**6090 FS**

Hydraulic Shovel

**Engine***

<table>
<thead>
<tr>
<th>Engine Model</th>
<th>2 × Cummins QSK60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Power – SAE J1995</td>
<td>3360 kW 4,500 hp</td>
</tr>
<tr>
<td>Net Power – SAE J1349</td>
<td>3360 kW 4,500 hp</td>
</tr>
</tbody>
</table>

*Electric drive option available (3200 kW) on 6090 AC FS

**Operating Specifications**

| Bucket Capacity – Front Shovel (heaped 2:1)  | 52.0 m³ 68.0 yd³ |
| Bucket Payload                              | 93.6 tonnes 103 tons |
| Operating Weight – Front Shovel              | 980 tonnes 1,080 tons |

*Electric drive option available (3200 kW) on 6090 AC FS
6090 FS Features

Substantially larger than any other available hydraulic mining shovel, the 6090 FS offers a versatile and selective digging capable alternative to electric rope shovels. Having garnered more than a decade of field experience in varying applications and climates, we have refined the design for improved reliability and productivity, substantiated by a greater than 100% increase in 6090 FS orders over the past two years. When paired with our ultra-class line of Cat® mining trucks, you can load up to 9000 tonnes (9,900 tons) of material per hour.

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We understand the challenges you face, the importance of reliability, and the relationship between uptime and productivity. That’s why we continually strive to produce the safest, most reliable and productive hydraulic mining shovels possible. Offering the widest payload range of any manufacturer in the industry, the ability to optimally pair with our popular line of mining trucks, and the support of our world-class Cat dealer network, we are uniquely positioned to partner with you to help achieve your productivity targets. We understand what matters to you. Our hydraulic mining shovels are built with you in mind. Because in mining, every day matters and every load counts.
Drive Systems
Balanced Combination of Power and Efficiency

Meeting Your Site Specific Needs with a Choice of Robust Drive System Options
Giving you the option to choose the drive system best suited for your operation, the Cat 6090 FS can be equipped with either two diesel engines for greater mobility, or an electric drive for better efficiency.

• Reliable Diesel Engines
  Delivering durable, reliable power that will keep your 6090 FS producing, the diesel engines currently in use were developed for mining and routinely achieve high uptime in mining applications.

• Efficient Electric Drive System on 6090 AC FS
  Providing a lower cost-per-ton alternative to diesel powered hydraulic mining shovels, our electric drive option maintains the ruggedness you need and offers superior availability since no refueling and less service is required.

The 6090 AC FS is the ideal solution for operations that do not require a great deal of mobility and value a low cost-per-ton model.
Twin-engine Concept  
Stay Up and Running More Consistently

Keep Producing and Ensure the Safety of Your Operators, Even During Single Engine Loss
You will realize enhanced safety, greater uptime, more productivity, and better serviceability as a result of our twin engine concept.

• Enhanced Safety
  The ability to move your shovel to a safe area for repair, away from highwalls, blast zones, or other safety hazards, is still possible with the use of a single engine.

• Greater Uptime and More Productivity
  65% of full production can still be achieved with the use of a single engine. This is due to the shovel’s continued ability to exert maximum digging forces, to lower the front attachment without requiring engine power (i.e., pressure-free), and to recuperate energy via its closed-loop swing circuit.

• Better Serviceability
  Troubleshooting is greatly simplified and expedited with the ability to compare one engine versus the other.
TriPower System
Superior Digging Capability and Bucket Fill Factors
Dig More Effectively with Our Unique TriPower Front Shovel Design

You will experience safer, easier and faster front shovel operation with TriPower, a system proven on over a thousand Cat hydraulic mining shovels worldwide. Generating superior mechanical leverage and control, our FS configured hydraulic mining shovels utilize a unique boom design that employs rotatable triangular rockers. This design facilitates quicker cycle times, increased effective lifting force, constant boom momentum, automatic constant bucket angle, and automatic roll-back limiter.

- **Quicker Cycle Times**
  - Faster lifting speeds are achieved, because the design enables the use of smaller-diameter boom cylinders.

- **Increased Effective Lifting Force**
  - Design transfers digging forces into the superstructure, creating supporting boom momentum in addition to momentum that is generated hydraulically.

- **Constant Boom Momentum**
  - Allows smaller boom cylinders for higher lifting speed.
  - Keeps lifting speed constant.
  - Enables the shovel to lift a single load along the entire digging distance.
  - No retracting of stick cylinders is required, ensuring that all hydraulic pumps are supplying the boom-up function.

- **Automatic Constant Bucket Angle**
  - Material spillage is avoided during boom lifting, because the filled bucket automatically maintains a constant bucket angle.
  - On conventional kinematics the operator has to control manually the bucket position during lifting which cut in half the available oil flow for the boom cylinders.

- **Automatic Roll-Back Limiter**
  - Preventing material spillage back on to the operator’s cab and machine superstructure, our system ensures that the bucket is always in a safe position, without operator control/manipulation, when it is at maximum height.
  - The boom cylinder continues to receive maximum oil flow, because the operator does not need to activate the bucket cylinder.
Hydraulic System
Easy Serviceability and Greater Productivity

**Straightforward, Safe System Maintenance**
Ensuring neat organization for safe operation, easy inspection, and fast service, and reducing the number of hoses needed, the main valve block is located on top of the boom.

**Faster Cycle Times**
Faster cycle times are realized, because float valves are used to lower the boom instead of engaging pumps. This facilitates faster boom movements and allows other operating functions to occur simultaneously, such as bucket curl and stick in/out.

**Greater Control**
Your operators will experience greater control with our five circuit hydraulics, allowing for two cylinder motions, two travel motions, and swing to be controlled simultaneously.
Protect and Extend the Life of Your Hydraulic Components and Seals

Providing a more efficient means of cooling, particularly in demanding applications, our unique independent oil cooling system will extend the life of your hydraulic mining shovel’s components.

More Efficient Oil Cooling

Our system is independent of return oil, achieving efficiency through the utilization of dedicated pumps that provide cooling capacity as needed, whether the engine is idling or under load. That means optimum oil temperature is being maintained, even while your operator waits for the next truck to load. Competitive hydraulic mining shovels only provide cooling when the machine is working and the engine is under load.

Additional efficiency is achieved via our thermostatically controlled radiator fan speed. The fans do not run until oil temperature exceeds a temperature of 50° C (122° F), saving energy.

Optimal Oil Temperature Maintained

The highly efficient oil cooling system ensures that the oil temperature is only 25° C to 30° C (45° F to 54° F) higher than the ambient temperature. Thus the hydraulic oil working temperature remains within the optimal operating viscosity range of 50° C to 70° C (122° F to 158° F).
Experience Improved Machine Control and Component Life, while Reducing Fuel Consumption and Noise Emission, with Our Intelligent Pump Managing System

Delivering optimal performance, our pump managing system continuously evaluates actual engine and hydraulic operating values against set values, and adjusts pump output accordingly. This results in efficient use of the engine for greater productivity.

Pump managing system advantages include:

- Best possible utilization of engine output and engine overload avoidance via electronic load limit regulation
- Less energy consumption and less thermal load on hydraulic oil with zero oil flow regulation for main pumps
- Less fuel consumption and lower noise emission via automatic RPM reduction
- Reduced component wear and lower noise emission with automatic oil flow reduction for closing/opening of bucket clam
- Protection of components with automatic oil flow reduction if hydraulic and/or engine coolant temperature exceed set maximum
- Improved operator control response via on-demand pump flow
Closed-loop Swing Circuit
More Efficient Energy Use and Faster Boom Lift Motion During Swing

Load More Material, at Lower Cost, with the Energy Recovery Capability of Our Closed-Loop Swing System
Delivering faster cycle times and improved energy efficiency, while also generating less heat, our closed-loop swing circuit provides distinct advantages over competitive machines utilizing open-circuit swing systems.

Greater Efficiency Via Energy Recovery
Kinetic energy captured during the swing motion is fed back into the system during deceleration, providing more power to drive the main and auxiliary pumps. Energy is saved during deceleration, because braking occurs via counteracting controls, as opposed to throttles used in open circuit swing systems.

Energy Savings During Acceleration
Energy is saved during acceleration via torque control, providing a pressure balance valve that controls the swing pump against pressure in the closed-loop swing circuit, ensuring that only the minimum necessary oil flow is utilized at any given time.

Faster Cycle Times
Faster boom lift motion during swing is achieved with our closed-loop swing system, increasing overall productivity.
Get Peak Operator Performance with Our Safe and Comfortable Operator’s Cab

We understand that the most important factor in your hydraulic mining shovel’s effectiveness is the performance of its operator. To help make their workday as productive as possible, we’ve incorporated safety and comfort features into the 6090 FS operator’s cab.

Protection for Your Operator; Every Day, Every Shift

• Safety glass is used for all cab windows, and armored glass for the windshield.
• Operator’s seat is equipped with integrated safety switch that automatically neutralizes the hydraulic controls when the operator leaves the seat.
• The height of the cab module ensures an eye level of approximately 8.8 m (28 ft 10 in), providing excellent visibility of the digging and loading areas.
• Cab meets Falling Object Protection System (FOPS) and DIN ISO 3449 standards.

Supporting Peak Operator Performance with Comfort Features

• Pneumatically cushioned, multi-adjustable operator’s seat.
• Large, transflective color touch-screen display provides vital machine monitoring and diagnostic data for convenient troubleshooting and service assistance.
• Enhanced control response and servo adjustment capability via electro-hydraulic servo control.
**Enhanced Control Response and Optimized Hydraulic Engine Load Management**
Help your team meet productivity and performance standards with our intuitive, informative on-board electronics.

**Electro-Hydraulic Servo Control**
- **Enhanced Control Response**
  The system relays actuating signals from the joysticks, delivering fast and precise machine reactions that reduce operator fatigue.
- **Increased Uptime**
  Uptime is increased as a result of simplified troubleshooting and advanced diagnostic capabilities.
- **Greater Operator Comfort**
  Easier setting of servo control characteristics allow operators to adjust to their preference.
- **Clean and Quiet Cab Environment**
  No hydraulic lines are present in the cab or the cab module, ensuring a clean arrangement with less noise emission.

**Control and Monitoring Platform (CAMP)**
- **Reduced Control System Inventory**
  Streamlined system requires only one type of controller for each function (i.e., left side drive train, right side drive train, servo, and auxiliary) reducing the number of required controllers in the system and associated replacement stock.
- **Less Fuel Consumption**
  Engine works in optimal range of performance during the entire digging cycle, reducing fuel burn.
- **Increased Component Life**
  Reduced hydraulic pulsation lessens stress imposed on the engine and hydraulic components.
- **Enhanced Operator Comfort**
  Less vibration and more even machine movement via reduced pressure peaks.
- **On-screen Documentation**
  The Parts book, Technical handbook, and Operating handbook, as well as hydraulic and electric schematics, are available in electronic format.
Cat MineStar System and Technology Solutions
Evolving Your Mine for Greater Safety and Productivity

Helping You Enhance Safety and Productivity Through Technology
Aimed at enhancing the productivity and profitability of your hydraulic mining shovel, we currently offer a combination of Cat MineStar System offerings and Cat hydraulic mining shovel technology solutions.
Cat MineStar System

Helping you achieve your goals for enhanced mine site safety, improved efficiency, reduced operating costs, and greater profitability, the Cat MineStar System provides the most comprehensive suite of mining technology products in the industry. It consists of a number of configurable capability sets – Fleet, Terrain, Detect, Health, and Command – that allow you to scale the system to your mine site needs. Cat MineStar System helps you manage everything from material tracking to sophisticated real-time fleet management, machine health systems, autonomous equipment, and more.

The Cat 6090 FS is currently able to utilize three of the Cat MineStar System capability sets:

- **Fleet**
  Fleet provides real-time machine tracking, assignment and productivity management, providing a comprehensive overview of all your asset operations from anywhere in the world.

- **Terrain**
  Terrain enables high-precision management of drilling, dragline, grading and loading operations through the use of guidance technology. It increases machine productivity and provides you real-time feedback for improved efficiency.

- **Detect**
  Detect provides equipment operators with enhanced awareness for increased site safety, using a combination of radars, an in-cab display, and multiple cameras.

The remaining Cat MineStar System capability sets are currently under development for the Cat hydraulic mining shovel product line.

Hydraulic Mining Shovel Technology Solutions

- **Monitoring and Diagnostic System**
  Enhancing diagnostic capabilities and providing detailed troubleshooting functions, our Board Control System uses sensors throughout the machine to monitor operating data, record faults, and notify the operator audibly and visually. This promotes the earliest possible detection of faults and allows for timely maintenance planning and assistance for speedy repair.
Loading/Hauling Efficiency
Move More Material with Optimal Pass Match Pairings

Achieve Targeted Loading/Hauling Production with Perfectly Paired Cat Hydraulic Mining Shovels and Mining Trucks

For full truck payloads with minimum loading time, an efficient loading/hauling system begins with an optimized equipment match. Cat hydraulic mining shovels are matched with Cat mining trucks to maximize volume of material moved at the lowest operating cost per ton.

6090 FS Pass Match with Cat Mining Trucks

<table>
<thead>
<tr>
<th></th>
<th>MT4000D AC</th>
<th>793F/793D</th>
<th>MT5300D AC</th>
<th>795F AC</th>
<th>797F</th>
</tr>
</thead>
<tbody>
<tr>
<td>6090 FS</td>
<td>218 tonne (240 ton)</td>
<td>226 tonne (250 ton)</td>
<td>290 tonne (320 ton)</td>
<td>313 tonne (345 ton)</td>
<td>363 tonne (400 ton)</td>
</tr>
<tr>
<td>6090 FS</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3-4</td>
<td>4</td>
</tr>
</tbody>
</table>

6090 FS Pass Match with Unit Rig™ Mining Trucks

<table>
<thead>
<tr>
<th></th>
<th>MT5500 AC</th>
<th>MT6300 AC</th>
</tr>
</thead>
<tbody>
<tr>
<td>6090 FS</td>
<td>326 tonne (360 ton)</td>
<td>363 tonne (400 ton)</td>
</tr>
<tr>
<td>6090 FS</td>
<td>3-4</td>
<td>4</td>
</tr>
</tbody>
</table>
Rugged Front Shovel Attachment Designed and Fabricated to Withstand Your Extreme Mining Conditions

To extend service life and ensure that your shovel keeps producing, our front shovel attachment structures are designed for durability and dependability. Extended performance in the harsh mining conditions you face daily is accomplished through selection of high-strength steels and rugged castings, joined and thermally stress-relieved, to help you achieve your productivity targets.

Front Shovel Attachment Structures Include:
• Heavy castings at all pivot points
• Better flow of forces and less welding seams, as top chords are made of one bend plate
• Entire boom and stick are stress relieved after welding
• Welding procedures allow for internal welding (double prep weld)
Swing System
Longer Component Life for Better Swing System Reliability

More Reliable Swing Component Life
Extending component life and ultimately improving machine uptime, our swing system includes a triple-race swing roller bearing with internal gearing connected to an automatic lubrication system.

For added reliability, all lube lines are located inside the roller bearing for maximum protection.

Service Friendly
Easier maintenance is afforded by the free accessibility of swing gears and rotary distributor.
Less Wear and Tear on Crawler Components
Extending track life and improving overall machine reliability, our undercarriages are engineered with extensive use of finite element analysis, steel structures are optimized, travel motors are well-protected by strong cover plates and hinged door covers, and a unique robust track chain incorporates a combined pad/link design. Further extending track life, a state-of-the-art track tensioning system with membrane accumulator automatically adapts the tensioning of the tracks, depending upon operating conditions.
Safety
Designed with Your Safety as Our Top Priority

Sharing your commitment to safety, and driven by our commitment to Zero Harm, we work tirelessly to design the safest machines possible to protect your most important asset; your employees. That is why we updated the design of the 6090 FS in accordance with the principles of MDG 41 and 15, and offer this standard, not as an option or upgrade.

Some examples of the safety-enhancing features of the Cat 6090 FS hydraulic mining shovel includes the following:

**Machine Access**
- All stairways have 45° angle for safe and comfortable access and movement about the machine.
- Slide down emergency egress ladder directly adjacent to the operator’s cab.
- Hydraulically operated boarding ladder with emergency lowering via nitrogen accumulator ensures that ladder remains operational even when engines shut off.
- Machine swing and propel capability is switched-off when ladder is in down position.

**Service and Maintenance**
- Improved routing and clamping of hydraulic hoses.
- Hydraulic hoses and electric wiring are separated from each other for fire prevention.
- All service areas are accessible via anti-slip walkways, and trip hazards eliminated.
- All hot surfaces are covered to prevent burns.

**Electrical System**
- Cabinet with battery isolation switch, mounted on top deck directly above the battery box, allows quick and easy shut-off of voltage on the entire shovel.
- Cabinet contains a starter isolator which allows on-board voltage, but prevents starting of engines.

**Emergency Shut-offs**
- An easily accessible, standard shut-off switch located in the cab shuts down the electrical system in case of emergencies.
- Additional shut-off switches are located on the machine, in the machine house or accessible from the ground with pull ropes.

**Precise Bucket Control**
- Minimizing the potential for material spill on to the attachment or cab, the TriPower automatic roll-back limiter prevents the bucket from being curled back too far.
Lowering your operating costs and maximizing your hydraulic mining shovel’s uptime and productivity is of supreme importance to us. To that end, we’ve made vital components more accessible and designed simpler systems to make maintenance activities quicker and easier.

**Open, Spacious Access to Components**
- Facilitating easier maintenance, exceptional accessibility is provided to systems like the swing motor, swing gearbox and rotary distributor in the well organized superstructure. The engine is accessible from three sides.
- Easily accessed by walkways on both sides, the boom-mounted main valve block, a feature unique to Cat hydraulic mining shovels, provides a clean layout and reduces the number of hoses leading from the superstructure to the attachment.

**Simple Hydraulic System with Main Valve Block Positioned on Boom**
- Ensuring neat organization for safe operation, easy inspection and fast service, the design of our hydraulic system significantly reduces the total number of frequently moving hoses from the superstructure to the attachment.
- Longer hose life via improved routing in accordance with MDG design standards.

**Easy Ground-level Fuel and Fluid Replenishment**
- Quick fuel and fluid replenishment is made easy with a retractable service station underneath the engine module, accessible at ground-level.

**Improved Drive Train Troubleshooting**
- Twin-engine design facilitates troubleshooting of drive trains, as one engine can be compared to the other.
Customer Support
Stay Up and Running with Service and Support from Our Unmatched Global Network

Commitment Makes the Difference
Cat dealers offer a wide range of solutions, services and products that help you lower costs, enhance productivity and manage your operation more efficiently. From the time you select a piece of Cat equipment until the day you trade or sell it, the support you get from your Cat dealer makes the difference.

Dealer Capability
Cat dealers provide the level of support you need, on a global scale. Dealer expert technicians have the knowledge, experience, training and tooling necessary to handle your repair and maintenance needs, when and where you need them.

Product Support
When Cat products reach the field, they are supported by a worldwide network of parts distribution facilities, dealer service centers and technical training facilities to keep your equipment up and running.

Cat customers rely on prompt, dependable parts availability through our global dealer network, ready to meet your needs 24/7.

Service Support
Every piece of Cat equipment is designed and built to provide maximum productivity and operating economy throughout its working life. Cat dealers offer a wide range of service plans that will maximize uptime and return on your investment, including:

• Preventive Maintenance Programs
• Diagnostic Programs, such as Scheduled Oil Sampling and Technical Analysis
• Rebuild and Reman Option
• Customer Support Agreements

Application Awareness
Operating and maintenance costs are influenced by many application and site-specific factors, such as: material density and fragmentation, payload, bench height, truck positioning, ground conditions, amount of traveling and maintenance. Your Cat dealer can provide you with an understanding of the effects application characteristics and operating techniques have on maintenance and operating costs.

Operation
Your Cat dealer can arrange training programs to help operators improve productivity, decrease downtime, reduce operating costs and enhance safety.
Meeting the needs of today without compromising the needs of tomorrow is the goal for all Cat machinery. The commitment to helping you operate safely and sustainably is affirmed in the production of the 6090 FS hydraulic mining shovel.

**Cat Hydraulic Mining Shovel Sustainability:**

- **Electric Power Option**
  Produces less emissions, heat, and sound, and avoids disposal/replenishment of engine oil and oil filters.

- **Energy Recovery**
  Emit less heat and improve energy efficiency via the energy recovery capability of the closed-loop swing circuit.

- **Rebuilds**
  Decrease your energy use and material consumption with a machine that’s designed to be rebuilt.
### 6090 FS Hydraulic Mining Shovel Specifications

#### General Data

<table>
<thead>
<tr>
<th>Operating weight</th>
<th>Face Shovel</th>
<th>980 tonnes</th>
<th>1,080 tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine output</td>
<td>SAE J1995</td>
<td>3360 kW</td>
<td>4,500 hp</td>
</tr>
<tr>
<td>Standard bucket capacity</td>
<td>Face Shovel (SAE 2:1)</td>
<td>52.0 m³</td>
<td>68.0 yd³</td>
</tr>
</tbody>
</table>

#### Features

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

#### Operating Weight

<table>
<thead>
<tr>
<th>Shovel</th>
<th>Standard track pads</th>
<th>2000 mm</th>
<th>6 ft 7 in</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating weight</td>
<td>980 000 kg</td>
<td>2,160,510 lb</td>
<td></td>
</tr>
<tr>
<td>Ground pressure</td>
<td>25.8 N/cm²</td>
<td>37.4 psi</td>
<td></td>
</tr>
</tbody>
</table>

- Additional track pads available on request

### Diesel Engines

<table>
<thead>
<tr>
<th>Cummins QSK60</th>
<th>2 × QSK60 2-stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make and model</td>
<td></td>
</tr>
<tr>
<td>Total rated net power ISO 3046/1</td>
<td>3360 kW</td>
</tr>
<tr>
<td></td>
<td>1,800 min⁻¹</td>
</tr>
<tr>
<td>Total rated net power SAE J1349</td>
<td>3360 kW</td>
</tr>
<tr>
<td></td>
<td>1,800 min⁻¹</td>
</tr>
<tr>
<td>Total rated net power SAE J1995</td>
<td>3360 kW</td>
</tr>
<tr>
<td></td>
<td>1,800 min⁻¹</td>
</tr>
<tr>
<td>Number of cylinders (each engine)</td>
<td>16</td>
</tr>
<tr>
<td>Bore</td>
<td>159 mm</td>
</tr>
<tr>
<td>Stroke</td>
<td>190 mm</td>
</tr>
<tr>
<td>Displacement</td>
<td>60.2 L</td>
</tr>
<tr>
<td>Aspiration</td>
<td>2-stage turbocharged; aftercooled and intercooled</td>
</tr>
<tr>
<td>Maximum altitude without deration – above sea level</td>
<td>4880 m</td>
</tr>
<tr>
<td>Emission certification</td>
<td>U.S. EPA Tier 4 Interim</td>
</tr>
<tr>
<td>Fuel tank capacity</td>
<td>15 100 L</td>
</tr>
</tbody>
</table>

- Hydraulically driven radiator fan with electronically controlled fan speed
- Micro processed engine control
- Heavy-duty air filters with automatic dust evacuation
- Two-stage fuel filter includes 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 hours

### Electric Motors – 6090 AC FS

<table>
<thead>
<tr>
<th>Type</th>
<th>2 × Squirrel cage induction motors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Output</td>
<td>3200 kW</td>
</tr>
<tr>
<td>Voltage</td>
<td>6.6 kV ± 10% (other on request)</td>
</tr>
<tr>
<td>Total Rated Current I_N</td>
<td>332A</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 Hz (60 Hz on request)</td>
</tr>
<tr>
<td>Revolutions</td>
<td>1,500 min⁻¹ (1,800 min⁻¹ at 60 Hz)</td>
</tr>
<tr>
<td>Maximum starting current</td>
<td>780A</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
**Electrical System (diesel drive)**

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>System voltage</td>
<td>24V</td>
</tr>
<tr>
<td>Batteries in series/parallel installation</td>
<td>6 × 210 Ah – 12V each</td>
</tr>
<tr>
<td></td>
<td>630 Ah – 24V in total</td>
</tr>
<tr>
<td>Alternators</td>
<td>2 × 175A each</td>
</tr>
<tr>
<td>Working spot lights</td>
<td>12 × high brightness LED lights</td>
</tr>
<tr>
<td>• Battery isolation relays</td>
<td></td>
</tr>
<tr>
<td>• Emergency stop switches accessible from ground level, in engine module and in operator’s cab</td>
<td></td>
</tr>
</tbody>
</table>

**Hydraulic System with Pump Managing System**

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main pumps</td>
<td>8 × variable flow axial piston pumps</td>
</tr>
<tr>
<td>Maximum oil flow</td>
<td></td>
</tr>
<tr>
<td>Diesel version</td>
<td>8 × 936 L/min 8 × 247 gal/min</td>
</tr>
<tr>
<td>AC version</td>
<td>8 × 943 L/min 8 × 249 gal/min</td>
</tr>
<tr>
<td>Maximum pressure, attachment</td>
<td>310 bar 4,495 psi</td>
</tr>
<tr>
<td>Maximum pressure, travel</td>
<td>360 bar 5,220 psi</td>
</tr>
<tr>
<td>Swing pumps</td>
<td>6 × reversible swash plate pumps</td>
</tr>
<tr>
<td>Maximum oil flow</td>
<td></td>
</tr>
<tr>
<td>Diesel version</td>
<td>6 × 488 L/min 6 × 129 gal/min</td>
</tr>
<tr>
<td>AC version</td>
<td>6 × 496 L/min 6 × 131 gal/min</td>
</tr>
<tr>
<td>Maximum pressure, swing pumps</td>
<td>350 bar 5,080 psi</td>
</tr>
<tr>
<td>Total volume of hydraulic oil – approximately</td>
<td>13 000 L 3,450 gal</td>
</tr>
<tr>
<td>Hydraulic tank capacity – approximately</td>
<td>10 000 L 2,640 gal</td>
</tr>
</tbody>
</table>

- 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)

**Hydraulic Oil Cooling**

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil flow of cooling pumps</td>
<td></td>
</tr>
<tr>
<td>Diesel version</td>
<td>4 × 975 L/min 4 × 258 gal/min</td>
</tr>
<tr>
<td>AC version</td>
<td>4 × 1000 L/min 4 × 264 gal/min</td>
</tr>
<tr>
<td>Diameter of fans</td>
<td>4 × 1524 mm 4 × 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

**Swing System**

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swing drives</td>
<td>6 compact planetary transmissions with axial piston motors</td>
</tr>
<tr>
<td>Parking brakes</td>
<td>Wet multiple disc brake, spring-loaded/hydraulically released</td>
</tr>
<tr>
<td>Maximum swing speed</td>
<td></td>
</tr>
<tr>
<td>Diesel version</td>
<td>3.9 rpm</td>
</tr>
<tr>
<td>AC 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

**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
## Operator’s Cab

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operator’s eye level – approximately</td>
<td>8.8 m</td>
</tr>
<tr>
<td>Internal dimensions of cab</td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>2200 mm</td>
</tr>
<tr>
<td>Width</td>
<td>1600 mm</td>
</tr>
<tr>
<td>Height</td>
<td>2150 mm</td>
</tr>
<tr>
<td>Internal dimensions of amenity cab</td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>1600 mm</td>
</tr>
<tr>
<td>Width</td>
<td>1600 mm</td>
</tr>
<tr>
<td>Height</td>
<td>2150 mm</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 according 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 includes 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

## Undercarriage

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel speed (2 stages)</td>
<td></td>
</tr>
<tr>
<td>1st stage – maximum</td>
<td>1.6 km/h</td>
</tr>
<tr>
<td>2nd stage – maximum</td>
<td>2.2 km/h</td>
</tr>
<tr>
<td>Maximum tractive force</td>
<td>4338 kN</td>
</tr>
<tr>
<td>Gradeability of travel drives –</td>
<td>44%</td>
</tr>
<tr>
<td>maximum</td>
<td></td>
</tr>
<tr>
<td>Track pads (each side)</td>
<td>48</td>
</tr>
<tr>
<td>Bottom rollers (each side)</td>
<td>7</td>
</tr>
<tr>
<td>Support rollers (each side)</td>
<td>2 plus a skid plate in between</td>
</tr>
<tr>
<td>Travel drives (each side)</td>
<td>1 planetary transmission with 2 two-stage axial piston motors</td>
</tr>
<tr>
<td>Parking brake</td>
<td>Wet multiple disc brake, spring applied/ hydraulically released</td>
</tr>
</tbody>
</table>

- 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
**Automatic Lubrication System**

- Capacity of grease container: 1000 L (264 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

**Attachment**

- 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 wear package consisting 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
6090 FS Hydraulic Mining Shovel Specifications

**Dimensions**

All dimensions are approximate.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8800 mm</td>
<td>2945 mm</td>
<td>3150 mm</td>
<td>7470 mm</td>
<td>1135 mm</td>
<td>8445 mm</td>
<td>10 980 mm</td>
<td>8050 mm</td>
<td>7800 mm</td>
<td>9720 mm</td>
<td>7600 mm</td>
<td>2000 mm</td>
<td>8600 mm</td>
<td>9990 mm</td>
</tr>
<tr>
<td></td>
<td>28 ft 10 in</td>
<td>9 ft 8 in</td>
<td>10 ft 4 in</td>
<td>24 ft 6 in</td>
<td>3 ft 9 in</td>
<td>27 ft 8 in</td>
<td>36 ft 0 in</td>
<td>26 ft 5 in</td>
<td>25 ft 7 in</td>
<td>31 ft 11 in</td>
<td>24 ft 11 in</td>
<td>6 ft 7 in</td>
<td>28 ft 3 in</td>
<td>32 ft 9 in</td>
</tr>
</tbody>
</table>
Working Range – TriPower Face Shovel Attachment (FS)

All dimensions are approximate.

**Working Range**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Ft</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom</td>
<td>9.5</td>
<td>31 ft 2 in</td>
</tr>
<tr>
<td>Stick</td>
<td>5.8</td>
<td>19 ft</td>
</tr>
</tbody>
</table>

**Working Range**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Ft</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum digging height</td>
<td>20.2</td>
<td>66 ft 3 in</td>
</tr>
<tr>
<td>Maximum digging reach</td>
<td>19.0</td>
<td>62 ft 4 in</td>
</tr>
<tr>
<td>Maximum digging depth</td>
<td>2.3</td>
<td>7 ft 7 in</td>
</tr>
<tr>
<td>Maximum dumping height</td>
<td>14.5</td>
<td>47 ft 7 in</td>
</tr>
<tr>
<td>Crowd distance on level</td>
<td>6.2</td>
<td>20 ft 4 in</td>
</tr>
</tbody>
</table>

**Maximum digging forces**

<table>
<thead>
<tr>
<th>Force Type</th>
<th>kN</th>
<th>lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum crowd force</td>
<td>3300</td>
<td>741,610</td>
</tr>
<tr>
<td>Maximum crowd force at ground level</td>
<td>3200</td>
<td>719,140</td>
</tr>
<tr>
<td>Maximum breakout force</td>
<td>2400</td>
<td>539,350</td>
</tr>
</tbody>
</table>

**Face Shovels**

<table>
<thead>
<tr>
<th>Type</th>
<th>Iron Ore Shovel</th>
<th>Heavy Rock Shovel</th>
<th>Heavy Rock Bucket 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/PCS A 1:1</td>
<td>43.5 m³</td>
<td>56.9 yd³</td>
<td>48.4 m³</td>
<td>63.3 yd³</td>
</tr>
<tr>
<td>Capacity SAE/CECE 2:1</td>
<td>37.0 m³</td>
<td>48.4 yd³</td>
<td>42.0 m³</td>
<td>54.9 yd³</td>
</tr>
<tr>
<td>Total width</td>
<td>5600 mm</td>
<td>18 ft 4 in</td>
<td>5600 mm</td>
<td>18 ft 4 in</td>
</tr>
<tr>
<td>Inner width</td>
<td>5100 mm</td>
<td>16 ft 9 in</td>
<td>5100 mm</td>
<td>16 ft 9 in</td>
</tr>
<tr>
<td>Opening width</td>
<td>2700 mm</td>
<td>8 ft 10 in</td>
<td>2700 mm</td>
<td>8 ft 10 in</td>
</tr>
<tr>
<td>Number of teeth</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Weight including universal wear kit</td>
<td>77 000 kg</td>
<td>169,750 lb</td>
<td>79 500 kg</td>
<td>175,270 lb</td>
</tr>
<tr>
<td>Maximum material density (loose)</td>
<td>2.6 t/m³</td>
<td>4,380 lb/yd³</td>
<td>2.2 t/m³</td>
<td>3,710 lb/yd³</td>
</tr>
</tbody>
</table>
## Optional Equipment

Optional equipment may vary. Consult your Cat dealer for details.

### 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 1800 mm (5 ft 11 in)

Additional optional equipment available on request.