be opened. The sun roof serves also as an emergency exit. As the cab is mounted on rubber pads, structure-borne noise and vibration transmitted through the chassis to the operator, is reduced to a low level. The operator's spring seat is equipped with a damping device. It is adjustable vertically, fore-and-aft and has an adjustable backrest. The driver can swivel the seat easily from a forward driving position to a rear-facing position for excavating. All instruments and controls are marked with symbols and located — according to frequency of use — within convenient reach and sight.



LOADER — SPECIFICATION

The snap-on coupling is of the same type as those fitted to the Volvo BM Allrounders, permitting use of 621/641 attachments (see attachment booklet).

Lifting force to top position 3380 mm (11'1")	2600 kgf (5730 lbf)
Breakout force at bucket tip	4100 kgf (9040 lbf)
Max. lifting height under flat bucket bottom	3390 (11'1")
Max. clearance under tipped bucket	2840 (9'4")
Distance between tipped bucket at top position and front of loader	730 (2'4")
Breakout angle	35°
Tipping angle at 2440 mm (8') tipping height	45°



EXCAVATOR — SPECIFICATION

The cylinder attachment points have self-aligning sealed link bearings to eliminate stresses and play. All hydraulic hoses have the same internal diameter and most of these are the same length, to simplify spare parts stocking. The bucket arm can be rotated continuously in relation to the boom. One cylinder, foot-operated, can rotate the bucket arm $\pm 30^\circ$. This rotating action can be utilised at any time during an excavation cycle. This design provides a number of advantages:

- you can dig along the foot of walls, fences etc.
- you can dig ditches to the side of the machine
- you can do clean-up and exposing work around wells and rocks etc.

The machine is delivered with snap-on couplings as standard to facilitate bucket and attachment changes.

Excavation depth	4270 mm (14')
Reach	5900 (19'4")
Loading height	3910 (12'10")
Breakout force at bucket lip	5 000 kgf (11 000 lbf)
Excavating force at bucket lip	3 410 kgf (7 520 lbf)
Bucket volume rec.std.	380 litres (13.4 ft ³)
Slew with laterally angled bucket arm	170 + 2 x 30°

Max. lifting force in hook (incl. bucket)	1 000 kgf (2 200 lbf) — boom cyl.
Max. lifting force in hook (incl. bucket)	1 600 kgf (3 530 lbf) — bucket arm cyl.
Parallel excavation	3700 mm (12'2") wide with 800 mm (2'8") wide bucket

STANDARD EQUIPMENT



ENGINE AND ELECTRICAL SYSTEM

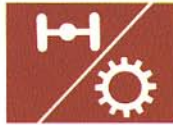
- Fuel gauge
- Temperature gauge, engine
- Alternator
- Battery disconnect switch, electrical system
- Electrical outlet, 24V
- Hour counter
- Starter interlock/lock
- Pilot lamp for: working lights front and rear, battery charging, brights, direction indicators, engine oil pressure, transmission oil

STANDARD EQUIPMENT cont.



SAFETY AND COMFORT

- Safety cab
- Cab heater and defroster
- Ergonomically designed and adjustable operator's seat
- Rear-view mirrors, external, 2
- Rear-view mirror, internal, 1
- Lights:
 - Headlights, bright/dim/asym.
 - Parking lights
 - Working lights, forward (2)
 - Working lights, rear (2)
- Side marker lights
- Brake lights
- Tail lights
- Cab lighting
- Instrument lighting
- Direction indicators
- Hazard flashers
- Mounting for seatbelt
- Utility basket in cab
- Instrument panel with symbols
- Roof hatch
- Horn
- Ashtray
- Cigarette lighter
- Tool box
- Wipers for front and rear windows
- Protection plate under steering axle (616B)
- Line rupture valve on outriggers
- Transport braces (chains) for outriggers
- Rubber-mounted step
- Matte black excavator and loader unit
- Opening right-hand side window
- Bronze-tinted cab glass



TRANSMISSION

- Power shift transmission
- Differential lock



HYDRAULIC SYSTEM

- Full flow filter
- Transport by-pass valve

OPTIONAL EQUIPMENT

(Standard equipment on certain markets)

- Underbody protection plates, rear and middle
- Cab ventilator with or without heating
- Air conditioning
- Float position valve for loader unit
- Third hydraulic function for loader attachments
- Scarifier
- Rotating beacon
- Inspection lamp
- Front fenders
- Extra protection for bucket cylinder
- Lifting hook
- Hydraulic take-off on excavator for: hand-held tools, excavator-mounted tools, vibrating cable layer, hydraulic post-raiser
- Seat belt
- Warning triangles
- Adjustable working light
- Windshield washers
- Fuel filling pump
- Hydraulic oil cooler
- Dual controls
- Trailer hitch
- Two-stage hydraulics
- Hydraulic attachment bracket on bucket arm
- Passenger seat

pressure, parking brakes, hazard flashers, cold start (engine block heater), air cleaner, gearbox temperature, hydraulic oil temperature.

- Central warning light on excavator unit's instrument panel:
 - engine temperature,
 - engine oil pressure,
 - hydraulic oil temperature

The manufacturers reserve the right to change specification or design without prior notice. Illustration do not necessarily show the machine in its standard version.

VOLVO BM

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