# Cat®
## 6090 FS
### 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 m³ (68.0 yd³)

### 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/cm² (37.4 psi)

Additional track pads available on request

### Electrical System (diesel drive)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>System voltage</td>
<td>24 V</td>
</tr>
<tr>
<td>Batteries in series / parallel installation</td>
<td>6 x 210 Ah - 12 V each</td>
</tr>
<tr>
<td>630 Ah - 24 V in total</td>
<td>2 X 175 A each</td>
</tr>
<tr>
<td>Working spot lights</td>
<td>12 x high brightness Xenon lights</td>
</tr>
<tr>
<td>Additional track pads available on request</td>
<td></td>
</tr>
</tbody>
</table>

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

### Hydraulic Oil Cooling

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil flow of cooling pumps</td>
<td></td>
</tr>
<tr>
<td>Diesel Version</td>
<td>4 x 975 l/min (4 x 258 US gal/min)</td>
</tr>
<tr>
<td>Electric Version</td>
<td>4 x 1 000 l/min (4 x 264 US gal/min)</td>
</tr>
<tr>
<td>Diameter of fans</td>
<td>4 x 1 524 mm (4 x 60 in)</td>
</tr>
</tbody>
</table>

- 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

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**Electric Motors (optional)**

<table>
<thead>
<tr>
<th><strong>Type</strong></th>
<th>2 x Squirrel cage induction motors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Output</strong></td>
<td>3,200 kW</td>
</tr>
<tr>
<td><strong>Voltage</strong></td>
<td>6.6 kV +/- 10% (other on request)</td>
</tr>
<tr>
<td><strong>Total Rated Current I&lt;sub&gt;N&lt;/sub&gt;</strong></td>
<td>332 A</td>
</tr>
<tr>
<td><strong>Frequency</strong></td>
<td>50 Hz (60 Hz on request)</td>
</tr>
<tr>
<td><strong>Revolutions</strong></td>
<td>1,500 min&lt;sup&gt;-1&lt;/sup&gt; (1,800 min&lt;sup&gt;-1&lt;/sup&gt; at 60 Hz)</td>
</tr>
<tr>
<td><strong>Max. starting current</strong></td>
<td>780 A</td>
</tr>
</tbody>
</table>

- 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**

- 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**

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

- 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

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**Hydraulic Shovel—6090 FS**

Dimensions:
- Width: 8,800 mm (28 ft 10 in)
- Height: 7,980 mm (26 ft 3 in)
- Length: 10,980 mm (36 ft)
- Wheelbase: 8,600 mm (28 ft 3 in)
- Bucket: 7,470 mm (24 ft 6 in)
- Engine deck: 9,990 mm (32 ft 9 in)
- Pin on bucket: 9,070 mm (29 ft 9 in)
- Track: 8,050 mm (26 ft 5 in)
- Track pitch: 2,000 mm (6 ft 7 in)
- Tread: 7,800 mm (25 ft 7 in)
- Cylinder: 7,600 mm (24 ft 11 in)
- Swing roller bearing: 2,945 mm (9 ft 8 in)
- Radiator: 3,150 mm (10 ft 4 in)
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)
- 1st stage Max. 1.6 km/h (0.99 mph)
- 2nd 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
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
Hydraulic Shovel—6090 FS

Operator’s Cab

<table>
<thead>
<tr>
<th></th>
<th>Approx. 8.8 m (28 ft 10 in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operator’s eye level</td>
<td></td>
</tr>
<tr>
<td>Internal dimensions of cab</td>
<td>Length: 2 200 mm (7 ft 3 in)</td>
</tr>
<tr>
<td></td>
<td>Width: 1 600 mm (5 ft 3 in)</td>
</tr>
<tr>
<td></td>
<td>Height: 2 150 mm (7 ft 1 in)</td>
</tr>
<tr>
<td>Internal dimensions of amenity cab</td>
<td>Length: 1 600 mm (5 ft 3 in)</td>
</tr>
<tr>
<td></td>
<td>Width: 1 600 mm (5 ft 3 in)</td>
</tr>
<tr>
<td></td>
<td>Height: 2 150 mm (7 ft 1 in)</td>
</tr>
</tbody>
</table>

- 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 transflective 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

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
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  - Horizontal automatic constant-angle bucket guidance
  - Vertical automatic constant-angle bucket guidance
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  - Heel shrouds at bottom edges
- Special wear packages for highly abrasive materials on request
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Swing System

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

• 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
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

<table>
<thead>
<tr>
<th>Type</th>
<th>Iron ore shovel</th>
<th>Heavy rock shovel</th>
<th>Oil sand shovel</th>
<th>Standard rock shovel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tooth system</td>
<td>on request</td>
<td>on request</td>
<td>on request</td>
<td>on request</td>
</tr>
<tr>
<td>Capacity SAE / PCSA 1:1</td>
<td>43.5 m³ (56.9 yd³)</td>
<td>48.4 m³ (63.3 yd³)</td>
<td>52.0 m³ (68.0 yd³)</td>
<td>59.8 m³ (78.2 yd³)</td>
</tr>
<tr>
<td>Capacity SAE / CECE 2:1</td>
<td>37.0 m³ (48.4 yd³)</td>
<td>42.0 m³ (54.9 yd³)</td>
<td>45.0 m³ (58.9 yd³)</td>
<td>52.0 m³ (68.0 yd³)</td>
</tr>
<tr>
<td>Total width</td>
<td>5 600 mm (18 ft 4 in)</td>
<td>5 600 mm (18 ft 4 in)</td>
<td>5 610 mm (18 ft 5 in)</td>
<td>6 170 mm (20 ft 3 in)</td>
</tr>
<tr>
<td>Inner width</td>
<td>5 100 mm (16 ft 9 in)</td>
<td>5 100 mm (16 ft 9 in)</td>
<td>5 175 mm (17 ft)</td>
<td>5 600 mm (18 ft 4 in)</td>
</tr>
<tr>
<td>Opening width</td>
<td>2 700 mm (8 ft 10 in)</td>
<td>2 700 mm (8 ft 10 in)</td>
<td>2 560 mm (8 ft 5 in)</td>
<td>2 650 mm (8 ft 8 in)</td>
</tr>
<tr>
<td>No. of teeth</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Weight incl. universal wear kit</td>
<td>77 000 kg (169,750 lb)</td>
<td>79 500 kg (175,270 lb)</td>
<td>82 000 mm (180,780 lb)</td>
<td>84 000 mm (185,190 lb)</td>
</tr>
<tr>
<td>Max. material density (loose)</td>
<td>2.6 t/m³ (4,380 lb/ft³)</td>
<td>2.2 t/m³ (3,710 lb/ft³)</td>
<td>2.0 t/m³ (3,370 lb/ft³)</td>
<td>1.8 t/m³ (3,030 lb/ft³)</td>
</tr>
</tbody>
</table>