



Cat[®] 6090

Hydraulic Shovel

Specifications

General Data

Operating weight

| | | |
|-------------|------------|------------|
| Face Shovel | 980 tonnes | 1,080 tons |
|-------------|------------|------------|

Engine Output

| | | |
|------------|----------|----------|
| SAE J 1995 | 3 360 kW | 4,500 HP |
|------------|----------|----------|

Standard Bucket Capacity

| | | |
|-----------------------|---------------------|----------------------|
| Face Shovel (SAE 2:1) | 52.0 m ³ | 68.0 yd ³ |
|-----------------------|---------------------|----------------------|

Features

- *TriPower* shovel attachment
- Independent oil-cooling system
- Spacious walk-through machine house
- 5-circuit hydraulic system
- Electronic-hydraulic servo control
- New Board Control System (BCS)
- Torque control in closed-loop swing circuit
- Automatic central lubrication system
- Xenon working lights

Operating Weight

Shovel

| | |
|---------------------|-----------------------------------|
| Standard track pads | 2 000 mm (6 ft 7 in) |
| Operating weight | 980 000 kg (2,160,510 lb) |
| Ground pressure | 25.8 N/cm ² (37.4 psi) |

Additional track pads available on request

Electrical System (diesel drive)

| | |
|---|--|
| System voltage | 24 V |
| Batteries in series / parallel installation | 6 x 210 Ah - 12 V each 630 Ah - 24 V in total |
| Alternators | 2 X 175 A each |
| Working spot lights | 12 x high brightness Xenon lights |

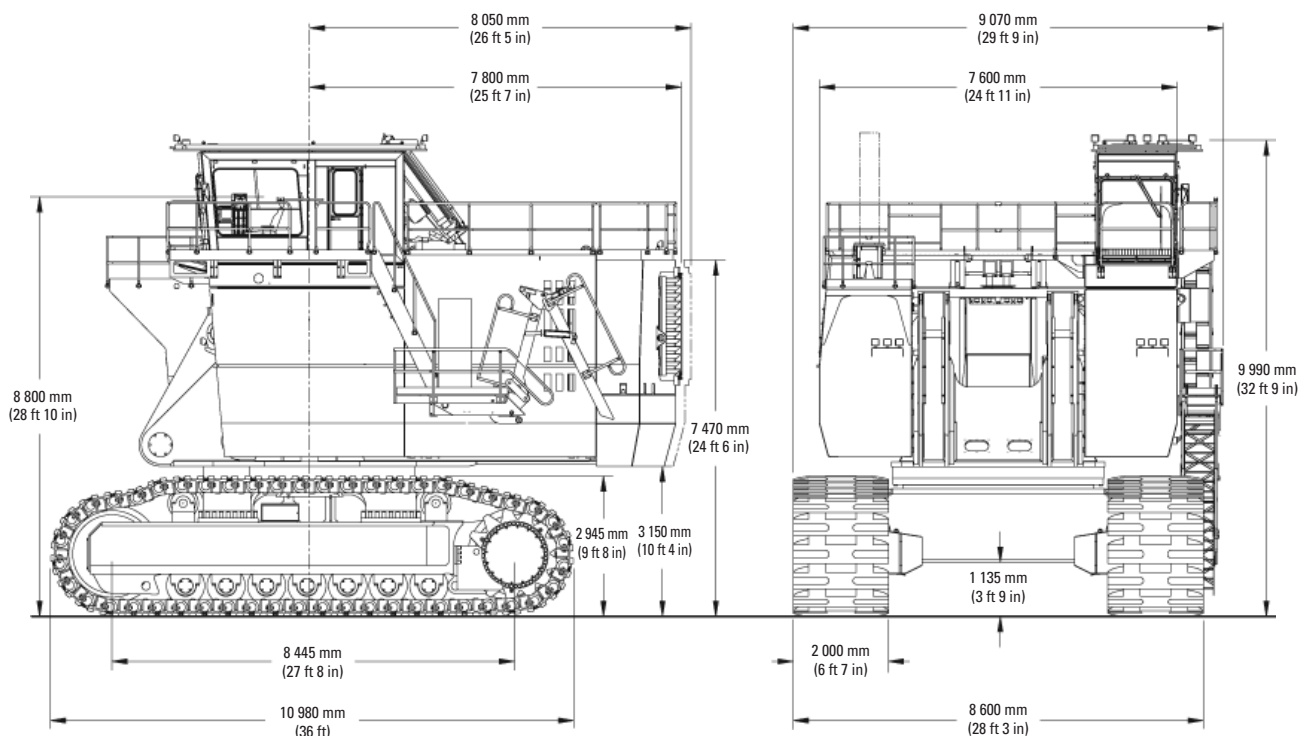
- Battery isolation relays
- Emergency stop switches accessible from ground level, in engine module and in operator's cab

Hydraulic Oil Cooling

| | |
|---------------------------|--------------------------------------|
| Oil flow of cooling pumps | |
| Diesel Version | 4 x 975 l/min (4 x 258 US gal/min) |
| Electric Version | 4 x 1 000 l/min (4 x 264 US gal/min) |
| Diameter of fans | 4 x 1 524 mm (4 x 60 in) |

- Cooling system is fully independent of all main circuits, i.e. controlled cooling capacity is available whenever engine is running
- Gear-type cooling pumps supplying high-volume, low-pressure oil to aluminum coolers
- Fan speed is thermostatically controlled
- Extremely high cooling efficiency to ensure optimum oil temperature

Hydraulic Shovel—6090



Electric Motors (optional)

| | |
|---------------------------|---|
| Type | 2 x Squirrel cage induction motors |
| Total Output | 3 200 kW |
| Voltage | 6.6 kV +/- 10% (other on request) |
| Total Rated Current I_N | 332 A |
| Frequency | 50 Hz (60 Hz on request) |
| Revolutions | 1,500 min^{-1} (1,800 min^{-1} at 60 Hz) |
| Max. starting current | 780 A |

- Custom-made electric motors with increased gap between rotor and stator to withstand severe mining conditions
- Power limit control by Pump Management System

Automatic Lubrication System

| | |
|------------------------------|----------------------|
| Capacity of grease container | 1 000 l (264 US gal) |
|------------------------------|----------------------|

- Dual-circuit system with hydraulically driven heavy-duty pump and electronic time relay control to adjust the pause / lube times
- Connected to the lubrication system are the swing roller bearing with internal gearing, and all pivot points of attachment, bucket and cylinders
- System failures displayed by Board Control System
- Grease filters (200 μm) between service station and container as well as directly behind grease pump

Diesel Engines

Cummins® QSK60 Tier 2

| | |
|----------------------------------|--|
| Make and model | 2 x QSK60 2-stage |
| Total rated net power ISO 3046/1 | 3 360 kW (4,500 HP) 1,800 min^{-1} |
| Total rated net power SAE J1349 | 3 360 kW (4,500 HP) 1,800 min^{-1} |
| Total rated net power SAE J1995 | 3 360 kW (4,500 HP) 1,800 min^{-1} |
| No of cylinders (each engine) | 16 |
| Bore | 159 mm (6.25 in) |
| Stroke | 190 mm (7.48 in) |
| Displacement | 60.2 l (3,674 in^3) |
| Aspiration | 2-stage turbocharged; aftercooled and intercooled |
| Max. altitude without deration | 4 880 m (16,000 ft) a.s.i. |
| Emission certification | US EPA Tier 4i |
| Fuel tank capacity | 15 100 l (4,000 US gal) |

- Hydraulically driven radiator fan with electronically controlled fan speed
- Microprocessed engine control
- Automatic rev. reduction
- Heavy-duty air filters with automatic dust evacuation
- Two-stage fuel filter incl. water separator
- Additional high-capacity water separator
- Pre-lube starting system
- Eliminator with centrifuge for engine oil filtration
- Engine-oil-change interval of 1,000 hrs

Hydraulic Shovel—6090

Hydraulic System with Pump Managing System

| | |
|-------------------------------|--------------------------------------|
| Main pumps | 8 x variable flow axial piston pumps |
| Max. oil flow | |
| Diesel version | 8 x 936 l/min (8 x 247 US gal/min) |
| Electric version | 8 x 943 l/min (8 x 249 US gal/min) |
| Max. pressure, attachment | 31 MPa = 310 bar (4,495 psi) |
| Max. pressure, travel | 36 MPa = 360 bar (5,220 psi) |
| Swing pumps | 6 x reversible swash plate pumps |
| Max. oil flow | |
| Diesel version | 6 x 488 l/min (6 x 129 US gal/min) |
| Electric version | 6 x 496 l/min (6 x 131 US gal/min) |
| Max. pressure, swing circuit | 33 MPa = 330 bar (4,790 psi) |
| Total volume of hydraulic oil | Approx. 13 000 l (3,450 US gal) |
| Hydraulic tank capacity | Approx. 10 000 l (2,640 US gal) |

- Pump Managing System contains:

- Electronic load limit control
- Flow on demand from main pumps depending on joystick position
- Automatic regulation of main pumps to zero flow without demand
- Automatic rpm reduction of engine speed during working breaks
- Reduced oil flow of main pumps at high hydraulic oil temperature or engine temperature

- Pressure cut-off for main pumps

- Cooling of pump transmission gear oil

- Filters:

- Full-flow high-pressure filters (100 µm) for the main pumps, installed directly behind each pump
- High pressure filters (100 µm) for the closed swing circuit
- Full-flow filters (10 µm) for the complete return circuit
- Full-flow filters (10 µm) for the cooling return circuit
- Pressure filters (40 µm and 6 µm) for servo circuit
- Transmission oil filters (40 µm)

Undercarriage

| | |
|------------------------------|--|
| Travel speed (2 stages) | 1 st stage Max. 1.6 km/h (0.99 mph) 2 nd stage Max. 2.2 km/h (1.37 mph) |
| Max. tractive force | 4 338 kN (442 t = 974,880 lb) |
| Gradability of travel drives | Max. 44% |
| Track pads (each side) | 48 |
| Bottom rollers (each side) | 7 |
| Support rollers (each side) | 2 plus a skid plate in between |
| Travel drives (each side) | 1 planetary transmission with 2 two-stage axial piston motors |
| Parking brake | Wet multiple disc brake, spring applied / hydraulically released |

- Cast double-grouser combined pad-links with bushings connected by hardened full floating pins
- All running surfaces of sprockets, idlers, rollers and pad links, as well as teeth contact areas of sprocket and pad links, are hardened
- Fully hydraulic, self-adjusting track tensioning system with membrane accumulator
- Automatic hydraulic retarder valve to prevent over-speed on downhill travel
- Acoustic travel alarm
- Idlers, bottom rollers and support rollers are connected to the automatic lubrication system

Operator's Cab

| | |
|------------------------------------|---|
| Operator's eye level | Approx. 8.8 m (28 ft 10 in) |
| Internal dimensions of cab | Length: 2 200 mm (7 ft 3 in) Width: 1 600 mm (5 ft 3 in) Height: 2 150 mm (7 ft 1 in) |
| Internal dimensions of amenity cab | Length: 1 600 mm (5 ft 3 in) Width: 1 600 mm (5 ft 3 in) Height: 2 150 mm (7 ft 1 in) |

- Pneumatically cushioned and multi-adjustable comfort seat with lumbar support, seat heating, safety belt, head and armrests
- Safety switch in seat cushion to automatically neutralize the hydraulic controls when operator leaves the seat
- Joystick controls integrated in independently adjustable seat consoles
- Fold-away auxiliary seat with safety belt
- FOPS (rock guard; approved acc. to DIN ISO 3449) integrated into cab structure
- All-round safety glass, armored windshield and sliding side window
- Windshield with parallel intermittent wiper / washer
- Roller blind at windshield
- Robust instrument panel incl. large colored BCS screen with transfective technology
- Board Control System (BCS); electronic monitoring and data logging system for vital signs and service data of engines, hydraulic system and lubrication system
- Machine access via retractable boarding ladder, hydraulically operated

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Retractable Service Station

Retractable service station installed underneath the engine module and easily accessible from ground

Equipped with:

- Quick couplings for:
 - Diesel fuel
 - Engine coolant - left / right
 - Pump transmission gear oil - left / right
 - Engine oil (oil pan) - left / right
 - Engine oil (additional tank - optional) - left / right
 - Hydraulic oil tank
 - Grease container
- Cat jump-start socket
- Indicator lights for fuel tanks left / right full and grease container full

Attachments

- Boom and stick are torsion-resistant, welded box design of high-tensile steel with massive steel castings at pivot areas
- Welding procedures allow for internal counter-welding (double prep weld) wherever possible
- Boom and stick are stress-relieved after welding
- Inspection hole in boom and stick
- Catwalks with rails at boom
- Pressure-free lowering of boom and stick by means of a float valve
- Shovel attachment with unique *TriPower* kinematics ensuring the following main features:
 - Horizontal automatic constant-angle bucket guidance
 - Vertical automatic constant-angle bucket guidance
 - Automatic roll-back limiter to prevent material spillage
 - Kinematic assistance to hydraulic forces
 - Constant boom momentum throughout the entire lift arc
 - Crowd force assistance
- All buckets are equipped with a universal wear package suitable for all standard applications, which consists of:
 - Special liner material covering main wear areas inside and outside of bucket
 - Lip shrouds between teeth
 - Wing shrouds on side walls
 - Heel shrouds at bottom edges
- Special wear packages for highly abrasive materials on request

Swing System

| | | |
|------------------|---|---------|
| Swing Drives | 6 compact planetary transmissions with axial piston motors | |
| Parking Brakes | Wet multiple disc brake, spring-loaded / hydraulically released | |
| Max. swing speed | Diesel version | 3.9 rpm |
| | Electric version | 4.1 rpm |
| Swing ring | Triple race roller bearing with sealed internal gearing | |

- Closed-loop swing circuit with torque control
- Hydraulic braking of the swing motion by counteracting control
- All race ways of swing ring as well as grease bath for internal gearing supplied by automatic central lubrication system

Optional Equipment

General

- Export crating
- Finishing as per end user's corporate colors
- Customizing of logos as per customer's specification

Superstructure

- Hydraulic service crane on superstructure with auxiliary engine
- Mesabi radiators instead of standard radiators
- 2nd retractable boarding ladder on right-hand side of engine module
- Various cold-weather packages
- Additional lighting

Cab

- Various heating and air conditioning systems
- Outside-mounted sun shields
- Additional instrumentation

Undercarriage

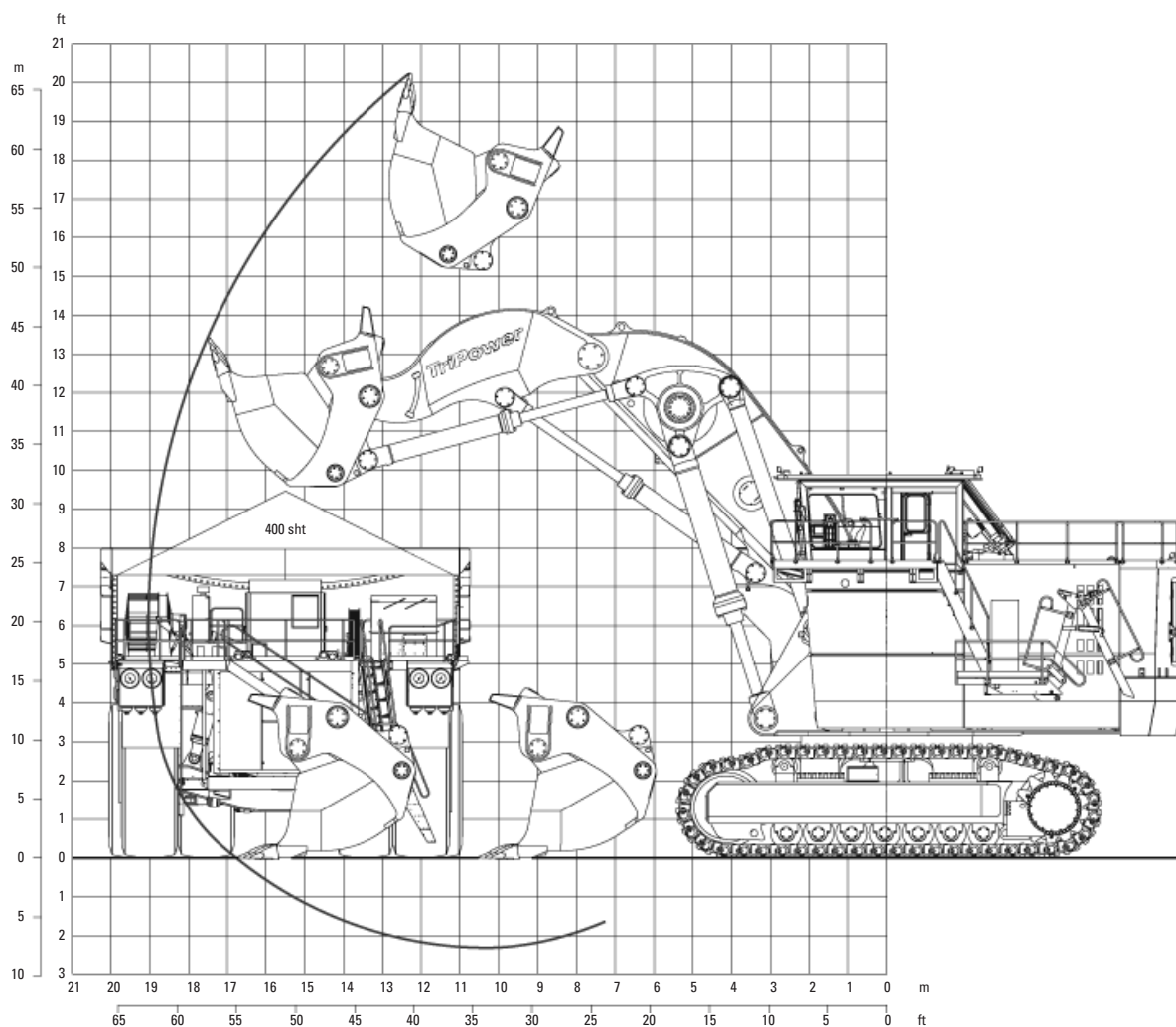
- Track pad width 1 800 mm

Additional optional equipment available on request

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TriPower Face Shovel Attachment (FS)

Working Diagram – Boom 9.5 m (31 ft 2 in) - Stick 5.8 m (19 ft)



Working Range

| | | |
|-------------------------|--------|------------|
| Max. digging height | 20.2 m | 66 ft 3 in |
| Max. digging reach | 19.0 m | 62 ft 4 in |
| Max. digging depth | 2.3 m | 7 ft 7 in |
| Max. dumping height | 14.5 m | 47 ft 7 in |
| Crowd distance on level | 6.2 m | 20 ft 4 in |

Digging Forces

| | | |
|----------------------------------|----------|------------|
| Max. crowd force | 3 300 kN | 741,610 lb |
| Max. crowd force at ground level | 3 200 kN | 719,140 lb |
| Max. breakout force | 2 400 kN | 539,350 lb |

Face Shovels

| Type | Iron ore shovel | Heavy rock shovel | Oil sand shovel | Standard rock shovel |
|---------------------------------|--|--|--|--|
| Tooth system | on request | on request | on request | on request |
| Capacity SAE / PCSA 1:1 | 43.5 m ³ (56.9 yd ³) | 48.4 m ³ (63.3 yd ³) | 52.0 m ³ (68.0 yd ³) | 59.8 m ³ (78.2 yd ³) |
| Capacity SAE / CECE 2:1 | 37.0 m³ (48.4 yd³) | 42.0 m³ (54.9 yd³) | 45.0 m³ (58.9 yd³) | 52.0 m³ (68.0 yd³) |
| Total width | 5 600 mm (18 ft 4 in) | 5 600 mm (18 ft 4 in) | 5 610 mm (18 ft 5 in) | 6 170 mm (20 ft 3 in) |
| Inner width | 5 100 mm (16 ft 9 in) | 5 100 mm (16 ft 9 in) | 5 175 mm (17 ft) | 5 600 mm (18 ft 4 in) |
| Opening width | 2 700 mm (8 ft 10 in) | 2 700 mm (8 ft 10 in) | 2 560 mm (8 ft 5 in) | 2 650 mm (8 ft 8 in) |
| No. of teeth | 6 | 6 | 6 | 6 |
| Weight incl. universal wear kit | 77 000 kg (169,750 lb) | 79 500 kg (175,270 lb) | 82 000 kg (180,780 lb) | 84 000 kg (185,190 lb) |
| Max. material density (loose) | 2.6 t/m ³ (4,380 lb/yd ³) | 2.2 t/m ³ (3,710 lb/yd ³) | 2.0 t/m ³ (3,370 lb/yd ³) | 1.8 t/m ³ (3,030 lb/yd ³) |

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