

KOMATSU®

960E-1K

GROSS HORSEPOWER

2610 kW **3,500 HP**

NOMINAL GVW

576072 kg **1,270,000 lb**

960E

ELECTRIC DRIVE TRUCK



Photo may include optional equipment.

WALK-AROUND

Productivity Features

- High performance Komatsu SSDA18V170 engine
Gross horsepower 2610 kW **3,500 HP**
- Komatsu Insulated-Gate Bipolar Transistor (IGBT)
AC electric drive system
- Advanced Hill Start
- 4620 kW **6,196 HP** continuous retarding capability
- Traction control
- Propulsion/retard speed control
- Customer specific body
- Hydropneumatic suspension designed for
optimum performance and ride
- Tight turning radius 16 m **52' 6"**
- Payload Meter III®

Environmentally Friendly

- Komatsu SSDA18V170 engine is compliant
with US EPA emissions regulations
- Fuel efficient engine
- 57 % less fluids compared to similar class
mechanical drive trucks
- Low noise retarding
- Electrically driven main blower

Reliability Features

- Frame structurally enhanced for
327 metric ton **360 short ton** payload
- Proven and reliable hydraulic system
- Steering and brake accumulators
- Hydraulically actuated multiple-disc
wet brakes



GROSS HORSEPOWER
2610 kW 3,500 HP

NOMINAL GVW
576072 kg 1,270,000 lb

Operator Environment

- Ergonomically designed spacious cab with excellent visibility
- Fully adjustable driving position settings
- Four post ROPS/FOPS Level 2 Cab
- Advanced dash panel with payload display
- AM/FM/CD/MP3/USB radio



Easy Maintenance

- KOMTRAX Plus allows immediate diagnostics of key engine, chassis, and drive system components
- Oil-cooled wet disc braking system reduces wear and extends component replacement intervals
- Extended oil change intervals based on the Centinel® and Reserve systems
- Automatic lubrication system
- Eliminator® oil filtration system
- In-tank fast fuel system

PRODUCTIVITY FEATURES

Komatsu SSDA18V170 High Horsepower Engine

Komatsu's SSDA18V170 engine was designed and developed by Industrial Power Alliance (IPA) technical joint venture between Komatsu and Cummins®. This 2610 kW **3,500 HP** engine will operate in most of today's mining applications without experiencing power derate. Fuel efficiency is maximized due to optimized air handling with two-stage turbocharging. A standard pre-lube system is designed to eliminate start-up wear and increase overhaul life. Standard features include:

- CENSE® on board monitoring of engine performance for each cylinder
- CENTINEL® Advanced Engine Oil Management System with Reserve oil
- ELIMINATOR® filtration system reduces oil and filter changes by one-third



Electric Dynamic Retarder

The 4620 kW **6,196 HP** retarding system provides state-of-the-art braking capacity for navigating today's mining operations which contain steep continuous descents and sharp switchbacks.

The power capacity, coupled with the low noise high volume fan, makes it possible for the operator to maintain control with confidence while hauling downhill. The dynamic electric retarder reduces the need for service brake applications.

Komatsu Drive

Field tested in the toughest applications, Komatsu Drive is a unique system that features:

- Improved torque capacity
- Top speed of 64 kph **40 mph**
- Independent control of the rear wheel motors
- Siemens liquid cooled IGBT inverter system and Traction Control algorithms

These features come together to deliver higher reliability and superior performance in applications ranging from high rolling resistance to long flat hauls.



Hill Start

An innovative feature the Komatsu drive system provides is the Hill Start logic. This built in functionality will help reduce rollback in the event of a stop while the truck is ascending a ramp. Additionally, the feature automatically controls the braking function when an operator that is stopped on grade wants to continue up the ramp.

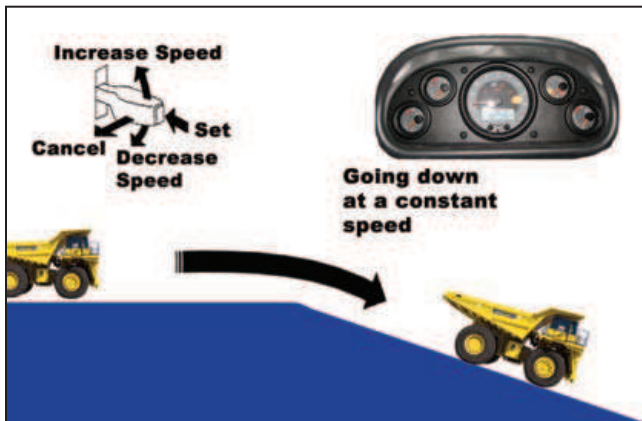


Traction Control

During slippery conditions, the 960E-1K wheel traction control technology detects and corrects wheel spin or slide events. Traction Control operates automatically and independently of the service brakes, providing a means of controlling the machine in slippery conditions.

Propulsion/Retard Speed Control

Propulsion/Retard Speed Control allows the operator to set a desired speed. This function monitors the speed of each wheel independently for immediate adjustments in propulsion or retarding effort in order to maintain the desired speed.



Customer Specific Body

Komatsu works with each customer to meet all of the criteria for body capacity and distribution. The Komatsu Body Worksheet (BW) process obtains the appropriate information from the customer about key factors that will help to determine the correct body for their site.

Komatsu offers a standard all-welded steel, flat floor body with an over the cab canopy and horizontal bolsters.

- Standard Body Struck Capacity: 149 m³ **195 yd³**
- Standard Body SAE Heaped 2:1: 214 m³ **280 yd³**
- Standard Komatsu Body Weight: 40823 kg **90,000 lbs**



Photos may include optional equipment.

960E-1K ELECTRIC DRIVE TRUCK



Steering

By using double acting hydraulic steering cylinders with a six-point articulation linkage, the 960E-1K power steering system provides steering control with minimal operator effort. The turning radius of the 960E-1K is 16 m **52' 6"**, which provides excellent maneuverability for tight loading and dumping conditions. The steering accumulators comply with ISO-5010 standards.



Payload Meter III® (PLM III)

PLM III is an electronic system that monitors and records payload information for Komatsu's off-highway mining trucks. The accurate and reliable payload measurement system is designed to help optimize payload, maximize productivity and reduce the life cycle cost of the machine. PLM III tracks and records the following key production parameters:

- Payload
- Empty Carry-Back
- Operator Identification
- Haul Cycle, Loading, Dumping Time and Date
- Distance Traveled (Loaded and Empty)
- Cycle Time Information
- Maximum Speeds (Loaded and Empty)
- TMPH Estimate for Front and Rear Tires
- Average Speed (Loaded and Empty)

Hydropneumatic Suspension

Hydrair II® is a suspension system that utilizes four nitrogen-over-oil cylinders. This suspension system is designed to maximize machine productivity by providing the operator with a smooth and comfortable ride. By absorbing shocks to the chassis during operation, Hydrair II® contributes to the durability of the machine's frame and components.



OPERATOR ENVIRONMENT

Operator Seat

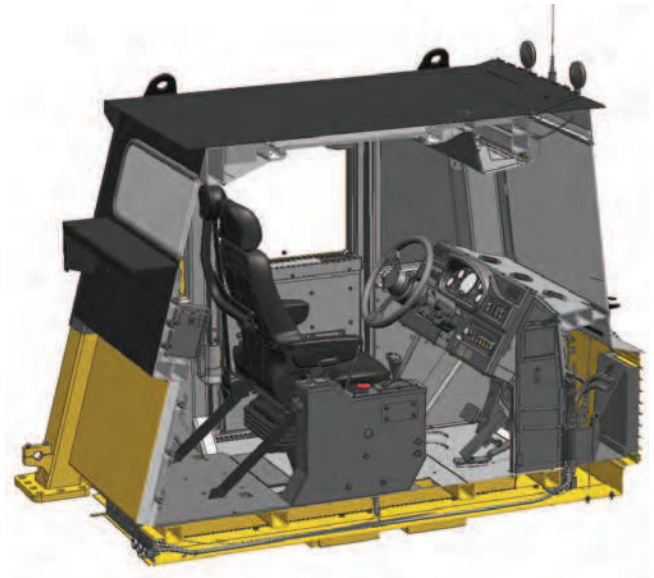
Komatsu recognizes that operator comfort is a key to productivity in today's mining environment. The five-way adjustable operator seat and the tilt-telescopic steering column provide an optimum driving posture for increased operator comfort and control over the machine. The air suspension seat absorbs vibrations transmitted from the machine, reducing operator fatigue. A 51 mm 2" wide three-point seat belt is provided as standard equipment.

Ergonomically Designed Cab

The Komatsu 960E-1K cab design provides a comfortable and productive environment to meet today's mining demands. The cab includes tinted windows, heating and air conditioning, acoustical insulation, double sealed doors, and provides filtered and pressurized air.

Built-in ROPS and FOPS Structure

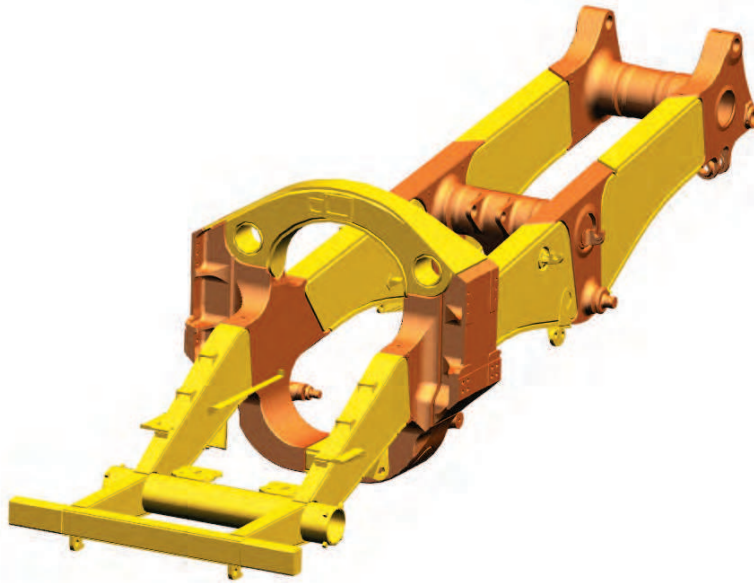
Integral ROPS/FOPS Level 2 cab. These structures conform to ISO standards 3471 and 3449.



RELIABILITY FEATURES

Structurally Enhanced Frame Design

By using advanced computer-aided design, finite element analysis, and full-scale dynamic and static testing, the frame has been designed to carry 327 metric tons **360 short tons** and provides the high structural reliability Komatsu is known for.



Castings Used in High Stress Areas

To increase frame reliability, steel castings have been incorporated at key frame pivot points and key load bearing critical portions of the frame. This includes the rear body pivot and horseshollar sections.

Simple and Reliable Hydraulic System

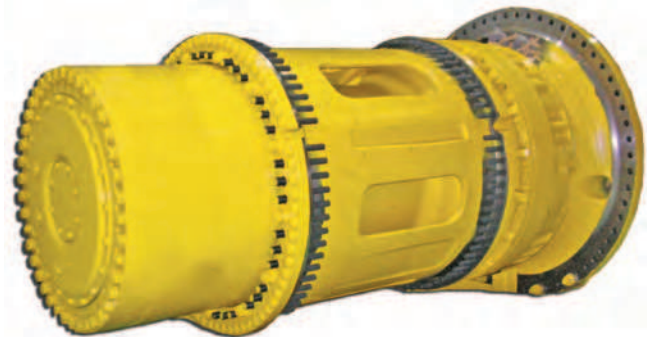
The hydraulic system is a proven and reliable design with fewer parts than other OEMs. The system utilizes a single tank, providing one common source of fluid for steering, braking, and hoisting. In-line, replaceable filtration elements provide protection from hydraulic system contamination. This makes the system easier to service.

To keep downtime to a minimum, Komatsu developed a sub-frame pump module that can be removed and replaced as a single unit. This reduces change-out time and allows easy access to the hydraulic pump module.



Komatsu Transmission

Our new transmission is designed to provide the reliability and high quality Komatsu is known for. Held to the highest standards, the transmission was subjected to extensive testing and quality confirmation, both on the bench and in the field. A full scale bench durability test was conducted during development to evaluate design quality prior to production. By using planetary design, extensive machining is not required during a standard rebuild.



Service Brakes

The 960E-1K comes standard with four-wheel, hydraulically actuated, oil-cooled service brakes.

- Max. service apply pressure: 18960 kPa **2,750 psi**
- Total friction area per brake: 103729 cm² **16,078 in²**

By using a fully hydraulic braking system, the formation of water and sediments - typical in air actuated braking systems - is no longer present. This prevents contamination, freezing and corrosion from affecting service brake component life.



EASY MAINTENANCE

Extended Oil Change System

CENTINEL® is a continuous oil management system that extends oil change intervals for up to 4,000 hours. Engine oil is injected into the fuel system for consumption at a rate proportional to fuel burn. Make-up oil is supplied from the Reserve System to keep the engine sump at the proper level. ELIMINATOR® is a self-cleaning filtration system that offers extended filter change intervals and superior serviceability.



Automatic Lubrication System

The automatic lubrication system is designed to reduce service downtime and improve durability of all pin joints by having a centralized module that automatically distributes grease at adjustable intervals. In addition, this hydraulically activated system can be adjusted to deliver the precise amount of grease required by each joint.

KOMTRAX Plus

As part of a complete service and support program, Komatsu equips every truck with KOMTRAX Plus. By using a satellite-based communication system, KOMTRAX Plus provides access to machine health parameters and trends, payloads, and critical faults in a user friendly web interface.

The information available through KOMTRAX Plus allows service personnel to review faults and trends, improve the quality of the troubleshooting process and reduce unscheduled machine downtime.



ADDITIONAL FEATURES

Environmentally Friendly

Noise Reduction

The 960E-1K comes with a remarkably quiet retarding package, designed to reduce noise through the low speed high volume fan.

Less Fluids Than Mechanical Drives

Komatsu electric drive trucks contain 57% less fluid compared to similar class mechanical drive trucks, creating a lower environmental impact and makes fluid replacement simpler, quicker and more economical.

U.S. EPA Compliant

The Komatsu SSDA18V170 engine is compliant with the U.S. EPA emissions regulations.

Reduced Fuel Consumption

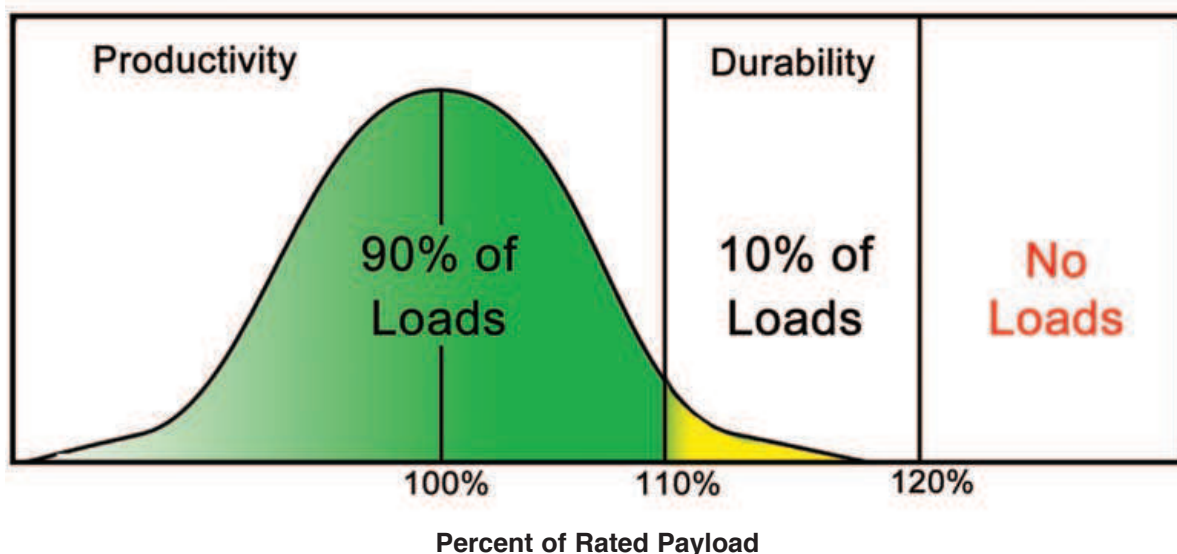
An electrically driven, more efficient main blower reduces fuel consumption and lowers operating costs.

Payload Policy

10-10-20 Load Policy Criteria

Recognizing that variation occurs naturally in material density, fill factors, and loading equipment, Komatsu America Corp. deems it necessary to establish a consistent payload policy. This payload policy is intended to identify the guidelines and limitations for the loading of Komatsu mining trucks, and is valid for approved applications and haul profiles only.

- 1) The average monthly payload must not exceed the rated payload of the truck
- 2) 90% of all loads must be below 110% of the rated payload of the truck
- 3) 10% of all loads may be between 110% and 120% of the rated payload of the truck
- 4) No single payload may exceed 120% of the rated payload of the truck



SPECIFICATIONS



ENGINE

Make and model.....	Komatsu SSDA18V170
Fuel	Diesel
Number of cylinders	18
Operating cycle	4 cycle
Gross horsepower*.....	2610 kW 3,500 HP @ 1900 rpm
Net flywheel power**	2495 kW 3,346 HP @ 1900 rpm
Weight (wet)	10800 kg 23,810 lb

* Gross horsepower is the output of the engine as installed in this machine, at governed rpm and with engine manufacturer's approved fuel setting. Accessory losses included are water pump, fuel pump and oil pump.

**Net flywheel power is the rated power at the engine flywheel minus the average accessory losses. Accessories include fan and charging alternator. Rating(s) represent net engine performance in accordance with SAE J1349 conditions.



ELECTRIC DRIVE

AC/DC CURRENT	
Drive System*.....	Komatsu AC Drive
Alternator	Siemens
Dual Fan Main Blower	419 m ³ /min 14,800 cfm
Control	IGBT AC Torque Control System
Ratio	38.12
Speed (maximum)	64.5 km/h 40 mph

* Drive system performance depends upon gross vehicle weight, haul road grade, haul road length, rolling resistance and other parameters. Komatsu must analyze each job condition to assure acceptable application.



BODY

All-welded steel flat floor body with horizontal bolsters and full canopy. Rubber mounts on frame are standard. Eyebrow, body up sling, extended canopy and pivot exhaust heating are optional.

Floor sheet	16 mm 0.63" Outer
	19 mm 0.75" Center
	1379 MPa 200,000 psi tensile strength steel
Front sheet	10 mm 0.39" Outer
	12 mm 0.47" Center
	1379 MPa 200,000 psi tensile strength steel
Side sheet	10 mm 0.39"
	1379 MPa 200,000 psi tensile strength steel
Canopy sheet	6 mm 0.24"
	690 MPa 100,000 psi tensile strength steel
Capacity struck	149 m ³ 195 yd³
SAE heaped 2:1	214 m ³ 280 yd³
Standard Komatsu body weight	40823 kg 90,000 lb



COOLING SYSTEM

L&M radiator assembly, split-flow, with deaerator-type top tank.

Radiator frontal area	7.02 m ² 75.5 ft²
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CAB

Advanced Operator Environment with integral 4-post ROPS/FOPS Level 2 structure (ISO 3449), adjustable air suspension seat w/lumbar support and arm rests, full-size passenger seat, maximum R-value insulation, tilt and telescoping steering column, electric windshield wipers w/washer, tinted glass, power windows, Payload Meter III, 61,000 Btu/hr heater and defroster, 19,900 Btu/hr air conditioning (HFC - 134A refrigerant).



TIRES AND RIMS

Rock service, tubeless, radial tires	
Standard tire*.....	56/80 R63
Flange mount, five (5) piece rim	
1041 mm x 1600 mm x 140 mm 41" x 63" x 5.5" rim assembly.	
Typical tire weight	29553 kg 65,154 lb

* Tires should meet application requirements for tkph/tmph, tread, compound, inflation pressure, ply rating or equivalent, etc.



FRAME

Advanced technology, full butt-welded box sectional ladder-type frame with integral ROPS supports, integral front bumper, rear tubular cross members, steel castings at all critical stress transition zones, rugged continuous horsecollar.

Plate material	482.6 MPa 70,000 psi
	tensile strength steel
Casting material	620.5 MPa 90,000 psi
	tensile strength steel
Rail width	305 mm 12"
Rail depth (minimum)	864 mm 34"
Top and bottom plate thickness	45 mm 1.77"
Side plate thickness	25 mm 0.98" Rear
	32 mm 1.26" Front
Drive axle mounting	Pin and spherical bushing
Drive axle alignment	Swing link between frame and axle



BRAKING SYSTEM

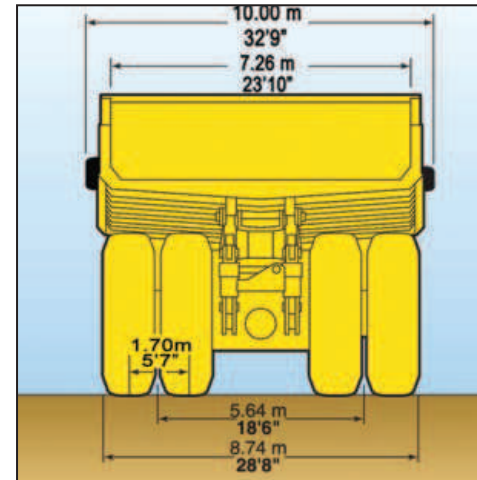
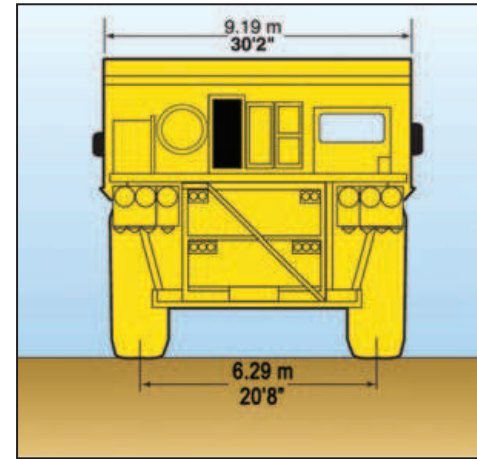
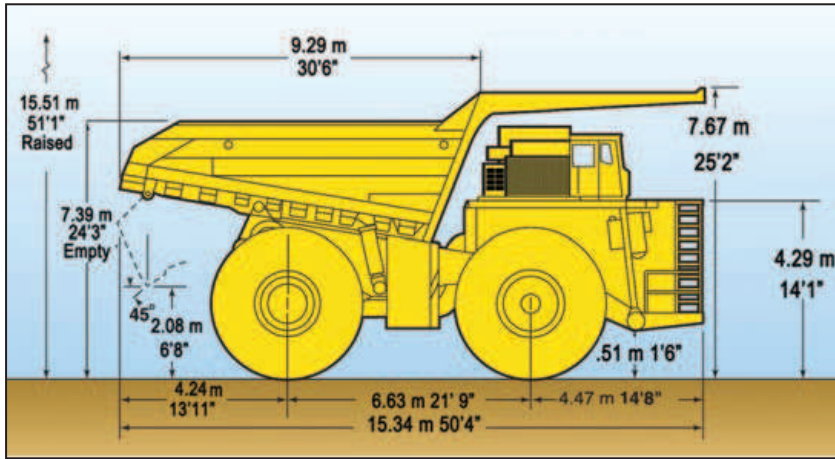
Service brakes	Oil-cooled, hydraulic
	actuated, multiple disc brakes at each wheel
Traction system	Wheel Spin-Slide Control
Max. service apply pressure	18960 kPa 2,750 psi
Total friction area per brake	103729 cm ² 16,078 in²
Secondary brakes	Automatically applied prior
	to hydraulic system pressure dropping below level
	required to meet secondary stopping requirements.
Wheel brake locks	Switch activated
Parking brakes	Multiple disc, spring-applied,
	hydraulically-released, dry brakes on inboard end
	of each wheel motor rotor shaft. Rated to hold on
	+15% grade at maximum gross vehicle weight.
Electric dynamic retarder	4620 kW 6,196 HP
Continuously rated high-density blown grids w/retard capacity at low	
speeds and retard in reverse.	



SUSPENSION

Variable rate hydro-pneumatic with integral rebound control	
Max. front stroke	328 mm 12.92"
Max. rear stroke	239 mm 9.40"
Max. rear axle oscillation	±6.5°

 **DIMENSIONS**



All dimensions are for unladen truck with standard body.

Body	Capacity		Loading Height*
	Struck	2:1 Heap	
Standard	149 m ³ 195 yd ³	214 m ³ 280 yd ³	7.14 m 23'5"

*Exact load height may vary due to tire make, type, and inflation pressure.

 **HYDRAULIC SYSTEM**

- Steering Accumulator assisted with twin double acting cylinders provide constant rate steering. Secondary steering automatically supplied by accumulator.
- Turning circle diameter (SAE) 32 m 105'
- Reservoir 947 L 250 U.S. gal
- Filtration In-line replaceable elements
- Suction Single, full flow, 100 mesh
- Hoist and steering Dual, in-line, high pressure
- Brake component cabinet Above deck, easily accessible with diagnostic test connections
- Hoist Two 3-stage dual-acting outboard cylinders, internal cushion valve, over-center dampening
- Hoist times
 - Power-up loaded 23 sec
 - Power-down 14 sec
 - Float-down empty 24 sec
- Pumps Two pumps, single package, in-line
- Hoist and brake cooling Tandem gear pump with output of 931 lpm 246 gpm at 1900 rpm and 18960 kPa 2,750 psi
- Steering and brake Pressure-compensating piston pump with output of 246 lpm 65 gpm at 1900 rpm and 20685 kPa 3,000 psi
- System relief pressures
 - Hoist and brake cooling 17237 kPa 2,500 psi
 - Steering and brake 20685 kPa 3,000 psi
- Ports available for powering disabled truck and for system diagnostics.

 **ELECTRICAL SYSTEM**

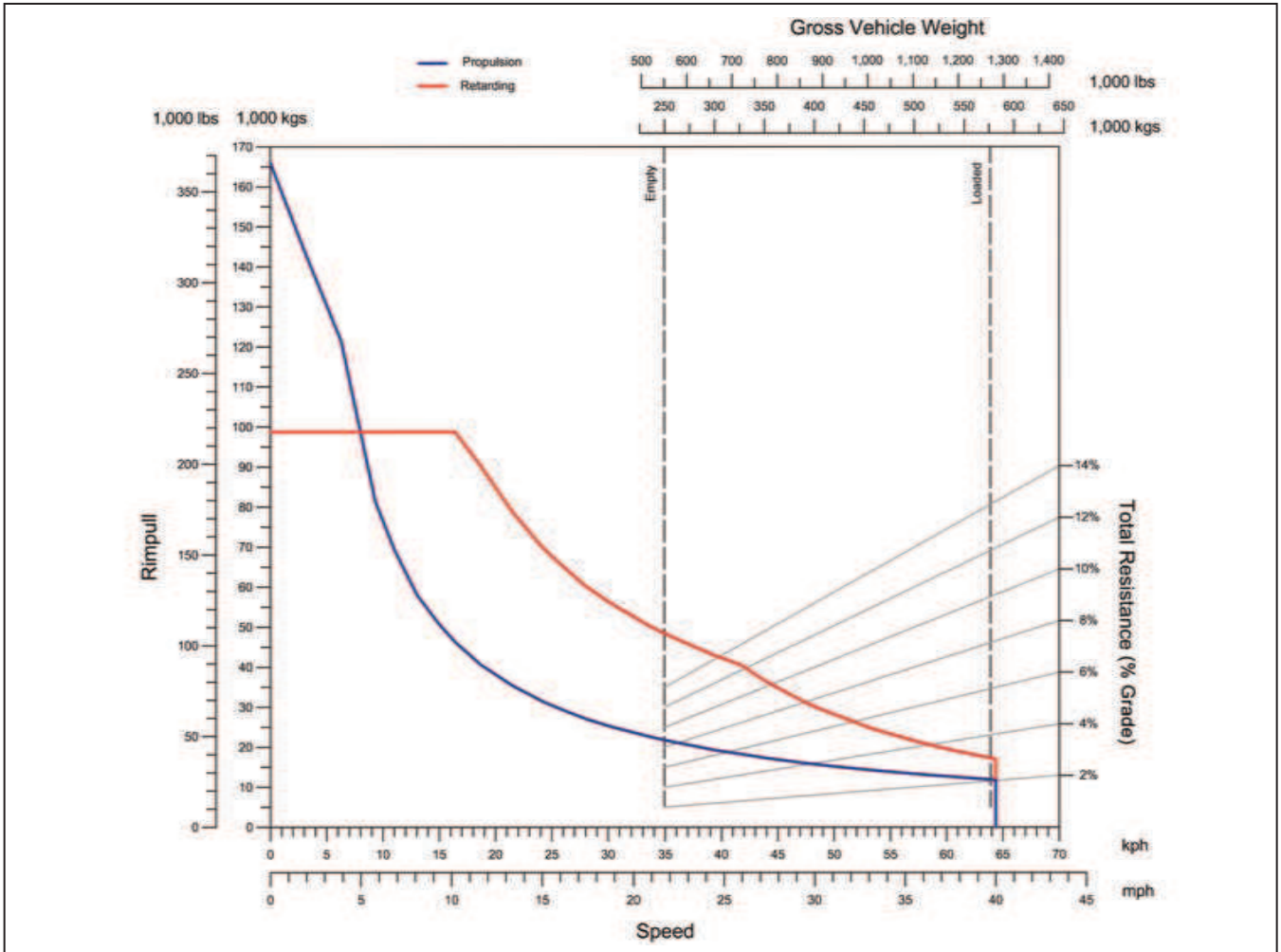
- 4 x 8D 1450 CCA, 12 volt, in series/parallel, bumper-mounted with disconnect switch.
- Alternator 24 volt, 140 amp
- Lighting 24 volt
- Cranking motors Two/24 volt

 **SERVICE CAPACITIES**

- Cooling system 719 L 190 U.S. gal
- Crankcase 341 L 90 U.S. gal
- Hydraulic system 1325 L 350 U.S. gal
- Motor gear box (each) 140 L 37 U.S. gal
- Fuel tank 5300 L 1,400 U.S. gal

960E-1K ELECTRIC DRIVE TRUCK

PERFORMANCE CHART



KOMATSU PRODUCT LINE LOADER/TRUCK MATCHING

Typical Number of Passes to Load

		Komatsu Trucks							
		HD785 100 ton	HD1500 159 ton	730E 203 ton	830E-AC 244 ton	860E-1K 280 ton	930E-4 320 ton	930E-4SE 320 ton	960E 360 ton
KOMATSU EXCAVATORS	PC2000 15.7 yd ³	4	7						
	PC3000 19.5 yd ³	4	6	7					
	PC4000 29 yd ³	3	4	5	6	6			
	PC5500 37 yd ³		3	4	5	5	6	6	7
	PC8000 55 yd ³				3	3	4	4	5

Nominal truck payload rating (short tons)

Bucket ratings are based on 1780 kg/lcm **3,000 lbs/lcy** material density.

Empty Vehicle Weight

Front Axle Distribution	123490 kg	272,250 lbs	49.5%
Rear Axle Distribution	125985 kg	277,750 lbs	50.5%
Total EVW	249475 kg	550,000 lbs	

Gross Vehicle Weight

Front Axle Distribution	190104 kg	419,100 lbs	33.0%
Rear Axle Distribution	385968 kg	850,900 lbs	67.0%
Nominal GVW	576072 kg	1,270,000 lbs	

Payload

Nominal Payload	32685 kg	720,000 lbs	
	327 metric tons	360 short tons	

Nominal payload is defined by Komatsu America Corp's payload policy documentation. In general, the nominal payload must be adjusted for the specific vehicle configuration and site application. The figures above are provided for basic product description purposes. Please contact your Komatsu distributor for specific application requirements.





STANDARD EQUIPMENT

- Air cleaners, Donaldson® SSG
- Alternator (24 volt/140A)
- Automatic lubrication system w/ground level fill & level indicator
- Back up alarm
- Batteries—4 x 8D (1450 CCA's)
- Battery charging cable and socket
- Body impact plate
- Body over center device
- Brakes: oil-cooled, multiple disc front & rear
- Deck guardrails
- Electric start
- Eliminator®, Centinel®, Cense®
- Fast-fill fuel system (in tank and left side remote)
- Filters, high pressure hydraulic
- Ground level radiator fill
- Mirrors, LH flat and RH rectangular convex
- Mud flaps
- Muffled exhaust—deck-mounted
- Power supply, 24 volt and 12 volt DC
- Propel/retard speed control
- Quick disconnects (hoist and diagnostics)
- Radiator sight gauge
- Removable power module unit (radiator, engine, alternator)
- Reverse retarding
- Service center—LH
- Thermostatic fan clutch

OPERATOR ENVIRONMENT & CONTROL

- All hydraulic service brakes with auto apply
- Battery disconnect switch
- Brake lock and drive system interlock
- Circuit breakers, 24 volt
- Diagonal staircase across grille
- Dynamic retarding with continuous rated element grids
- Engine shutdown at ground level

- Hoist propulsion interlock
- Horns (electric—front)
- Integral ROPS/FOPS Cab Level 2
- Maintenance and power lockout
- Parking brakes with warning light & speed application protection
- Power steering w/auto secondary steering
- Pump driveline protector
- Radiator fan guard
- Seat belts
 - Operator 3-point 51 mm 2" retractable
 - Passenger lap 51 mm 2" retractable
- Slip-resistant / dimpled surface on walkways

STANDARD HIGH VISIBILITY DELUXE CAB

- AC drive interface display
- Air cleaner vacuum gauges
- Air conditioner HFC-134A
- AM/FM radio with CD, USB & MP3
- Dome light
- Electronic Dash & Status Panel
 - Body up
 - Engine oil temperature (high)
 - Parking brake
 - Propulsion system not ready
 - No DC link voltage
 - No propel
 - Service brake applied
 - Wheel brake lock applied
 - Maintenance monitor
- Engine hourmeter, oil pressure gauge, coolant temperature gauge, hydraulic oil temperature gauge
- Engine shutdown w/ "Smart Timer" delay
- Floor mat (double barrier)
- Fuel gauge in cab
- Fuel low level light and buzzer
- Gauges (w/backlight)
- Headlight switch
- Heater and defroster (heavy-duty)

- Heater switch
- High beam selector and indicator
- Horn switch (center of steering wheel)
- Indicator lights (blue)
 - Engine service
 - KOMTRAX Plus snapshot (IM)
- Komatsu Payload Meter III®
- KOMTRAX Plus
- Operator seat, adjustable w/air suspension, lumbar support and arm rests
- Panel lighting (adjustable)
- Passenger seat, mechanical suspension
- Power windows
- Pressurized cab air system w/fan on
- Single brake/retarder pedal
- Sunvisor (adjustable)
- Tilt & telescoping steering column
- Tilt & telescoping steering wheel
- Voltmeter (battery output)
- Windows
 - Laminated glass, front
 - Tempered glass, sides and rear
- Windshield wiper (dual) and washer (electric)

LIGHTING

- Back-up lights—rear mount (2) halogen
- Back-up lights—R and L - deck mount (2) halogen
- Brake and retard lights on top of cab
- Clearance lights (LED)
- Dynamic retarding, rear (2) (LED)
- Engine compartment service lights
- Fog lights (2) halogen
- Headlights (8) halogen
- Manual back-up light, switch and indicator
- Payload lights R and L (LED)
- Stairway lights
- Stop & tail lights (2) (LED)
- Turn signals (LED)



OPTIONAL EQUIPMENT

Note: Optional equipment may change operating weight.

- Accumulators (cold weather)
- Body liners
- Body up sling
- Extended canopy
- Eyebrow
- Fire extinguisher 9 kg **20 lb**
- Heated body
- Hot start engine oil (220V 2-500W)
- Hot start hydraulic oil
- Hot start engine coolant (220V 2-2500W)
- Hubodometer
- Lights (HID)
- Mufflers between frame rails
- ORBCOMM®
- PLM III® scoreboards
- Reversed access ladder
- Service center—RH
- Shutters (radiator)
- Special language decals
- Suspensions (cold weather)

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