# KOMATSU®

960E-2K

960E



## WALK-AROUND

#### **Productivity Features**

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

#### **Environmentally Friendly**

- Optional Tier 4 compliant Komatsu SSDA18V170 engine
- 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 tonne 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 improved 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





## 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 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.

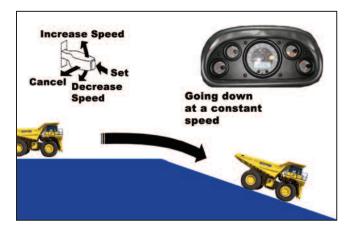


#### **Traction (Spin-Slide) Control**

During slippery conditions, the 960E-2K 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.



#### **Application Specific Body**

For all trucks, Komatsu goes through the Body Worksheet (BW) process to ensure that each body is designed to meet the requirements for each specific application while carrying its rated payload. Komatsu works with each customer to understand all of the material properties at a mine site and to identify the appropriate liner package.

Komatsu offers a standard all-welded steel, flat floor body with a full canopy and horizontal bolsters. This body includes a driver side eyebrow, body up sling, and rubber mounts on the frame.

• Standard Body Struck Capacity: 149 m<sup>3</sup> 195 yd<sup>3</sup>

• Standard Body SAE Heaped 2:1: 214 m3 280 yd3

• Standard Komatsu Body Weight: 40823 kg 90,000 lbs



Photos may include optional equipment

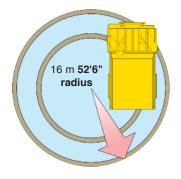
#### 960E-2K ELECTRIC DRIVE TRUCK



#### **Tight Turning Radius**

By using double acting hydraulic steering cylinders with a six-point articulation linkage, the 960E-2K power steering system provides steering control with minimal operator effort. The turning radius of the 960E-2K is 16 m 52' 6", which provides excellent maneuverability for tight loading and dumping conditions. The steering accumulators comply with ISO-5010 standards.



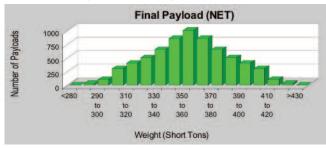


#### Payload Meter III® (PLM III)

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)

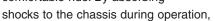
#### **Example of Payload Summary**



Nitrogen gas

#### **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



Hydrair II® contributes to the durability of the machine's frame and components.



## **OPERATOR ENVIRONMENT**

#### **Ergonomically Designed Cab**

The Komatsu 960E-2K 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.

#### **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.

#### **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 tonne **360 short tons** and provides the highest structural reliability from Komatsu.



#### 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.



#### **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 horsecollar sections.

#### **Steering and Brake Accumulators**

In the event that the hydraulic pressure in the steering or braking system drops below an acceptable minimum, nitrogen-charged accumulators will automatically apply the brakes so that the truck may be stopped. There are separate accumulators for the braking and steering systems.



#### **Komatsu AC Drive**

Our Komatsu AC drive is designed to provide the reliability and highest quality from Komatsu. 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.



#### **Fully Hydraulic Controlled Multiple-Disc Wet Brakes**

Although the dynamic retarding system is the primary braking force, the 960E-2K comes standard with four-wheel, hydraulically actuated, oil cooled service brakes. In the event that the truck's hydraulic system pressure drops below an acceptable level, accumulator tanks will automatically apply all wheel brakes to bring the truck to a complete stop.

- Max. service apply pressure: 18960 kPa 2,750 psi
- Total friction area per brake: 103729 cm<sup>2</sup> 16,078 in<sup>2</sup>

The oil cooled brake system provides lower maintenance costs and higher reliability versus dry disc brakes. This system is fully sealed to help keep contaminants out and reduce brake wear and maintenance. The brakes are hydraulically actuated, removing all air from the design. By eliminating an air system, air bleeding is not required and water condensation that can lead to contamination, freezing, and corrosion is no longer present. There are three independent hydraulic circuits that provide hydraulic back-up.





## EASY MAINTENANCE

### Advanced Monitoring System – On-board Diagnostics

The Komatsu advanced monitoring system identifies maintenance items to the operator, reduces diagnostic times, indicates oil and filter replacement hours, and displays fault codes. This monitoring system is designed to maximize machine availability.

#### **Automatic Lubrication System**

The automatic lubrication system is designed to reduce downtime for lubrication by having a centralized location that automatically distributes grease to all lubrication points.



#### Flange Type Tire Rims

The flange type rims allow quicker removal and installation of the tires which minimizes the overall impact on downtime.



#### **KOMTRAX Plus**

As part of a complete service and support program, Komatsu equips every mining and quarry sized machine with KOMTRAX Plus. By using a satellite-based communication system, KOMTRAX Plus offers a new vision of monitoring your valuable assets by providing insight to critical operating metrics and information that can be used to increase availability, lower owning and operating costs and maximize fuel efficiency.

The KOMTRAX Plus information available on MyKomatsu.com allows service personnel and asset owners to review cautions, operational data, fuel consumption, payloads and key component measurements provided in forms of trends. With KOMTRAX Plus, knowledge becomes the power to fuel your productivity.



#### Extended Oil Change System

Cummins CENTINEL® oil management system and ELIMINATOR® filtration system reduce oil and filter changes by one-third. Oil drain is extended to 4,000 hours, and there are no spin-on oil filters. Centrifuge paper is replaced every 1,500 hours.



## **ADDITIONAL FEATURES**

### **Environmentally Friendly**

#### Komatsu SSDA18V170 Engine

Optional Tier 4 compliant Komatsu SSDA18V170 engine.

#### **Noise Reduction**

The 960E-2K comes with a remarkably quiet retarding package, designed to reduce noise through the low speed high volume fan.

#### **Reduced Fuel Consumption**

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

#### **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.

#### **Selectable Stairway Direction**



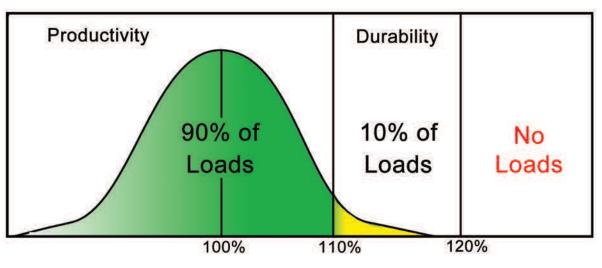
Komatsu's 960E-2K offers stairway access with entry from either the right or left side of the truck depending on the customer's preference.

### 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.

- The average monthly payload must not exceed the rated payload of the truck
- 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
- No single payload may exceed 120% of the rated payload of the truck



**Percent of Rated Payload** 

## **SPECIFICATIONS**



#### **ENGINE**

Make and model*	. Komatsu SSDA18V170
Fuel	Diesel
Number of cylinders	
Operating cycle	4 cycle
Gross horsepower**2610 k\	N <b>3,500 HP</b> @ 1900 rpm
Net flywheel power***2495 k\	
Weight (wet)	11750 kg <b>25,897 lb</b>
(dry)	11250 kg <b>24,795 lb</b>

- Optional Tier 4 emission compliant engine for North American market. Non-emissionized
- engine for markets outside of North America.

  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	
Alternator Flow	266 m <sup>3</sup> /min <b>9,380 cfm</b>
Wheel Motor Flow	419 m³/min <b>14,800 cfm</b>
Control	. IGBT AC Torque Control System
Ratio	
Speed (maximum)	64.5 km/h <b>40 mph</b>

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



#### TIRES AND RIMS

Rock service, tubeless, radial tires
Standard tire*
Flange mount rim
1041 mm x 1600 mm x 140 mm 41" x 63" x 5.5" rim assembly.
Rims rated at 758 kPa 110 psi cold inflation pressure.
Typical tire weight

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



#### **BODY**

All-welded steel flat floor body with horizontal bolsters and full canopy. Rubber mounts on frame are standard. Eyebrow, body up

;l	ng, extended canopy and pivot exhaust heating are optional.
	Floor sheet
	19 mm <b>0.75</b> " Center
	1379 MPa 200,000 psi tensile strength steel
	Front sheet
	12 mm <b>0.47</b> " Center
	1379 MPa 200,000 psi tensile strength steel
	Side sheet
	1379 MPa 200,000 psi tensile strength steel
	Canopy sheet
	690 MPa 100,000 psi tensile strength steel
	Capacity struck149 m <sup>3</sup> 195 yd <sup>3</sup>
	SAE heaped 2:1
	Standard Komatsu body weight 40823 kg 90,000 lb



Advanced Operator Environment with integral 4-post ROPS/FOPS Level 2 cab (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).



#### **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.

٠,	.gg-u	
	Plate material	′ '
		tensile strength steel
	Casting material	620.5 MPa <b>90,000 psi</b>
		tensile strength steel
	Rail width	305 mm <b>12</b> "
	Rail depth (minimum)	864 mm <b>34</b> "
	Top and bottom plate thickness	45 mm <b>1.77</b> "
	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 be	



#### RAKING SYSTEM

· · · Ellerance ClClEss
Service brakes
Traction system
Max. service apply pressure
Total friction area per brake
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 <b>6,196 HP</b>
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 <b>9.40</b> "
Max. rear axle oscillation	±6.5°



#### **COOLING SYSTEM**

L&M radiator assembly, split-flow, with deaerator-type top tank. Radiator frontal area.....7.02 m<sup>2</sup> 75.5 ft<sup>2</sup>

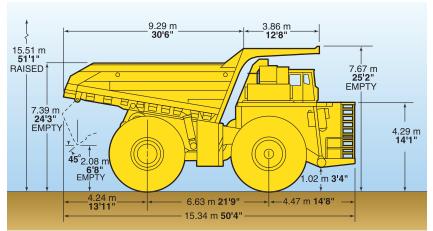


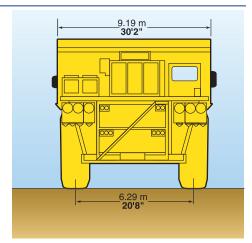
#### SERVICE CAPACITIES

Cooling System	190 U.S. gal
Crankcase*	90 U.S. gal
Hydraulic system	350 U.S. gal
Motor gear box (each)	37 U.S. gal
Fuel	1400 U.S. gal

<sup>\*</sup> Includes lube oil filters





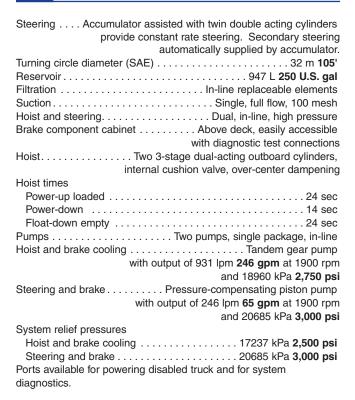


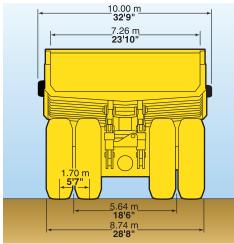
All dimensions are for unladen truck with standard body.

	Cap	Loading		
Body	Struck	2:1 Heap	Height*	
Standard	149 m <sup>3</sup> <b>195 yd</b> <sup>3</sup>	214 m <sup>3</sup> <b>280 yd</b> <sup>3</sup>	7.39 m <b>24'3''</b>	

<sup>\*</sup>Exact load height may vary due to tire make, type, and inflation pressure.







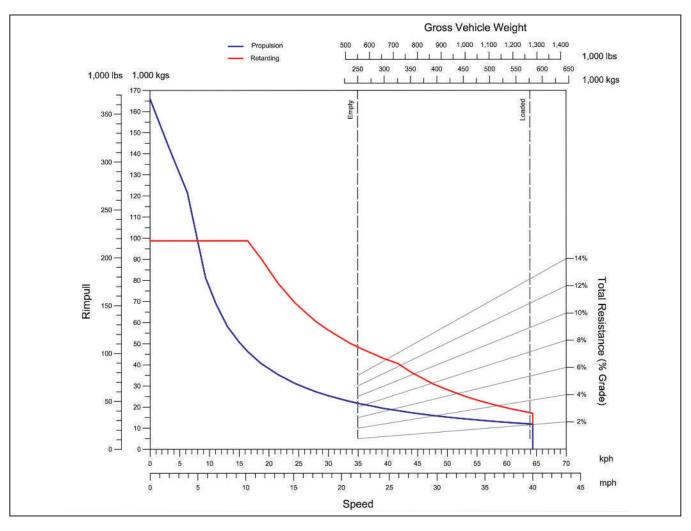
### ELECTRICAL SYSTEM

 $4\ x$  8D 1450 CCA, 12 volt, in series/parallel, bumper-mounted with disconnect switch.

Alternator
Lighting
Cranking motors

#### 960E-2K ELECTRIC DRIVE TRUCK

#### **PERFORMANCE CHART**



#### KOMATSU PRODUCT LINE LOADER/TRUCK MATCHING

**Typical Number of Passes to Load** 

			50	4		u 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
PC2000	15.7 yd³	4	7						
PC3000	19.5 yd <sup>3</sup>	4	6	7					
PC4000	29 yd <sup>3</sup>	3	4	5	6	6			
PC5500	37 yd <sup>3</sup>		3	4	5	5	6	6	7
PC8000	55 yd <sup>3</sup>				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 Veh	icle 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 Vehi	cle 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	326585 kg 327 metric tons	720,000 lbs 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.





- Air cleaners, Donaldson® w/evacuators
- Alternator (24 volt/250A)
- 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 &
- Deck guardrails
- Electric start
- Eliminator®, Centinel®, Cense®
- Fast-fill fuel system (in tank and left side remote)
- Filters, high pressure hydraulic
- Fuel tank sight gauge (3)
- Ground level radiator fill
- L&M Radiator
- 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 ladder tread cap plates
- Dynamic retarding with continuous rated element grids
- Engine access guard rail
- Engine shutdown at ground level
- Hoist propulsion interlock
- Horns (electric–front)

- Hydraulic tank ladder
- Integral ROPS/FOPS Level 2 cab
- Maintenance and power lockout
- Parking brakes with warning light & speed application protection
- Power steering w/auto secondary steering
- Pump driveline protector
- Radiator fan guard
- RH & LH multi-cambered convex mirrors
- Seat helts
- Operator 3-point 51 mm 2" retractable
- Passenger lap 51 mm 2" retractable
- Slip-resistant / dimpled surface on walkways
- Stairway-selectable direction (L to R)

#### 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)
- Insulation (Max R-Value)
- Komatsu Payload Meter III®
- KOMTRAX Plus with ORBCOMM
- 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
- Starter key switch
- Sunvisor (adjustable)
- Tilt & telescoping steering column
- 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
- Halogen headlights- all high & low beam positions (10)
- HID-style backup/ berm light
- Manual back-up light, switch and indicator
- Payload lights R and L (LED)
- Platform lights R, L and Center
- Recessed corner marker/ signal lighting (LED)
- Stairway lights
- Stop & tail lights (2) (LED)
- Turn signals (LED)



Note: Optional equipment may change operating weight.

- · Accumulators (cold weather)
- Antifreeze (-40°C)
- **Body liners**
- Bumper mounted headlights
- 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) ISRI 3 point seat
- Lights (HID)
- Mudflaps on hydraulic tank & fuel tank Mudflaps on hydraulic tank & fuel tank without ladder on hydraulic tank
- PLM III® scoreboards
- Reversed access ladder (R to L)
- Scoreboard PLM III Display
- Service center-RH
- Shutters (radiator)
- Special language decals Suspensions (cold weather)

· HID headlights AESS833-00

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