

**JOYGLOBAL**

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**P&H**

## 4100XPC

Electric Mining Shovel - AC Drive  
Product Overview





## P&H 4100XPC AC Shovel: building on proven success

Mine operations and maintenance managers demand the best from their loading tools. For this reason, Joy Global has been the electric mining shovel market share leader and preferred equipment supplier to the world's toughest mining environments for over 100 years.

Joy Global is proud to offer the P&H 4100XPC AC electric mining shovel. The P&H shovel line is combining its solid reputation of reliability with the proven Centurion electrical control system, industry leading IGBT AC technology, rugged structures and the industry's only OEM owned field service and support network to set the industry standard for electric mining shovels.

Increases in availability and productivity ultimately lead to the lowest cost per ton and the most efficient ultra-class loading tool available in the industry today. P&H shovels dig deeper into the realms of productivity safety, and reliability with greater control, comfort and consistency.



## Proven performance

P&H AC-Drive shovels are exceeding customer requirements and expectations:

- 3% faster cycle times
- 2.5% increase in availability
- 5% increase in productivity

### Providing our customers:

- Lowest Total Cost of Ownership
- Highest productivity
- Superior machine reliability and durability

**We set the industry standard for electric mining shovels**

### A closer look

The P&H 4100XPC AC utilizes proven components.

- Common motors and drive line-up as on proven P&H 4100C BOSS AC and P&H 2800XPC AC machines, adapted to handle additional swing motor
- Structures developed with advanced design software and field data collection
- Motors designed and manufactured by Joy Global specifically for electric mining shovels

## Joy Global and ABB:

### Two leaders combine to deliver breakthrough productivity and performance

ABB is the global leader in drives with 40+ years of experience.

- ABB's Direct Torque Control has the best dynamic performance in the industry
- Our AC drives are compact, air-cooled, modular
- Maintenance-friendly modules are easy-to-replace

Joy Global is the worldwide leader in electric mining shovels. The P&H 4100XPC AC sets the standard in performance and productivity.

- Powerful advancements based on already-successful technologies
- Extensive collaboration with customers and our drive partner ABB
- Years of experience in building rugged, reliable equipment

### We are driven by achieving the lowest total cost of ownership for our customers:

- Quality components
- Focus on machine availability and productivity
- Heavy-duty structures
- Joy Global field support

## The Joy Global AC performance edge

We've achieved better performance throughout the entire shovel. That includes *higher speed* and *peak horsepower*. The shovel features *improved electrical availability* and *overall reliability*. In addition, the structures have been optimized to work efficiently with AC technology.

### The benefits are clear:

- Better cycle time and utilization
- Improved job efficiency
- Higher rates of availability

### Attachment of choice for the world's toughest pits

- Twin-leg dipper handle – Stable dipper trajectory, faster cycle times, higher productivity
- Rack and pinion crowd – Less maintenance, all weather performer
- Optima dippers – Mine-matched dippers with adjustable pitch braces for precise rake angles

### Rugged components

- Dual hoist motors – Balanced and evenly distributed load
- Delta drive – Improved shoe-to-tumbler engagement
- Planetary transmissions – Proven long life on swing and propel with over 20 million hours logged

### Technology

- Centurion electrical control system – Superior performance, monitoring and data integration capabilities
- Universal shovel interface – Send and receive data with any mine management system
- PreVail remote health management – Real time machine health and performance management



### World-class cab

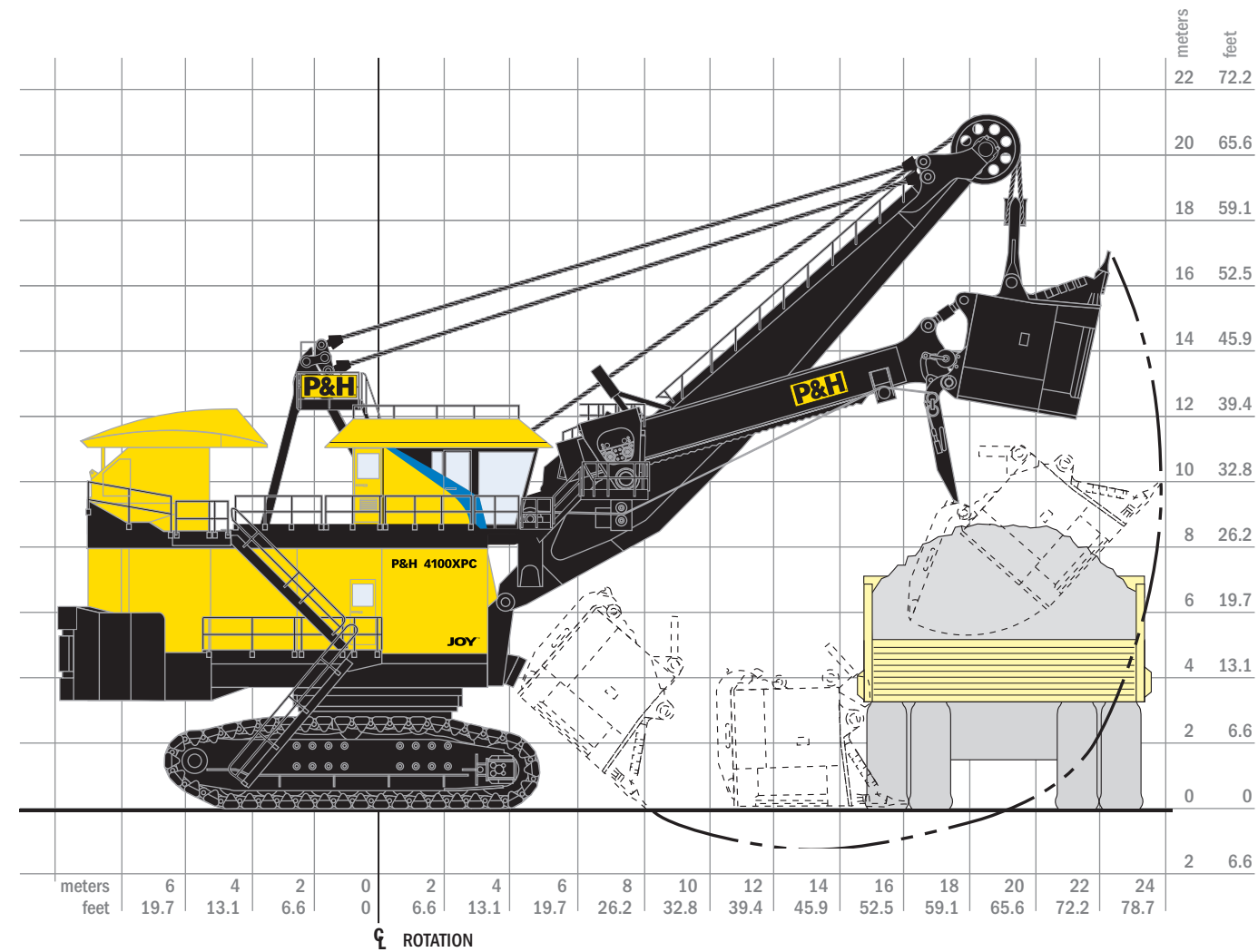
- Smart ergonomics
- Clear sight lines
- Easy access to command and control functions
- Access to key data on machine health and performance provided by Centurion electrical control system

### JoySmart Solutions

- Our smart connected products and systems, advanced analytics and direct services are integrated together and customized to solve our customers' toughest challenges:
- Service products and consumables
  - Machine assembly and rebuild
  - Component exchange programs
  - Life cycle management
  - Genuine OEM parts
  - Prognostics and remote health management

# 4100XPC Electric Mining Shovel - AC Drive

## General Specifications



### Working ranges

Height of cut	16.8 m	55 ft. 2 in.
Radius of cut	23.9 m	78 ft. 8 in.
Dumping height* (door open)	9.5 m	31 ft. 0 in.
Floor level radius	16.0 m	52 ft. 6 in.
Tail swing radius	9.8 m	32 ft. 3 in.
Operator eye level	10.1 m	33 ft. 1 in.

\*Height shown with bail-type dipper. Heights will be greater with bail-less or compact-bail dippers. Actual dumping height can be greater than door clearance height.

### Capacity

Nominal payload*	99.8-108.9 mt	120 st
Nominal dipper capacity		
SAE struck	52.8-61.2 m <sup>3</sup>	69-82 yd <sup>3</sup>
SAE 2:1	58.3-67.6 m <sup>3</sup>	74.4-88.4 yd <sup>3</sup>
Rated suspended load	195 mt	215 st
Optimum truck size (400 st truck shown)	218-363 mt	240-400 st

\*Payload and dipper capacity are dependent on many factors. Contact Joy Global for an analysis of your specific application.

### Electrical control

Centurion Supervisory Controller provides direct integrated communication with motor drives giving precise motor control and fast cycle times. Real-time multi-tasking capability allows for optimal machine logic sequencing, monitoring and control.

Centurion I/O System uses 'Profibus' communication protocol for seamless integration of all shovel subsystems and future expandability. Low-voltage 24V DC I/O drop points feature open and short circuit detection for improved diagnostics and troubleshooting.

Centurion Information System's enhanced Graphical User Interface (GUI) features intuitive, icon-based screens to display vital information such as shovel status, troubleshooting information, and optional production monitoring data and operator feedback.

P&H Digital AC Drive provides precise, reliable, solid state power to the main motion motors.

### Electrical control systems

Electrical Drive Ratings (50°C, 2000m)	Drive Power
IGBT Supply Unit (ISU)	4550 kVA
Crowd Motion	1160 kVA
Hoist Motion	4640 kVA
Propel Motion	2320 kVA
Swing Motion	3480 kVA

The electrical drive system is comprised of a multi drive platform, sharing a common DC bus between the IGBT Supply Unit (ISU) and the motor drive Inverter Units (INU). The fully regenerative ISU controls the power flow to and from the shovel, maintaining a unity power factor with extremely low harmonic content. The fully regenerative INU controls the power flow to and from the individual AC motors.

P&H AC Fast Response main machinery motors

Hoist Motor (Two used)	Continuous rating @ 690 volts Peak developed power	Total 2388kW / 3200hp 2964kW / 3973hp
Swing Motor (Three used)	Continuous rating @ 690 volts Peak developed power	Total 1635kW / 2190hp 1644kW / 2205hp
Crowd Motor (One used)	Continuous rating @ 690 volts Peak developed power	Total 545kW / 730hp 759kW / 1017hp
Propel Motor (Two used)	Continuous rating @ 690 volts Peak developed power	Total 1090kW / 1460hp 1644kW / 2205hp

### Power requirements

Supply Voltage*	7200 or 13800V 3 Phase, 60 Hz	6000, 6600, 7200 or 11000 3 Phase, 50 Hz
Supply Transformer	(Minimum) 3750 kVA	
Minimum Short Circuit VA Available at Shovel	30 MVA	

\*Voltage per customer requirements

### Dipper and dipper trip

Optima dippers combine consistent productivity with high durability and maintainability. Dippers are configured to mine specific conditions and capacity requirements from a variety of combinations of body and lip designs, as well as other unique Joy Global technologies. Specific wear packages and GET styles can be cooperatively specified.

TripRite system utilizes a brushless DC electric motor with sealed planetary drive unit for reliable trip and slack take up operation.

### Swing

Three modular P&H planetary gear cases of proven design and a single piece forged swing gear transmit torque for fast cycle times.

Spring-set air release disc brakes - one per motor.

Splash lube filtration system.

### Propel

Propel on demand provides rapid transfer to propel mode. Rapid transfers allow frequent positioning of the shovel to the bank resulting in faster cycle times and more efficient digging.

Two rugged P&H planetary gear cases of proven design independently transmit torque to the drive sprockets, producing the tractive effort required for fast, efficient propel and positioning operations.

DELTA Drive low tension sprocket drive system with heavy duty cast crawler shoes.

Spring-set air release disc brakes - one per motor.

### Crowd

Powerband V-belt drive between motor and gear case absorbs shock loads.

First and second reduction gearing in enclosed gear case for reliable splash lubrication, ease of maintenance, and extended component life.

Twin-leg dipper handle with torsion box and rack and pinion drive has inherent stability in the bank for optimal digging.

Spring-set air release disc brake.

### Hoist

All gearing housed in single enclosed gear case with filtered and cooled oil fed to all bearings in addition to splash lubrication for reliable operation and ease of maintenance.

Large 68" diameter hoist drum for extended rope bending life. Ferrule becket system and dual electric tuggers are standard for efficient rope change.

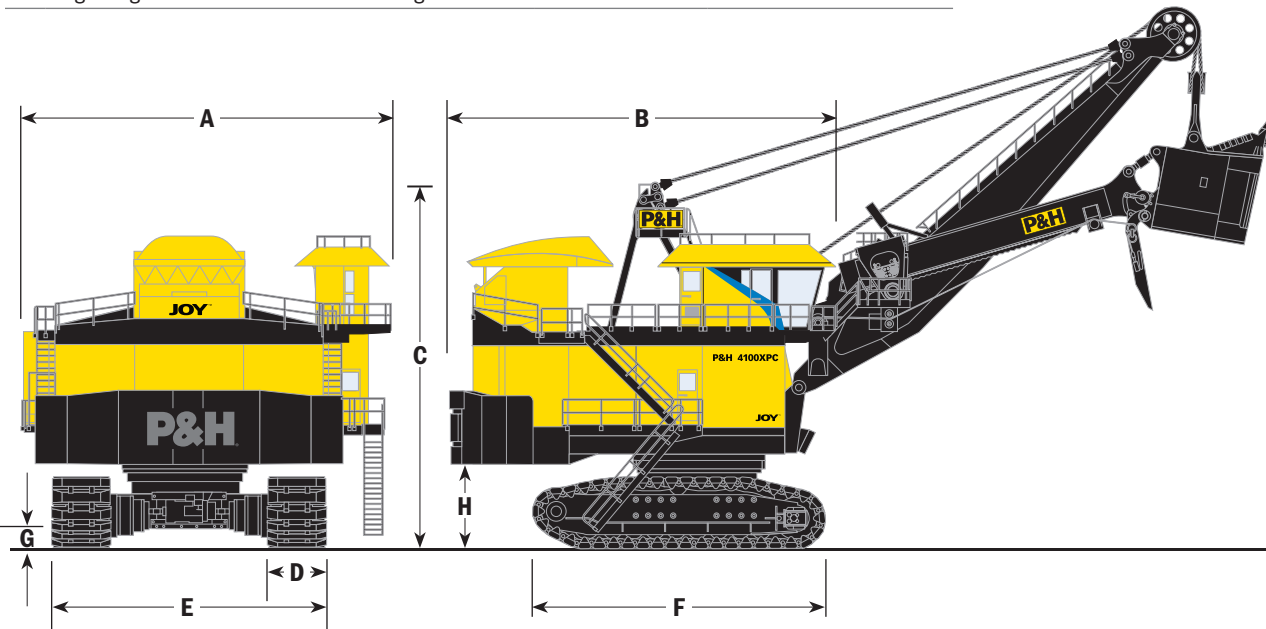
Spring-set air release disc brakes - one per motor.

### Cable data

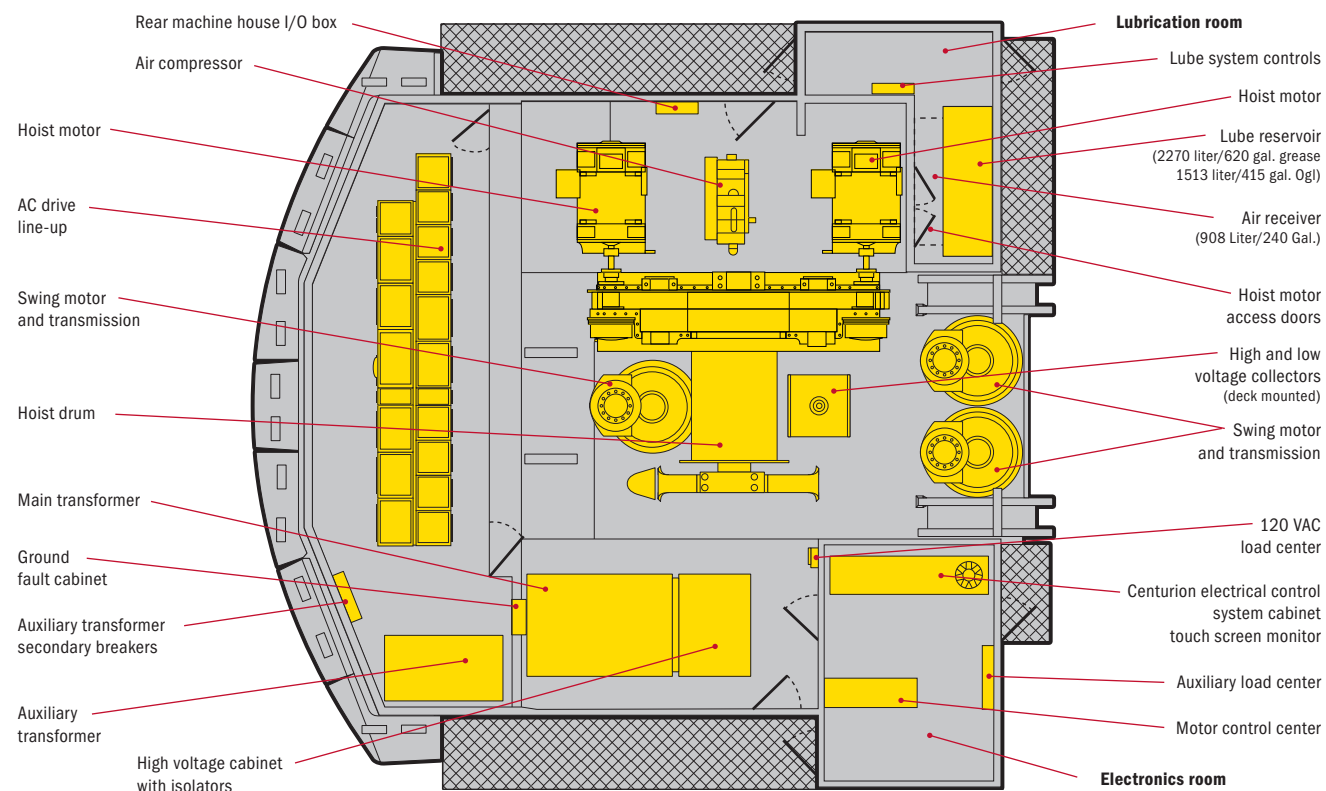
Hoist (wire rope)	73 mm	2.75 in. dia.
Suspension (bridge strand)	102 mm	4.00 in. dia.
Dipper trip (wire rope)	19 mm	0.75 in. dia.

## Overall dimensions

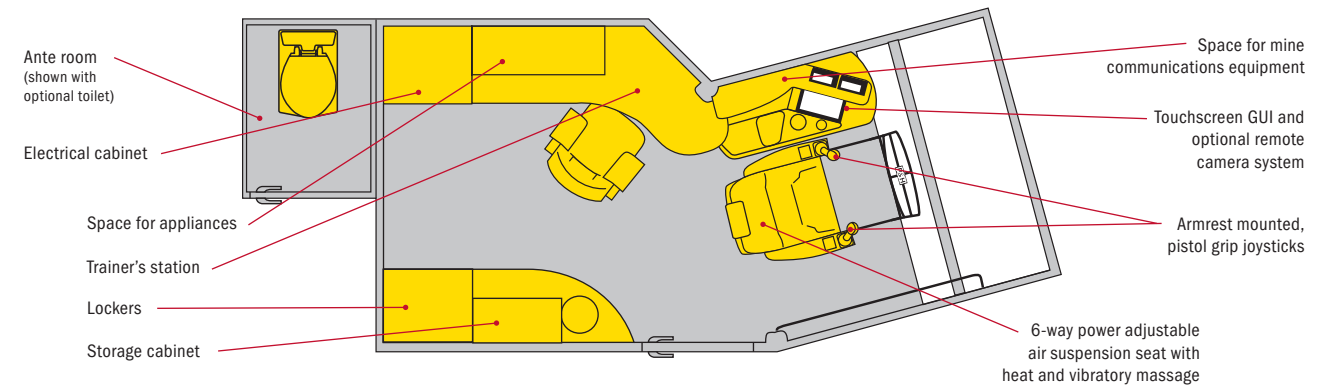
A Width	14.4 m	47 ft. 1 in.
B Length	15.0 m	49 ft. 4 in.
C Height over gantry	14.7 m	48 ft. 3 in.
D Width of crawler shoes	1930 mm 2210 mm	76 in. 87 in.
E Width of crawlers (76")	10.2 m	33 ft. 6 in.
F Length of crawlers	11.7 m	38 ft. 6 in.
G Ground clearance	0.7 m	2 ft. 2 in.
H Height – ground to bottom of counterweight slabs	3.6 m	11 ft. 10 in.



## Machinery deck plan



## Loading control center



## Ground pressure and weight

### Bearing area – ground pressure

Standard:		
crawler bearing area 76" shoes / 1930 mm	34.58 m <sup>2</sup>	53,597 in <sup>2</sup>
Crawler ground pressure 76" shoes / 1930 mm	434.4 kPa	63.0 psi
Optional:		
crawler bearing area 87" shoes / 2210 mm	39.58 m <sup>2</sup>	61,354 in <sup>2</sup>
Crawler ground pressure 87" shoes / 2210 mm	379.9 kPa	55.1 psi

### Weights – approximate\*

Working weight (with dipper, approx. wt.)

76" shoes / 1930 mm	1,532,235 kg	3,378,000 lbs
87" shoes / 2210 mm	1,536,771 kg	3,388,000 lbs
Counterweight (punchings)**	204,100 kg	450,000 lbs

\* All weights subject to 5% variation.

\*\* To be furnished by customer.

## Features and customization

The P&H 4100XPC is built with several features to enhance safety, reliability, and productivity over the life cycle of the operation.

- Automatic lubrication and compressed air systems with advanced diagnostic and control
- Temperature monitoring system for all AC motors, drum shaft bearings, shipper shaft bearings
- Automatic boom soft setdown system (ABSS) and boom profile protection envelope to help prevent excessive loading to the attachment during operation
- Anti-Swing-in-Bank system to reduce excessive side loading on handle and attachment
- Remote hoist control pendant and hoist rope winch to assist in safe and efficient rope changeouts
- House pressurization system to provide filtered air for cooling and dust repression

The shovel has multiple options for local and minesite specific conditions in the following areas:

- Climate control
- Technology and software
- Maintenance systems





Joy Global worldwide locations

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