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 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

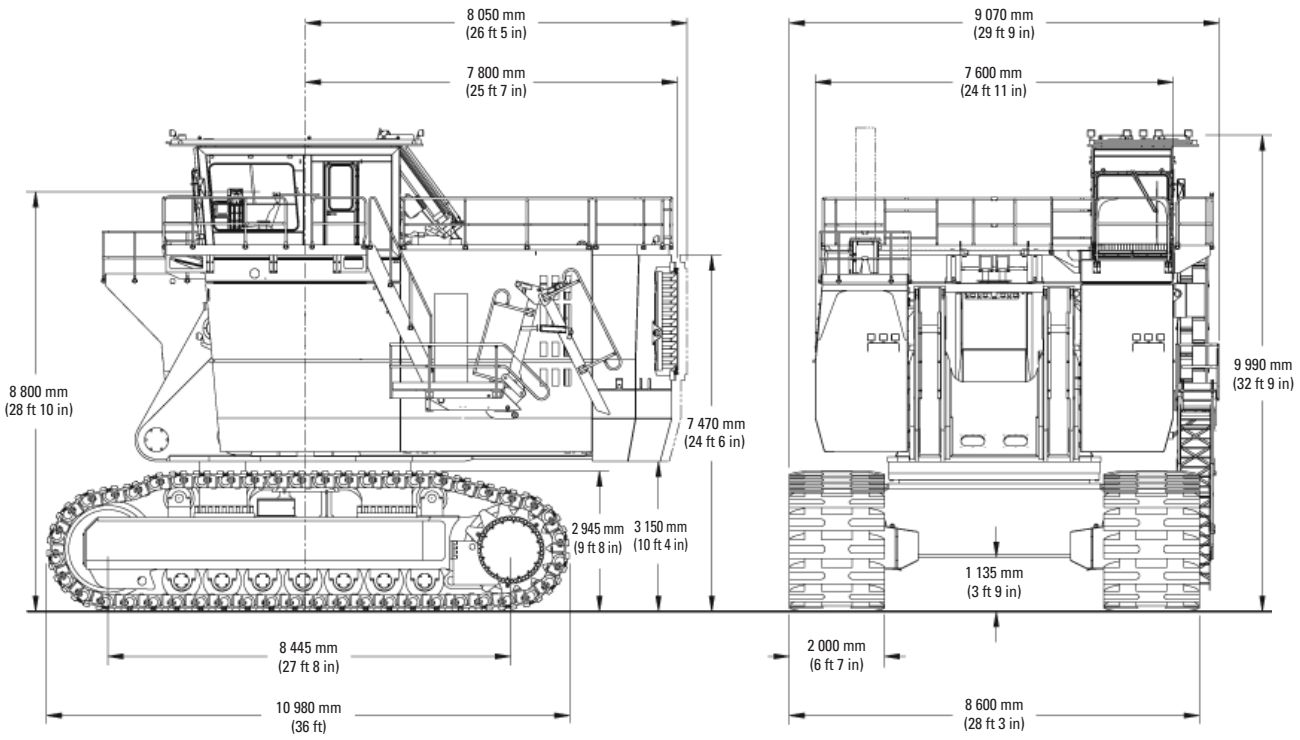
- Battery isolation relays
- Emergency stop switches accessible from ground level, in engine module and in operator's cab

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 avaiable 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 FS



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 FS

Hydraulic System with Pump Managing System	
Main pumps	8 x variable flow axial piston pumps
Max. oil flow Diesel version Electric version	 8 x 936 l/min (8 x 247 US gal/min) 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 Electric version	 6 x 488 l/min (6 x 129 US gal/min) 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 2nd stage	Max. 1.6 km/h (0.99 mph) 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

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 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

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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 Electric version	3.9 rpm 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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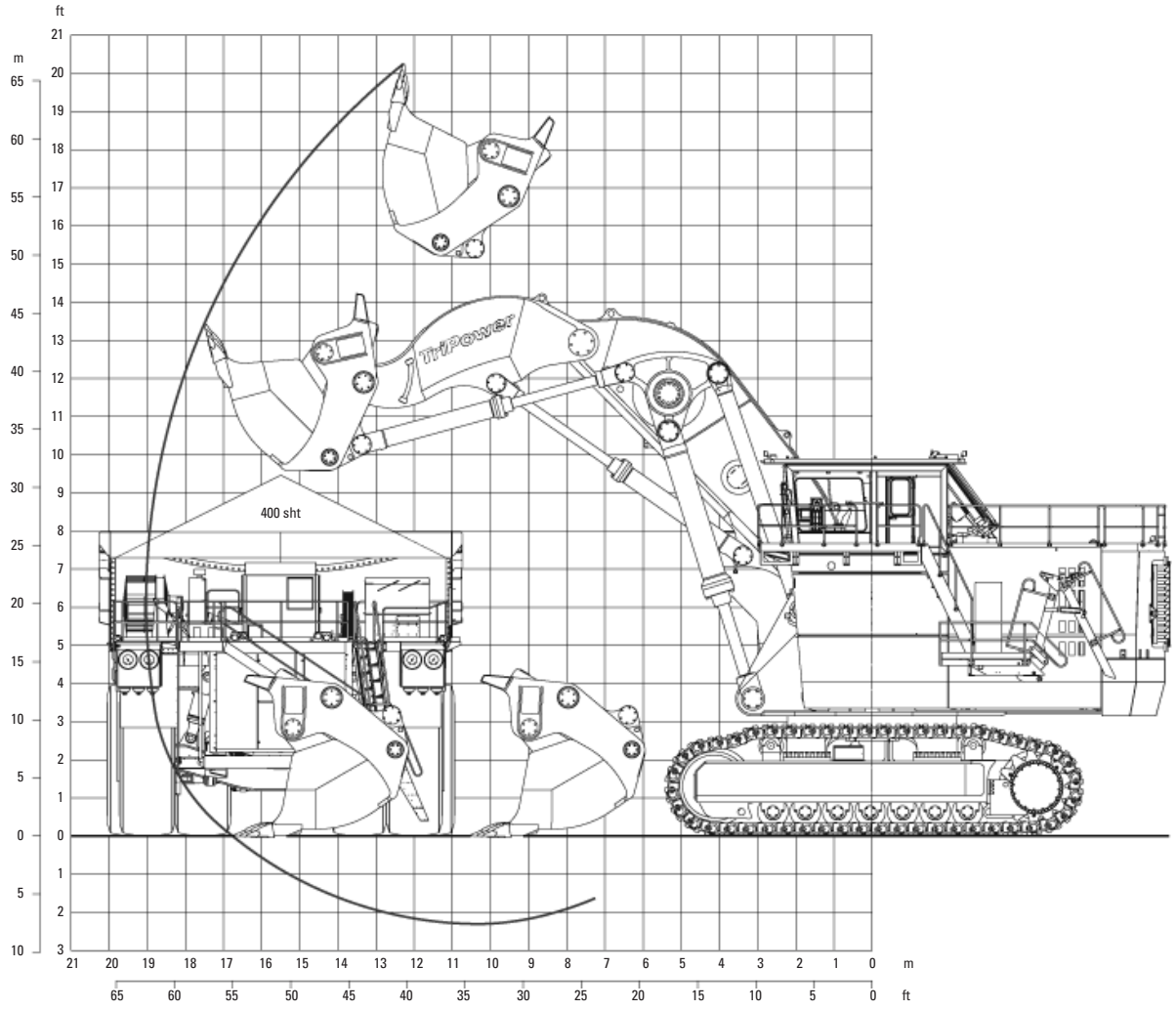
TriPower Face Shovel Attachment (FS)

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 m^3 (48.4 yd^3)**	**42.0 m^3 (54.9 yd^3)**	**45.0 m^3 (58.9 yd^3)**	**52.0 m^3 (68.0 yd^3)**
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 mm (180,780 lb)	84 000 mm (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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