

JOYGLOBAL



12CM Series Continuous Miner Product Overview



JOYGLOBAL
Service Leader



Delivering world-class mine performance

At the core of our commitment to customers is providing world-class solutions through our unique direct service network. This allows us to **collaborate with customers**, developing innovative parts, products, consumables and systems that lower their total cost of ownership while safely maximizing production.

JOY Operational Excellence
Taking us to the next level



Our commitment to quality and reliability is supported by our focus on Operational Excellence. We use Joy OpEx principles to eliminate waste, simplify the process, automate and remove people from harm's way.



12CM series

Joy Global's answer for the mid to high-seam applications is the 12CM series continuous miners. Utilizing proven technology from years of service life, this product

Designed to provide high productivity and reliability

line is designed to provide high productivity and reliability in the most rigorous of conditions.

The basic elements of each continuous miner are similar in design, following field proven

philosophies perfected by Joy Global over the years. Each machine employs Joy Global's multi-motor concept with outboard access to motors, gearcases, controllers and other major components. The philosophy calls for the isolation of major components for easier troubleshooting and maintenance. The continuous miners use individual motors with direct drive transmissions to power the cutter, traction, gathering and hydraulic systems. This permits service or repair quickly and easily, thus reducing downtime and maintenance costs.

Wethead cutterhead systems

The Wethead continuous miner cutterhead incorporates a fine water spray behind each cutting bit on the cutter drums. Acting as both a cooling and wetting agent, the water reduces the potential for frictional ignitions and also reduces respirable dust levels. The water spray acts as both a cooling and wetting agent in order to address both issues at the same time. The sprays also provide lubrication that substantially improves bit life. The Wethead does all this while potentially consuming less water than the standard miner dust sprays.



Application specific cutting

A wide variety of cutting options...

The 12CM is available in solid head models ranging in drum diameter from 1120 to 1380 mm (44 to 53 3/4 in). Combined with cutting power up to 698 hp (520 kW), the cutting system can be sized to match most seam conditions.



Smartconveyor

Smartconveyor incorporates the latest sound abatement technologies to reduce sound output while improving maintainability. "Underground results show a 45% and 65% noise exposure reduction for the operator" when compared to a standard machine. (Mining Engineering, 2011, Vol. 63, No. 7, p. 83) Smartconveyor combines multiple technologies such as Joy Global's patented dual sprocket conveyor chain and auto-tensioning features to improve the operating environment. Smartconveyor is currently available as an option on all continuous miner models.

Smartzone Proximity System

The Smartzone Proximity System is an integrated training device that helps teach personnel to operate a continuous miner from safe working zones, and to otherwise stay clear of danger zones due to the machine's tram and conveyor swing functions. Its unique ability to track, recognize and log operator movement around the machine provides an additional layer of analysis for in depth training initiatives. The Smartzone Proximity System option is currently available on all continuous miner models.

High voltage capability

The 12CM27 has multiple voltage options for various applications. Higher voltage options reduce thermal losses in the cutter motors and trailing cable and allow the machine to perform at its maximum capability.

Total control *The latest in VFD technology...*

Today's 12CM traction system builds on years of field-tested performance to offer an even more durable, maneuverable package. Patented Optidrive AC electronics are coupled to a compact all-gear transmission to provide smooth, reliable service. Cutter motor feedback and traction differential features optimize sump performance in even the most demanding applications. Optional track frame widths are offered to suit specific floor and entry conditions. Brushless AC traction motors are highly reliable and require minimal maintenance.



Joy Global history

Tradition in quality and pride...

With over 7,000 continuous miners shipped since 1948, Joy Global leads the mining industry with innovations that increase productivity and improve operator safety. Innovations such as air scrubbers, Wethead cutterhead drums, AC traction motors, noise reducing conveyor systems, and hydraulics manifolds are just a few examples. All are industry firsts from Joy Global, the world leader in underground mining innovations.





12CM automation

The Faceboss control platform enables operators to consistently operate at the optimal balance of production rate and cost.

Competitive and market pressures require that Joy Global's customers produce product at an ever increasing rate and at an ever decreasing cost per ton. These objectives are made all the more challenging by the worsening attributes of available reserves and the ever deteriorating operating conditions in which machinery must operate.

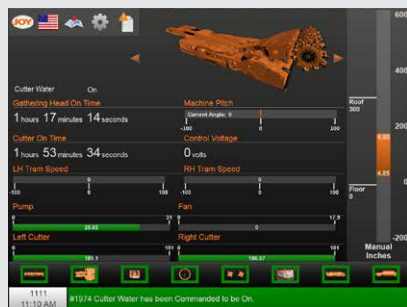
Using a combination of operator assistance tools, automated sequences, advanced diagnostics, machine performance monitoring and analysis tools, the Faceboss control platform enables operators to consistently operate their Joy Global underground machinery at the optimal balance of production rate and cost.

Multilingual display

On a standard control platform...

The Faceboss control platform can be configured to display a variety of languages. In combination with local field personnel, this multilingual control platform helps Joy Global underground equipment to achieve the goal of operating at the lowest cost per ton, regardless of where the equipment is located.

This platform is standard across all Joy Global underground equipment, reducing inventory to support a typical fleet. Common practices reduce training burdens and overall knowledge required for electrical maintenance personnel. This enables maintenance and trouble-shooting performance to rise to a more productive level.



Product optimization

The Faceboss control platform can maximize continuous miner productivity in a variety of ways:

- Optimized cutting** Rate of cutting is automatically maximized during sump and shear cycles by ensuring optimal cutter loading through the control of the traction motor speed and hydraulic shear rate respectively
- High availability feedback** Control loops protect all electric motors on the continuous miner from jam and thermal overloads, ultimately extending motor life and minimizing machine downtime

Reliability through design

All Faceboss hardware has been designed and tested specifically for underground applications. Testing at extreme temperatures and vibration levels ensures that each component can stand up to harsh conditions. Further testing to destruction in a typical conditions allows Joy Global engineers to better understand the failure modes of each component in order to improve the overall design and reliability.

- Automated sequences** Consistent operation is now possible, even while changing operators or across multiple shifts. For example, one-touch-shear automatically controls the position of the cutter boom, which ensures the floor and roof levels are properly maintained while reducing operator fatigue
- Maximum flexibility** Different operating parameters for the typical cycle cutting requirements (e.g., full pass, half pass, cross cut, etc.) can be pre-defined, and are easily and quickly selected via the continuous miner remote station to prevent unnecessary delays



Outby communications

With the Joy continuous miner connected to a surface computer, the Faceboss control platform enables the real-time monitoring of the machine from remote locations (Remote Machine Monitoring - RMM).

In addition to RMM, the Faceboss control platform continuously buffers and streams operating data to the surface computer. The surface computer, installed with Joy Surface Reporting Software (JSRP), interprets this data and generates value-added production reports directly following each shift and emails the report to the appropriate mine/Joy Global individuals. This feedback mechanism allows management to intervene where required to make positive change. Similarly, monthly production and engineering reports are generated and communicated to provide a higher-level interpretation of the operation.

Advanced diagnostics

The Faceboss control platform includes an on-board graphical display which includes a log of events, messages and alarms. Machine operating parameters are continuously monitored and recorded during machine operation. By using the on-board trending and graphing capability on this stored information, the root cause of machine failure can be quickly and easily determined.

For quick and easy reference, on-board service manuals are accessible through the on-board display. Supplementary to the service manual are step-by-step instructions for regular maintenance operations and help text for systematic trouble shooting.

User friendly interface

Machine setup/configuration...

Graphical on-board interface with intuitive screens simplifies initial machine setup. These same screens make it easy to adapt to changing mining conditions without the need to open an XP enclosure. In addition, preset tram functions can be selected from the remote to allow the operator to make on the fly cutter feedback adjustments as conditions dictate. The roof and floor cutting limits used with automation sequences are conveniently adjusted via the remote.



Joy 12CM continuous miner

	12CM12	12CM15	12CM27
Cutter head design	Solid head		
Cutter head diameter	1120 mm (44")	1120 mm (44")	1200 mm (47.25") 1310 mm (51.5") 1367 mm (54")
Maximum cutting height	3685 mm (12'-1") 3960 mm (13') 4600 mm (15'-1")	3685 mm (12'-1") 3960 mm (13') 4600 mm (15'-1")	3685 mm (12'-1") 5000 mm (16'-5")
Minimum cutting height *Without dust collector	1400 mm (55") 1500 mm (59") 2150 mm (85")	1400 mm (55") 1500 mm (59") 2150 mm (85")	1600 mm (63") 2500 mm (98")
Weight	65,770 kg (145,000 lb)	61,235 kg (135,000 lb)	77,110 kg (170,000 lb)
Ground pressure	213 kPa (31 psi)	200 kPa (29 psi)	245 kPa (35 psi)
Ground clearance	305 mm (12")		
Conveyor width	965 mm (38")	760 mm (30")	965 mm (38")
Tram speed	First - 4.6 m/min (15 fpm) Second - 9.1 m/min (30 fpm) Third - 19.8 m/min (65 fpm) Third (optional, turbo) - 25.9 m/min (85 fpm)		
Machine input voltage	950 volt @ 60 hz	950 volt @ 60 hz 950 or 1050 volt @ 50 hz	950 volt @ 50 hz or 60 hz 2300 volt @ 60 hz 3300 volt @ 50 hz
Dust collector *Optional	22 kW or 30 kW (30 hp or 40 hp) @ 60 hz 19 kW or 26 kW (25 hp or 35 hp) @ 50 hz		
Cutter	175 kW (235 hp) @ 60 hz 225 kW (300 hp) @ 60 hz* 170 kW (228 hp) @ 50 hz	175 kW (235 hp) @ 60 hz 170 kW (228 hp) @ 50 hz	240 kW (320 hp) @ 950 V 60 hz 245 kW (328 hp) @ 2300 V 60 hz 210 kW (280 hp) @ 950 V 50 hz 260 kW (349 hp) @ 3300 V 50 hz
Pump	40 kW (54 hp)	40 kW (54 hp)	40 kW (54 hp)
Gathering head	50 kW (67 hp) x 2 @ 60 hz 45 kW (60 hp) x 2 @ 50 hz		
Traction	60 kW (80 hp) x 2		
Total power *Does not include dust collector fan	610 kW (818 hp) @ 60 hz 545 kW (730 hp) @ 50 hz	610 kW (818 hp) @ 60 hz 545 kW (730 hp) @ 50 hz	740 kW (992 hp) @ 950 V 60 hz 750 kW (1005 hp) @ 2300 V 60 hz 670 kW (898 hp) @ 950 V 50 hz 770 kW (1033 hp) @ 3300 V 50 Hz

JoySmart Solutions

Integrated JoySmart Solutions help solve customers' toughest challenges using data-driven intelligence, collaboration

Joy Global service facilities have given world-class service a new home.

through partnership and experienced-based service execution. They are a way of partnering with customers to help reduce costs and increase productivity, in line with customers' operating and financial goals.

JoySmart Service Centers are strategically located around the world in order to conveniently serve our customers. With each new service center built, Joy Global products and people are becoming more connected, allowing for expanded benchmarking. Located strategically in zones of mining activity, each service center brings local support that is world-class. Services offered are structured to fulfill the lifecycle of mining equipment, optimizing equipment for productivity and safety.

Our commitment to world-class service is delivered through world-class processes and metrics. Our Joy OpEx processes bring operational excellence by prioritizing the elimination of waste, simplifying processes, automating and removing people from harm's way. We leverage those principles throughout our network, with the ability to rapidly customize locally, helping customers work smarter, worldwide.



JoySmart Solutions are integrations of smart connected Joy Global products and systems, advanced analytics and direct services customized to solve customers' toughest challenges.

JoySmart Solutions at work:

Costs

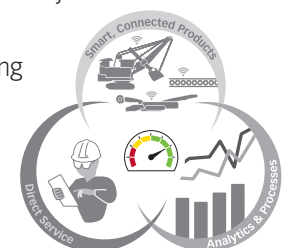
- Lower cost per unit produced by reducing overall parts and consumables expenditures
- Optimize costs for power/fuel, labor and rebuilds

Safety

- Automate processes and controls
- Increase awareness through training and standard setting

Productivity

- Improve system availability, performance, utilization and consistency
- Leverage extensive Joy Global engineering knowledge to solve problems



JoySmart Solutions



Joy Global worldwide locations

JOYGLOBAL



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EN-12CMS02-0616-V2

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12HM series

For the industrial minerals market, Joy Global offers the 12HM (Heavy-duty miner) series continuous miner. Within this series is the 12HM46, the largest and most powerful drum

12HM continuous miners are successfully operated in mines around the world. type continuous miner manufactured. Utilizing common continuous miner components, but designed to meet specific applications, 12HM continuous miners are successfully operating in trona, gypsum, potash and salt mines around the world.

The basic elements of each continuous miner are similar in design, following field proven philosophies perfected by Joy Global over the years. Each machine employs Joy Global's multi-motor concept with outboard access to motors, gearcases, controllers and other major components. The philosophy calls for the isolation of major components for easier troubleshooting and maintenance. The continuous miners use individual motors with direct drive transmissions to power the cutter, traction, gathering and hydraulic systems. This permits service or repair quickly and easily, thus reducing downtime and maintenance costs.

Cutting system

As the 12HM continuous miners are the largest manufactured by Joy Global, the cutting systems have been designed to match the machine mass. This series of miners is available either with chainless 51 1/2 in (1310 mm) or 53 3/4 in (1367 mm) cutter head drum diameter or with Ripperveyor cutter head drum diameter of 58 in (1475 mm). Depending on the cutter head design, the cutting horsepower can be as much as 764 HP (570 kW). Through Joy Global's experience in this market, we also realize that all applications are different and therefore, we provide a number of different cutter bit spacing configurations.

Application specific cutting

A wide variety of cutting options...

The 12HM is available in solid head or Ripperveyor models and in drum diameters ranging from 51.5 to 58 in or 1200 to 1475 mm. With this availability, the cutting system can be sized to match seam conditions. Rated cutting power as high as 764 hp (570 kW) is available within this product line.



Smartzone Proximity System

The Smartzone Proximity System is an integrated training device that helps teach personnel to operate a continuous miner from safe working zones, and to otherwise stay clear of danger zones due to the machine's tram and conveyor swing functions. Its unique ability to track, recognize and log operator movement around the machine provides an additional layer of analysis for in depth training initiatives. The Smartzone Proximity System option is currently available on all continuous miner models.

Bolted construction

Due to shaft restrictions at many industrial mineral mines, access is often limited. With this in mind, the 12HM series has been designed in several bolted configurations to allow for such restrictions. After complete assembly and testing at a Joy Global facility, the machine is disassembled to the required size, shipped to the mine and reassembled with technical assistance from Joy Global. The machines are designed to be reassembled without, or with limited, welding of components.

High capacity conveying system

The conveying system on the 12HM features a 38 in (965 mm) conveyor for increased production capability. In addition to the dual gathering head system, the machine is equipped with single rear conveyor drive or optional dual rear conveyor chain drive. A cam style take-up automatically provides proper conveyor chain adjustment as the conveyor swings.

Haulage system compatibility

The 12HM series continuous miners can be designed to match mine specific haulage systems. Different conveyor lengths and conveyor chain speeds are available to optimize the haulage system performance, whether it is batch or continuous haulage. For continuous haulage capability the conveyor can also be supplied to match up with an attached haulage system.

Total Control *The latest in VFD technology...*

Today's 12HM traction system builds on years of field-tested performance to offer even more durability and continuous miner maneuverability. Patented Optidrive AC electronics are coupled to a compact all-gear transmission to provide smooth and reliable performance. Cutter motor feedback control loops and an electronic traction motor differential optimize sump performance in even the most demanding of applications. Various track frame widths are available to suit specific floor conditions and entry widths.



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Technological features

Joy continuous miners are operated via radio remote control. The ergonomically designed control station is powered from an internal battery to provide ease of use for the operator. For places where multiple machines will operate in close proximity to one another, different frequencies are available.



High voltage operation

The relationship between machine input voltage and mining rate has long been recognized. For this reason, the 12HM series machines have been designed to operate at 2300 volt, 60 Hz (3300 volt, 50 Hz). In addition to the potential for increased performance, high voltage operation also provides lower costs associated with component failures and the potential to use a trailing cable with a smaller conductor size as compared to a medium voltage machine.

Engineered for perfection Why high voltage...



The potential for increased machine performance is due to the decrease in percent voltage drop (for a given current) occurring in a trailing cable when higher voltage is induced on that cable. Since motor torque varies with the speed of the voltage, any decrease in machine voltage has a drastic effect on motor performance.



Dual-sprocket chain conveyor system

All 12HM continuous miners are available with the patented Joy dual-sprocket continuous miner conveyor chain. The dual-sprocket chain is 50% stronger in tension than conventional chains and is driven by two parallel 8-tooth sprockets which provide better torsional rigidity. Combined, these features reduce the probability of abrupt chain breakage. Increased contact area between the chain and sprocket significantly decreases the amount of wear, increasing the working life of both components. The dual-sprocket conveyor chain has an even pitch and travels smoothly around the sprocket and return-roller, reducing the noise generated by up to three decibels and consequently reducing the exposure level of the typically located continuous miner operator.

Dust collector systems

Building on years of experience on continuous miners operating in coal mines, Joy Global now offers flooded bed dust collector systems for use in industrial mineral applications. As industrial mineral applications typically have larger entry sizes, these dust collector systems are designed with larger airflow options. Maintenance of the system is kept to a minimum by offering large access doors and water spray flushing systems.

The dual-sprocket chain is 50% stronger in tension than conventional chains.

Addressing corrosion Pin and bushing design...

Through years of mine experience and in-house testing, Joy Global is able to provide a pin and bushing design that can withstand the often corrosive environments of industrial mineral applications. This significantly extends component life, making the machine more productive.





12HM automation

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- **High availability feedback** Control loops protect all electric motors on the continuous miner from jam and thermal overloads, ultimately extending motor life and minimizing machine downtime

Reliability through design

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- **Maximum flexibility** Different operating parameters for the typical cycle cutting requirements (e.g., full pass, half pass, cross cut, etc.) can be pre-defined, and are easily and quickly selected via the continuous miner remote station to prevent unnecessary delays



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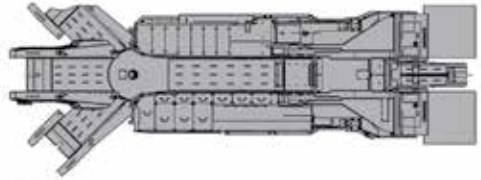
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Joy 12HM continuous miner



	12HM26	12HM27	12HM36	12HM46
Cutter head design	Ripperveyor head	Solid head	Ripperveyor head	Ripperveyor head
Cutter head diameter	1475 mm (58")	1200 mm (47.25") 1310 mm (51.5") 1367 mm (54")	1475 mm (58")	1475 mm (58")
Maximum cutting height	3830 mm (12'-6") 4600 mm (15'-1")	3350 mm (11') 3960 mm (13') 5000 mm (16'-5")	4200 mm (13'-9") 4600 mm (15'-1")	3500 mm (11'-6") 4500 mm (14'-9") 5500 mm (18")
Minimum cutting height *Without dust collector	1820 mm (6'-2") 2100 mm (6'-10")	1700 mm (5'-7") 2100 mm (6'-10") 2410 mm (8')	1900 mm (6'-3") 2400 mm (7'-10")	1860 mm (6'-1") 2700 mm (8'-10") 2800 mm (9'-2") 3000 mm (9'-10")
Weight	95,255 kg (210,000 lb)	86,180 kg (190,000 lb)	117,935 kg (260,000 lb)	154,220 kg (340,000 lb)
Ground pressure	231 kPa (34 psi)	209 kPa (30 psi)	269 kPa (39 psi)	260 kPa (38 psi)
Ground clearance	305 mm (12")			
Conveyor width	965 mm (38")			
Tram speed	First - 4.6 m/min (15 fpm) Second - 9.1 m/min (30 fpm) Third - 19.8 m/min (65 fpm)			
Machine input voltage	950 volt @ 60 hz 2300 volt @ 60 hz 4160 volt @ 60 hz	950 volt @ 60 hz 2300 volt @ 60 hz 4160 volt @ 60 hz	2300 volt @ 60 hz 4160 volt @ 60 hz 3300 volt @ 50 hz	2300 volt @ 60 hz 4160 volt @ 60 hz 3300 volt @ 50 hz
Cutter	235 kW (315 hp) @ 950 V 60 hz 250 kW (335 hp) @ 2300 V 60 hz 250 kW (335 hp) @ 4160 V 60 hz	240 kW (322 hp) @ 950 V 60 hz 245 kW (328 hp) @ 2300 V 60 hz 245 kW (328 hp) @ 4160 V 60 hz	250 kW (335 hp) @ 2300 V 60 hz 250 kW (335 hp) @ 4160 V 60 hz 285 kW (382 hp) @ 3300 V 50 hz	250 kW (335 hp) @ 2300 V 60 hz 250 kW (335 hp) @ 4160 V 60 hz 285 kW (382 hp) @ 3300 V 50 hz
Pump	40 kW (54 hp)	40 kW (54 hp)	70 kW (94 hp) @ 2300 V 60 hz 70 kW (94 hp) @ 4160 V 60 hz 52 kW (70 hp) @ 3300 V 50 hz	70 kW (94 hp)
Gathering head	50 kW (67 hp) x 2 @ 60 hz 45 kW (60 hp) x 2 @ 50 hz			
Traction	60 kW (80 hp) x 2			
Total power *Does not include dust collector fan(s)	730 kW (978 hp) @ 950 V 60 hz 750 kW (1005 hp) @ 2300 V 60 hz 750 kW (1005 hp) @ 4160 V 60 hz	740 kW (992 hp) @ 950 V 60 hz 750 kW (1005 hp) @ 2300 V 60 hz 750 kW (1005 hp) @ 4160 V 60 hz	790 kW (1059 hp) @ 2300 V 60 hz 790 kW (1059 hp) @ 4160 V 60 hz 832 kW (1115 hp) @ 3300 V 50 hz	790 kW (1059 hp) @ 2300 V 60 hz 790 kW (1059 hp) @ 4160 V 60 hz 850 kW (1139 hp) @ 3300 V 50 hz



JoyCut™

With Joy drums, you are getting quality, workmanship and expertise.

It begins by measuring and recording the existing cutting system and practices to establish baseline data. Geological samples are taken from the face for testing in our controlled laboratory. Joy Global has 65 years of experience and an extensive database to consult for identifying the right configuration and components to meet your requirements.

Increased productivity

- Increases machine utilization by reducing maintenance and downtime
- Improves product size and reduces fines

Lower total cost of ownership

- Maximizes bit and sleeve life for lower replacement costs
- More efficient cutting system leads to reduced component wear and less maintenance

Enhanced safety

- Reduces fines and dust for improved worker environment
- Decreases maintenance requirements to reduce worker contact with the machine



JS-Series Bit Holder Cutting System



The JS series bit holder features a rear access hole for easy bit removal saving time and energy. The induction case-hardened bore provides extended life of the bit blocks through multiple sleeve change-outs. Lower profile helps alleviate potential wear that can shorten the life of the block.

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JoySmart Solutions at work:

Costs

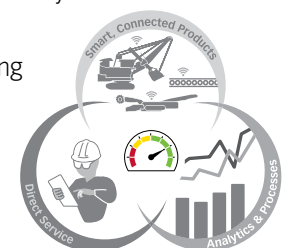
- Lower cost per unit produced by reducing overall parts and consumables expenditures
- Optimize costs for power/fuel, labor and rebuilds

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- Increase awareness through training and standard setting

Productivity

- Improve system availability, performance, utilization and consistency
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EN-12HMSCM01-0616-V1

JOYGLOBAL



14CM Series Continuous Miner Product Overview



JOYGLOBAL
Service Leader

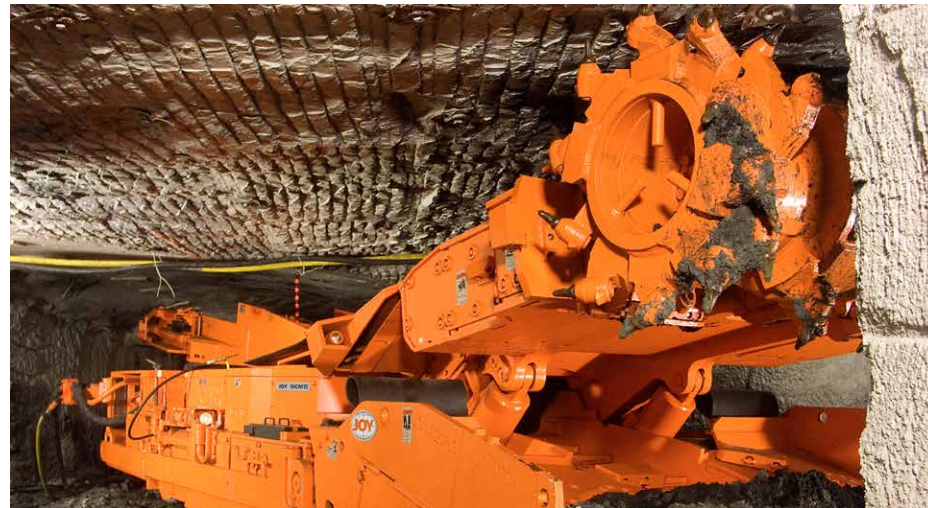


Delivering world-class mine performance

At the core of our commitment to customers is providing world-class solutions through our unique direct service network. This allows us to **collaborate with customers**, developing innovative parts, products, consumables and systems that lower their total cost of ownership while safely maximizing production.



Our commitment to quality and reliability is supported by our focus on Operational Excellence. We use Joy OpEx principles to eliminate waste, simplify the process, automate and remove people from harm's way.



14CM series

The Joy 14CM continuous miner product line has been developed to meet the high productivity requirements of today's underground mining industry and is the product of choice for the world's top producing mines. Joy continuous miners provide the ideal combination of cutting power, proven components and reliability for lower to mid-seam applications in a variety of materials. Built to withstand rigorous conditions, the 14CM offers optimum service life and return on investment.

The basic elements of each continuous miner are similar in design, following field proven philosophies perfected by Joy Global over the years. Each machine employs Joy Global's multi-motor concept with outboard access to motors, gearcases, controllers and other major components. The philosophy calls for the isolation of major components for easier troubleshooting and maintenance. The continuous miners use individual motors with direct drive transmissions to power the cutter, traction, gathering and hydraulic systems. This permits service or repair to be completed quickly and easily, thus reducing downtime and maintenance costs.

Wethead cutterhead systems

The Wethead continuous miner cutterhead from Joy Global incorporates a fine water spray behind each cutting bit on the cutter drums. Acting as both a cooling and wetting agent, the water reduces the potential for frictional ignitions and also reduces respirable dust levels. The water spray acts as both a cooling and wetting agent in order to address both issues at the same time. The sprays also provide lubrication that substantially improves bit life. The Wethead does all this while potentially consuming less water than the standard miner dust sprays.



Application specific cutting

A wide variety of cutting options...

The 14CM is available in solid head or Ripperveyor models and in drum diameters ranging from 30 to 44 inches or 762 to 1117 mm. The cutting system can be sized to match seam conditions. Rated cutting power as high as 590 hp (440 kW) is available within this product line.



Smartconveyor

SmartConveyor incorporates the latest sound abatement technologies to reduce sound output while improving maintainability. "Underground results show a 45% and 65% noise exposure reduction for the operator" when compared to a standard machine. (Mining Engineering, 2011, Vol. 63, No. 7, p. 83) SmartConveyor combines multiple technologies such as Joy Global's patented Dual Sprocket Conveyor Chain and auto-tensioning features to improve the operating environment. SmartConveyor is currently available as an option on all continuous miner models.

Smartzone Proximity System

The Smartzone Proximity System is an integrated training device that helps teach personnel to operate a continuous miner from safe working zones, and to otherwise stay clear of danger zones due to the machine's tram and conveyor swing functions. Its unique ability to track, recognize and log operator movement around the machine provides an additional layer of analysis for in depth training initiatives. The Smartzone Proximity System option is currently available on all continuous miner models.

Total control

The latest in VFD technology...

Today's 14CM traction system builds on years of field-tested performance to offer even more durability and continuous miner maneuverability. Patented Optidrive AC electronics are coupled to a compact all-gear transmission that provides smooth and reliable performance. Cutter motor feedback control loops and an electronic traction motor differential optimize sump performance in even the most demanding of applications. Various track frame widths are available to reduce ground bearing pressure and better suit specific floor conditions and entry widths.



Joy Global history

Tradition in quality and pride...

With over 7,000 continuous miners shipped since 1948, Joy Global leads the mining industry with innovations that increase productivity and improve operator safety. Innovations such as air scrubbers, Wethead cutterhead drums, AC traction motors, noise reducing conveyor systems, and hydraulics manifolds are just a few examples. All are industry firsts from Joy Global, the world leader in underground mining innovations.





14CM automation

The Faceboss control platform enables operators to consistently operate at the optimal balance of production rate and cost.

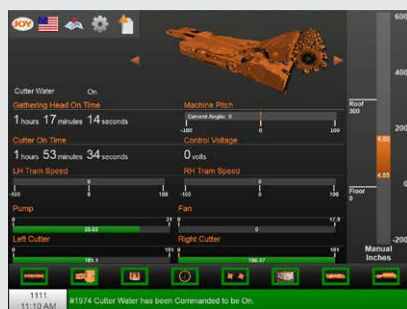
Competitive and market pressures require that Joy Global's customers produce product at an ever increasing rate and at an ever decreasing cost per ton. These objectives are made all the more challenging by the worsening attributes of available reserves and the ever deteriorating operating conditions in which machinery must operate.

Using a combination of operator assistance tools, automated sequences, advanced diagnostics, machine performance monitoring and analysis tools, the Faceboss control platform enables operators to consistently operate their Joy Global underground machinery at the optimal balance of production rate and cost.

Multilingual display On a standard control platform...

The Faceboss control platform can be configured to display a variety of languages. In combination with local field personnel, this multilingual control platform helps Joy Global underground equipment to achieve the goal of operating at the lowest cost per ton, regardless of where the equipment is located.

This platform is standard across all Joy Global underground equipment, reducing inventory to support a typical fleet. Common practices reduce training burdens and overall knowledge required for electrical maintenance personnel. This enables maintenance and trouble-shooting performance to rise to a more productive level.



Product optimization

The Faceboss control platform can maximize continuous miner productivity in a variety of ways:

- **Optimized cutting** Rate of cutting is automatically maximized during sump and shear cycles by ensuring optimal cutter loading through the control of the traction motor speed and hydraulic shear rate respectively
- **High availability feedback** Control loops protect all electric motors on the continuous miner from jam and thermal overloads, ultimately extending motor life and minimizing machine downtime

Reliability through design

All Faceboss hardware has been designed and tested specifically for underground applications. Testing at extreme temperatures and vibration levels ensures that each component can stand up to harsh conditions. Further testing to destruction in a typical conditions allows Joy Global engineers to better understand the failure modes of each component in order to improve the overall design and reliability.

- **Automated sequences** Consistent operation is now possible, even while changing operators or across multiple shifts. For example, one-touch-shear automatically controls the position of the cutter boom, which ensures the floor and roof levels are properly maintained while reducing operator fatigue
- **Maximum flexibility** Different operating parameters for the typical cycle cutting requirements (e.g., full pass, half pass, cross cut, etc.) can be pre-defined, and are easily and quickly selected via the continuous miner remote station to prevent unnecessary delays



Outby communications

With the Joy continuous miner connected to a surface computer, the Faceboss control platform enables the real-time monitoring of the machine from remote locations (Remote Machine Monitoring - RMM).

In addition to RMM, the Faceboss control platform continuously buffers and streams operating data to the surface computer. The surface computer, installed with Joy Surface Reporting Software (JSRP), interprets this data and generates value-added production reports directly following each shift and emails the report to the appropriate mine/Joy Global individuals. This feedback mechanism allows management to intervene where required to make positive change. Similarly, monthly production and engineering reports are generated and communicated to provide a higher-level interpretation of the operation.

Advanced diagnostics

The Faceboss control platform includes an on-board graphical display which includes a log of events, messages and alarms. Machine operating parameters are continuously monitored and recorded during machine operation. By using the on-board trending and graphing capability on this stored information, the root cause of machine failure can be quickly and easily determined.

For quick and easy reference, on-board service manuals are accessible through the on-board display. Supplementary to the service manual are step-by-step instructions for regular maintenance operations and help text for systematic trouble shooting.

User friendly interface Machine setup/configuration...

Graphical on-board interface with intuitive screens simplifies initial machine setup. These same screens make it easy to adapt to changing mining conditions without the need to open an XP enclosure. In addition, preset tram functions can be selected from the remote to allow the operator to make on the fly cutter feedback adjustments as conditions dictate. The roof and floor cutting limits used with automation sequences are conveniently adjusted via the remote.



Joy 14CM continuous miner

	14CM10AA	14CM9A	14CM9CC	14CM15CC	14CM15C	14CM15B	14CM15D	14CM15E	14CM27
Cutter head design	Ripperveyor	Solid head							
Cutter head diameter	762 mm (30")	865 mm (34")	965 mm (38")				1120 mm (44")		
Maximum cutting height	2290 mm (7'6")	2270 mm (7'5")	2325 mm (7'7")	3075 mm (10')	3125 mm (10'3")	3260 mm (10'8")	3350 mm (11')	3400 mm (11'2")	
Minimum cutting height *height to clear drum and boom	760 mm (30")	865 mm (34")	965 mm (38")	1010 mm (40")	1090 mm (43")	1170 mm (46")	1250 mm (49")	1330 mm (52")	
Recommended operating range	965 mm-1220 mm (38"-48")	1065 mm-1525 mm (42"-60")	1120 mm-1525 mm (46"-60")	1220 mm-1650 mm (48"-65")	1295 mm-1830 mm (51"-72")	1370 mm-2135 mm (54"-84")	1450 mm-2135 mm (57"-84")	1525 mm-2135 mm (60"-84")	
Weight	45,360 kg (100,000 lb)	49,900 kg (110,000 lb)	54,450 kg (120,000 lb)	56,700 kg (125,000 lb)	59,000 kg (130,000 lb)	61,200 kg (135,000 lb)	63,500 kg (140,000 lb)	63,500 kg (140,000 lb)	72,500 kg (160,000 lb)
Ground pressure	160 kPa (23 psi)	170 kPa (25 psi)	195 kPa (28 psi)	200 kPa (29 psi)	210 kPa (30 psi)	215 kPa (31 psi)	220 kPa (32 psi)		225 kPa (33 psi)
Ground clearance	150 mm (6")		197 mm (7-3/4")			273 mm (10-3/4")		349 mm (13-3/4")	
Conveyor width	762 mm (30")			965 mm (38")					
Tram speed	5 m/min - 26 m/min (15 fpm - 85 fpm)								
Dust collector	13 kW (18 hp)		13 kW or 22 kW (18 hp OR 30 hp)		22 kW (30 hp)			22kW or 30 kW (30 hp or 40 hp)	
Cutter	123 kW (165 hp)	150 kW (201 hp)	175 kW (235 hp)					220 kW (295 hp)	
Pump	30 kW (40 hp)		40 kW (54 hp)						
Gathering head	50 kW (67 hp)								
Traction	60 kW (80 hp)								
Total power *does not include fan	496 kW (665 hp)	550 kW (738 hp)	600 kW (805 hp)					700 kW (938 hp)	

JoySmart Solutions

Integrated JoySmart Solutions help solve customers' toughest challenges using data-driven intelligence, collaboration

Joy Global service facilities have given world-class service a new home.

through partnership and experienced-based service execution. They are a way of partnering with customers to help reduce costs and increase productivity, in line with customers' operating and financial goals.

JoySmart Service Centers are strategically located around the world in order to conveniently serve our customers. With each new service center built, Joy Global products and people are becoming more connected, allowing for expanded benchmarking. Located strategically in zones of mining activity, each service center brings local support that is world-class. Services offered are structured to fulfill the lifecycle of mining equipment, optimizing equipment for productivity and safety.

Our commitment to world-class service is delivered through world-class processes and metrics. Our Joy OpEx processes bring operational excellence by prioritizing the elimination of waste, simplifying processes, automating and removing people from harm's way. We leverage those principles throughout our network, with the ability to rapidly customize locally, helping customers work smarter, worldwide.



JoySmart Solutions are integrations of smart connected Joy Global products and systems, advanced analytics and direct services customized to solve customers' toughest challenges.

JoySmart Solutions at work:

Costs

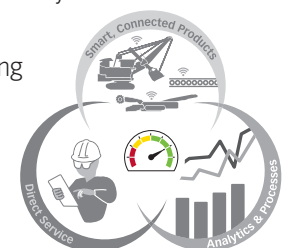
- Lower cost per unit produced by reducing overall parts and consumables expenditures
- Optimize costs for power/fuel, labor and rebuilds

Safety

- Automate processes and controls
- Increase awareness through training and standard setting

Productivity

- Improve system availability, performance, utilization and consistency
- Leverage extensive Joy Global engineering knowledge to solve problems



JoySmart Solutions



Joy Global worldwide locations

JOYGLOBAL



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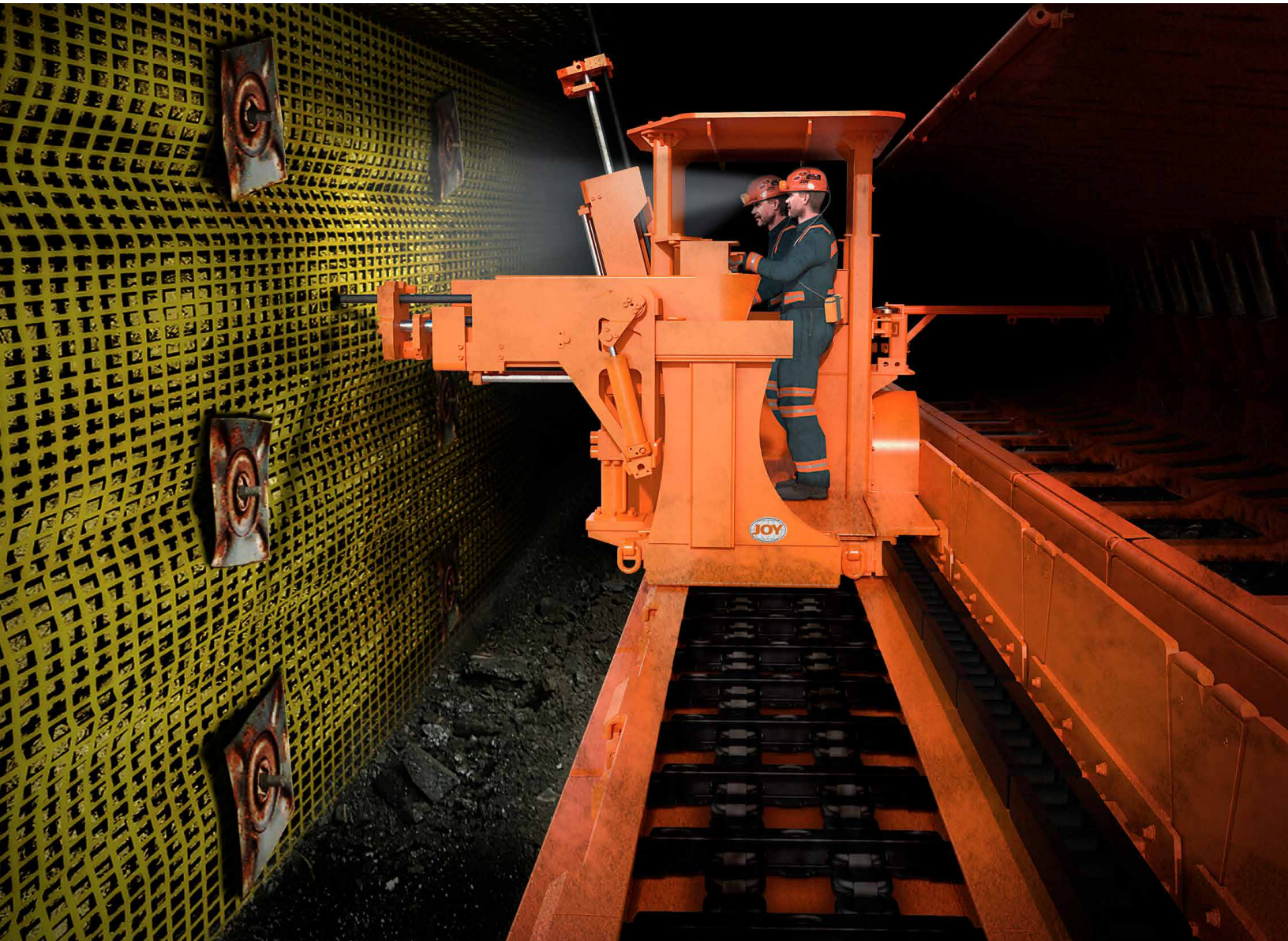
joyglobal.com

EN-14CMS01-0616-V1

JOYGLOBAL



Mobile Bolters Product Overview



JOYGLOBAL
Service Leader



Delivering world-class mine performance

At the core of our commitment to customers is providing world-class solutions through our unique direct service network. This allows us to **collaborate with customers**, developing innovative parts, products, consumables and systems that lower their total cost of ownership while safely maximizing production.



Our commitment to quality and reliability is supported by our focus on Operational Excellence. We use Joy OpEx principles to eliminate waste, simplify the process, automate and remove people from harm's way.



RamTrak 2300

The Joy RamTrak 2300 series of mobile roof bolters from Joy Global offers a highly versatile, narrow width, single boom bolting machine complete with extensive boom

RamTrak 2300 allows a complete range of roof, rib and floor bolting.

movement and rotary movement allowing a complete range of roof, rib and floor bolting. The RamTrak mobile roof bolter is capable of roof and rib-bolting in working heights of 1.85 metres and above. The compactness of this machine gives it excellent maneuverability.

RamTrak 2300 machines from Joy Global are electro-hydraulic and feature onboard condition monitoring and semi-automatic drill operations, with an optional temporary roof support. The RamTrak roof bolter can be fitted with rotary or percussive drills to suit conditions and is available in either standard or long-reach articulating arm versions as well as gas drainage versions. The RamTrak 2300 roof bolter can also be configured for use by a single operator in "place change" operations, for installation of secondary cable bolting, or for gas drainage drilling.

2300 Specifications

Typical operating range	1850 - 5000 mm
Length (typical)	5700 mm
Width (typical)	1660 mm
Height (typical)	1820 mm
Machine weight	10,000 kg (depending on options)
Ground pressure at max. rated load	95 kPa (depending on options)
Hydraulic motor	60 kW (1140V or 1050V or 550V 50 Hz)
Hydraulic traction	0-28 m / min
Rotary actuator	Wide range of drilling positions
Boom swing	Sideways +/- 28°, Raise/lower +32°/-23°, Twist +10° to -15°
Dual controls	Rear of machine and pendant control
Canopy	Optional

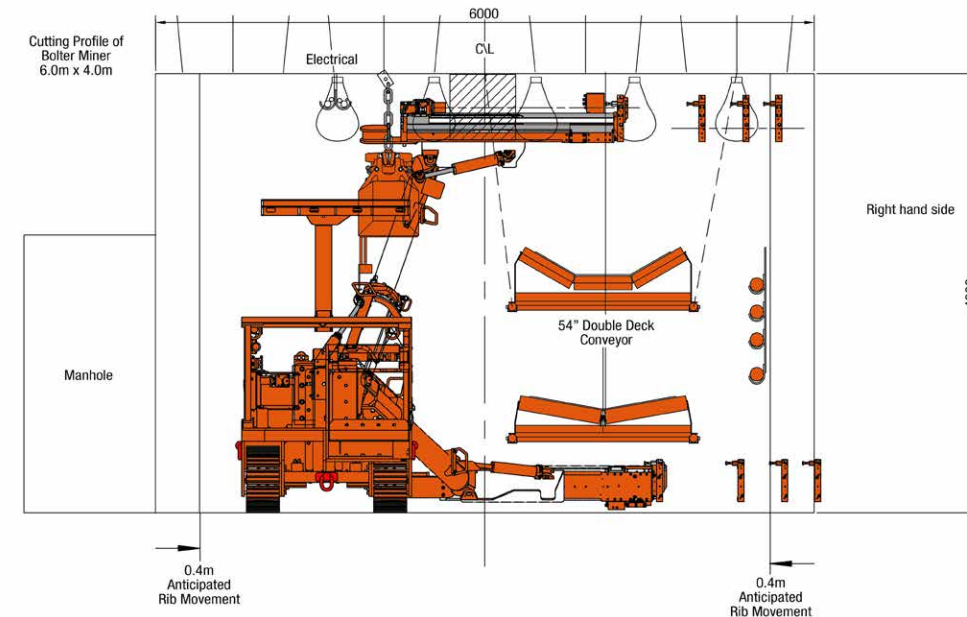


RamTrak 2300 - wide reach

The RamTrak 2300 wide reach bolter has been specially adapted to provide a wide range of drilling and bolting solutions for secondary bolting in difficult conditions. This highly versatile, single-mast bolter can achieve numerous roof and rib bolt positions from one location.

Bolting in awkward locations

The extended arm can swing from side to side, raise and lower as well as lift and twist. This range of motion allows secondary bolting in awkward locations such as above and below the conveyor belt structure and behind obstacles.



Maximum versatility

360 degree rotation...

The 360 degree rotary actuator allows the RamTrak 2300 roof bolter to easily adapt to place bolts at a variety of different positions in roof, rib or floor. The arm is also extendable and moves from side to side allowing accurate indexing and positioning of bolts.



Ramtrack gas drainage

Longhole drilling...



Mobile machines are available for forward drilling of long holes in de-gassing and for wet or dry (vacuum) roofbolting with either percussive or rotary drilling units. The single and multi-head bolters are proven for speed and reliability and offer cost-effective solutions for roof and rib-bolting and gas drainage drilling. All machines can be adapted for cable-bolting with semi-automatic operation to install bolts up to 15 metres long.



Quadbolter

The latest generation Joy Quadbolter is a twin boom, four mast, mobile bolting machine with a wide range of boom movement and highly versatile bolting positions. It combines innovative design and proven Joy technologies. The inherent advantages of a twin boom, four mast, semi-automatic bolter are more bolts installed in less time with less effort.

The Joy Quadbolter combines innovative design and proven Joy technologies.

The quadbolter is capable of installing four bolts simultaneously using two operators. The outer roof bolters can be rotated over to provide rib-bolting. Drilling is accomplished by Joy Global patented hydraulic roofbolters and direct mast-mounted hydraulic controls, reducing the number of hoses.

The mast-mount controls are directly ported into the feed carrier eliminating most hosing and down-time associated with conventional drilling equipment. The semi-automated control system allows the operator to smoothly install two bolts in a parallel operation that significantly reduces cycle times.

A wide range of drill options is available for rotary or percussive drilling. The rotary drills can be used in wet or dry drilling applications. The functionality of the operator's platform is of paramount importance. The quadbolter has the largest deck area available of any boom-style bolter. Well-lit and spacious, the layout provides operators the opportunity to perform their duties with greater ease and safety. The platform has a large canopy providing excellent protection for the operator. The canopy is rated to withstand a vertical load of 100kN and has adjustable height settings. The boom arrangement, with a unique parallel holding design, provides full range ability for medium and high seam applications.

The operator has the ability to adjust the level of the platform for varying localized seam conditions. The standard quadbolter has the option to raise the operator's platform and TRS an additional 600 mm for high seam operation.

A large capacity, on-board materials pod provides storage for all bolting consumables. Operators have a material storage tray mounted directly behind them for easy access. The tramming and TRS station provides excellent all around vision and is spacious and well lit with a large walkway that provides safe access through the center of the machine.

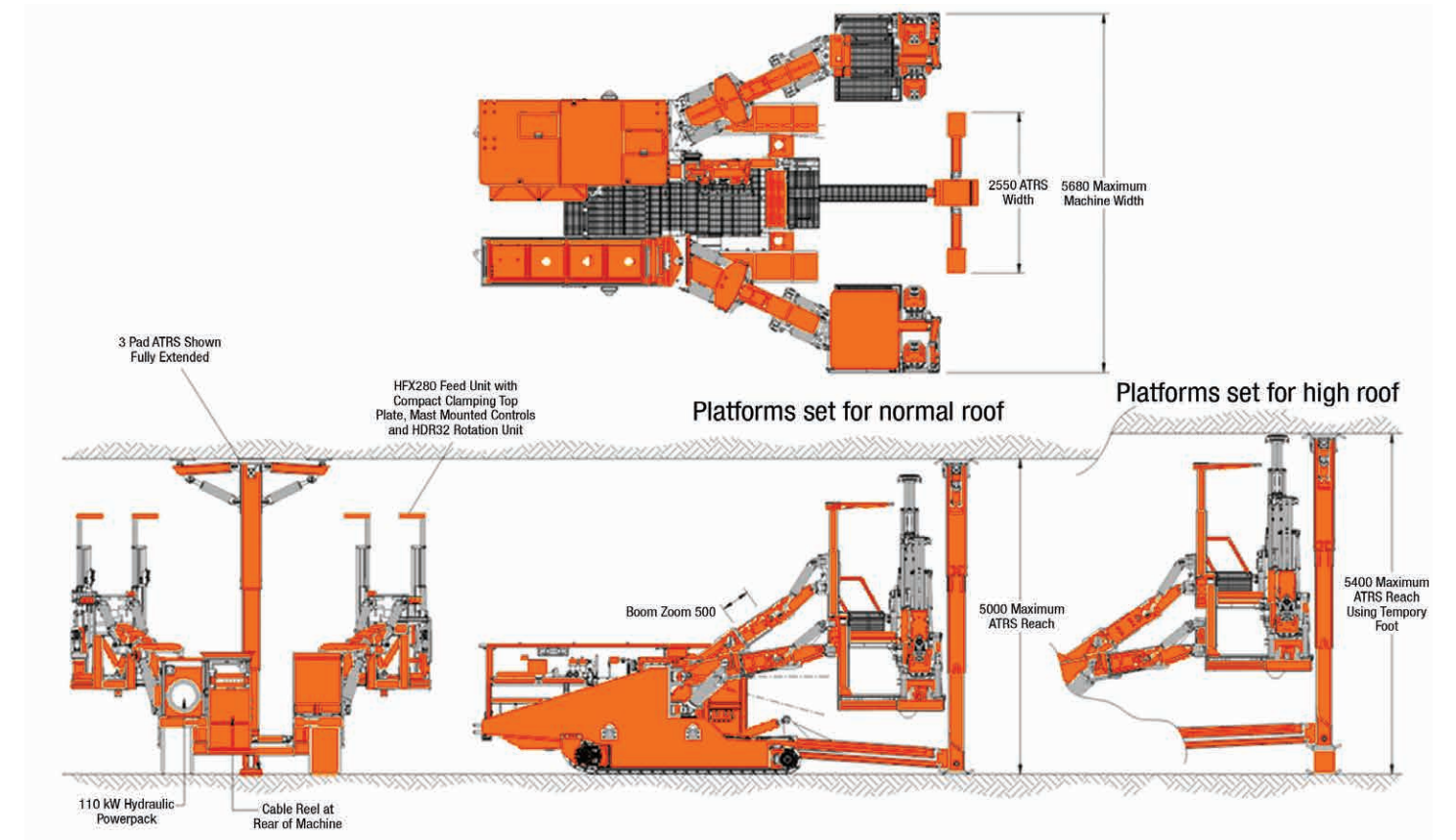


Maximum versatility

Four bolts, multiple positions...



Four roof, or two roof and two rib bolts can be placed from many different set up positions simultaneously. The extendable booms and three dimensional positioning in space allow a full range of bolting positions.



General specifications

Number of roof drills
Number of rib drills

Machine weight
Ground pressure

ATRS

Machine length
Machine width

Operating width
Operating range

Min tramming height

Ground clearance

Traction speed

Hydraulic tank

Motors

Pump

Voltage

Mid-to-high seam

Nominally 4
Roof drills roll over to bolt rib

Approx 29,800 kg depending on options
170 kPa

3-point advanced temporary roof support (in front of machine)

8008 mm
3160 mm retracted, 5680 mm with platforms extended

Up to 6000 mm
2400 mm to 5000 mm

2060 mm

360 mm

0 - 20 m/min hydraulic drive, proportional control

450 litres main tank + 350 litres in chassis

Hydraulic pump motor 1 x 125kW air-cooled 50 Hz

Fixed gear pump, 4 sections, each section 97 litre/min

1140V, 1050V or 950V



Multibolter

The Joy multibolter is one of the most innovative additions to Joy Global's bolting product range. It is a multiple drill-head, platform-based, mobile bolter designed primarily for "place change" continuous miner applications. The functional and ergonomic design, based around a large operating platform that can be raised and lowered, reduces cost and increases the working space, enhancing safety and productivity. The elimination of swinging booms and other moving parts reduces repair costs, enhances operator safety and extends the unit's operating life.

The Joy multibolters can be designed to meet a wide range of operating conditions with four models to cover various seam heights. The number of platform-mounted drill units can be matched to suit the bolting pattern and mine conditions with up to six semi-automatic roofbolters. Either wet-drill or dry-drill versions (with vacuum dust collection system) are available and, with additional equipment, the multibolter can be used for rockdusting and installation of ventilation ducting.



Side frames extended



Multibolter 2036



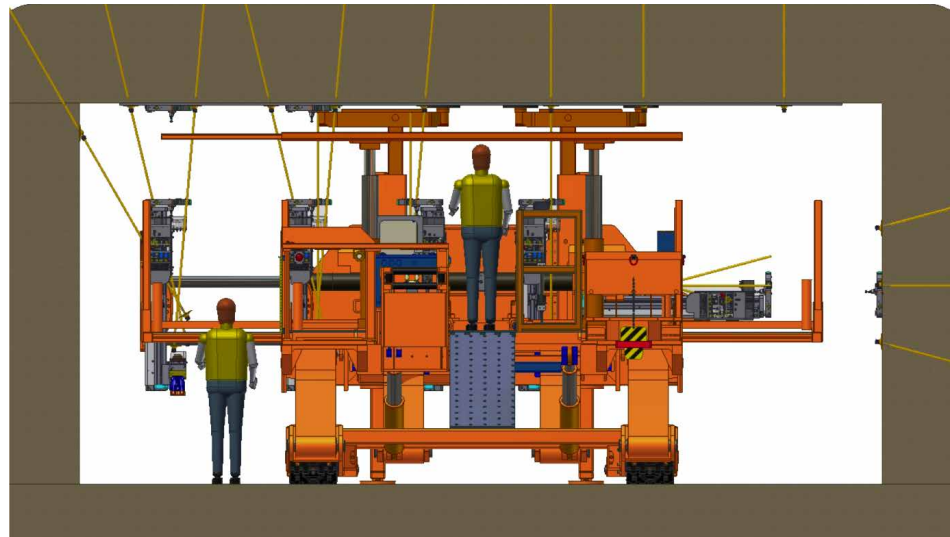
Maximum bolting range
Full range of roof and rib drilling...

All bolters can be indexed and tilted for multiple bolting positions. The outer bolters can be extended and rolled over to bolt the ribs.



General specifications

	2036	2337	3045	3554
Nominal operating range	2.0 - 3.6 m	2.3 - 3.7 m	3.0 - 4.5 m	3.5 - 5.4 m
Length (typical)	7510 mm	6680 mm	5982 mm	6400 mm
Width (typical)				
Retracted	3200 mm	3400 mm	4000 mm	4000 mm
Extended	4550 mm	4900 mm	6800 mm	6800 mm
Closed height (typical)	2100 mm	2400 mm	2550mm	3050 mm
Machine weight	28,000 kg	34,000 kg	35,000 kg	46,500 kg
Ground pressure (typical)	140 kPa	150 kPa	170 kPa	200 kPa
Hydraulic motor	112 kW	112 kW	112 kW	125 kW
Voltage 50Hz	1140V / 1050V	1140V / 1050V	1140V / 1050V	1140V / 1050V
Traction	Hydraulic	Hydraulic	Hydraulic	Hydraulic
Traction speed	0-20 m / min	0-20 m / min	0-25 m / min	0-20 m / min
Auto Temporary Roof Support (ATRS)	2 point 6 to 170 kN	2 point 6 to 170 kN	2 point 6 to 170 kN	2 point 6 to 170 kN



Multibolter 3045

Operational features

- Side platforms extend to allow full-width bolting
- Outer bolters can roll over to allow a range of rib bolting options
- Platform lifts using cylinder and scissor mechanism



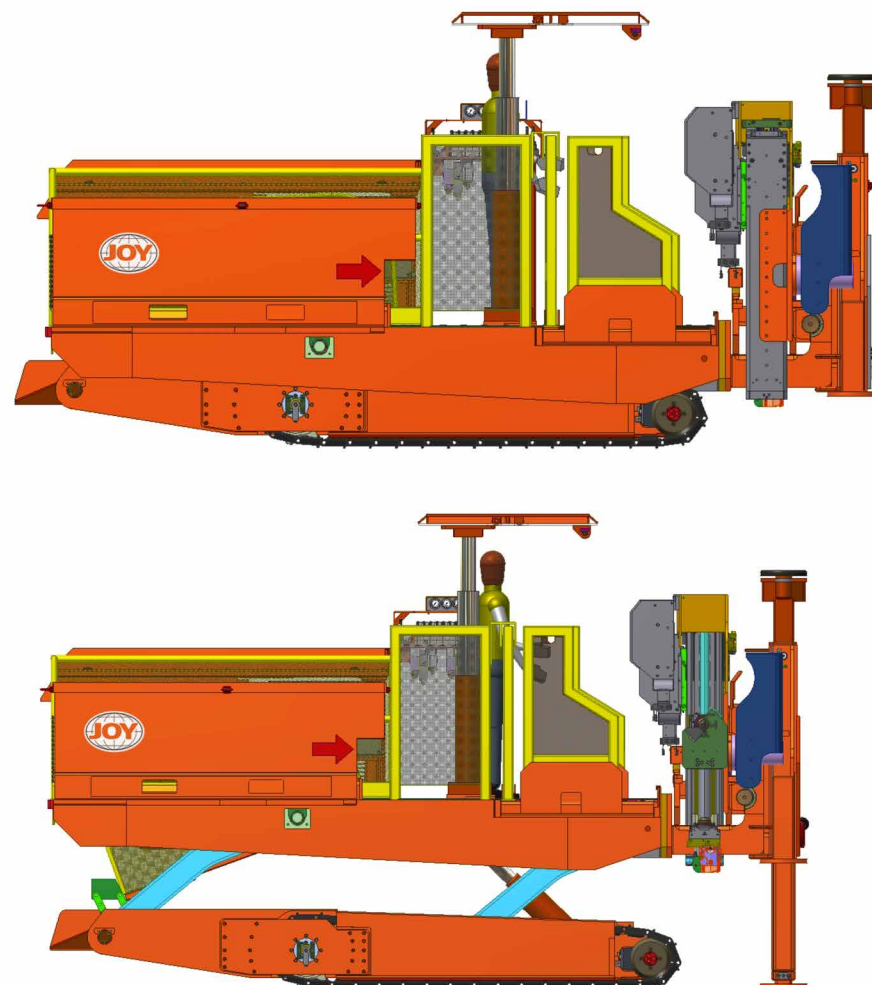
Extendable bolting platform

Maximum versatility

Extendable side frame...



The main platform can be raised and lowered. The outer bolters are mounted on extending cylinders with a tilt mechanism to fully cover roadway widths and rib bolting positions.



Zero harm mentality

Increased safety

The walk-through machine concept, together with the use of extendable platforms and semi-automatic two-speed, two-handed drilling operations are designed to place all operators in a safety-assessed environment, removed from interaction with rotating or moving machinery and other safety hazards. Joy can also assist end users in the risk assessment process for operators and operations and for all machine and drilling functions.

With its unique scissor lift arrangement, the Multibolter 3045 can achieve a wide range of bolting heights. The platform extensions allow for a wide range of operating widths and also enable rib bolting.

The operator height range of the new Multibolter 3045 is greatly extended by the new scissor lift mechanism. Also the entire operator platform and guard rails extend sideways to fully reach the roadway edges.





ICM2 - Mast-mounted control module (auto drill and return cycle)

HDR
Hydraulic Rotation Unit



- Compact drill motor
- Improved bearings
- Self lubrication, internal porting
- Better offset (side) loads
- Improved water sealing
- Robust, reliable

Hydraulic roofbolter

HFX, HDR and ICM2

The HFX drill feed is designed to be a key component in automated roofbolting systems. Mounted on continuous miners, roadheaders or other mobile equipment, it provides fast, reliable roofbolting.

The HFX drill feed is a patented, semi-automatic, wear-resistant and telescopic roofbolter that minimizes maintenance and downtime. The highly reliable, semi-automatic drilling and bolt insertion machine provides for either single lever auto-drilling or manual operation. The Joy HFX drill feed from Joy Global also provides auto-water on-off and mast extend-retract during a drilling cycle. A very important safety feature is the ability to disable the auto-drill function by simply pressing a button. The HFX drill feed features a completely sealed carrier unit that virtually eliminates wear to the hardened chrome slide bars. Integration of the carrier and the slide bars provides outstanding structural stiffness. This roofbolter is available in two and three stage versions as well as rib-bolter models.

The HFX drill feed comes in a range of sizes with a choice of top plates and rotation units. The unit's advanced features include rapid penetration rate, easy use, quick set-up and long-life, low-wear design. Combined with reliability and a reduction in life cycle costs, these features provide optimum roofbolter performance.

HFX drill feeds - technical specifications

Model	170	190	210	240	280	310	340
Retracted length	1250	1400	1507	1675	1885	2035	2185
Extended length	2075	2275	3464	2770	3170	3470	3770
Chain travel	925	1075	1156	1350	1560	1680	1790
Total travel	1750	1950	2113	2445	2845	3145	3440
Approximate mass kg	360	405	445	505	590	650	710



AFX, TSRU and ICM3

The AFX drill feed from Joy Global is a heavy-duty, low-maintenance drill feed with a 50% increase in feed thrust over the HFX drill feed and is suitable for wet or dry drilling. It offers high reliability and durability. The patented HFX and AFX roofbolters feature a hardened, corrosion-resistant slide tube rod structure and sealed, automatically lubricated slide blocks which virtually eliminate wear to the hardened chrome slide bars, reduce maintenance and increase productivity.

AFX drill feeds - technical specifications

HFX and AFX models ranging from 1.9m to 3.4m single pass capabilities. Typical model and travel lengths for the AFX models are shown below:

Model	190	210	280	310
Retracted length	1533	1645	1900	2145
Extended length	2425	2445	3338	3645
Chain travel	1042	1152	1500	1650
Total travel	1934	2152	2848	3150
Approximate mass kg	585	655	720	790



ICM3 Integrated Control Module

- Auto-cycle, two-speed control
- Auto-feed options
- Increased safety with two-handed operation during bolting operations
- Two-speed control
- Water monitoring



TSRU Two-Speed Rotation Unit

- Two-speed motor requiring less oil
- Compatible with existing HFX drill feed masts
- Wet and dry drilling options
- Slow speed for safe operator interface
- High speed drill rig
- 240 - 750 rpm speed range
- 71 Lt/min oil supply
- 400 Nm peak output torque





Electro-hydraulic roofbolter

The Joy Electro-Hydraulic bolting rig or 'E-Bolter' takes Joy Global's roofbolting equipment to the next level of automation, control, monitoring and safety. The E-Bolter offers a number of additional features. Based on the proven AFX feed, the E-bolter utilises solenoid-controlled proportional valves mounted directly on the drill feed mast. The solenoids are controlled by an electronic controller which, in turn, links back to a display screen. Every function can be individually controlled from a push button console and, if preferred, programmed to perform controlled automatic cycles. Once the rig has been positioned, an automatic drilling cycle can be initiated. When the automatic drilling cycle is complete and the chemical has been inserted, the automatic bolting cycle can be initiated to spin in the bolt and torque up the nut to pre-defined limits. The automatic bolting cycle inserts the bolt, mixes the chemical, waits for the set time and then tightens the nut.

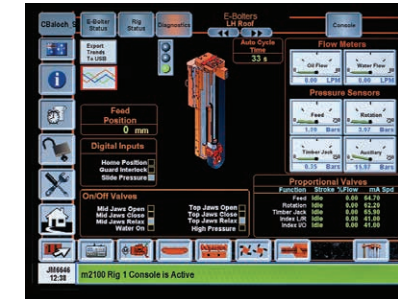
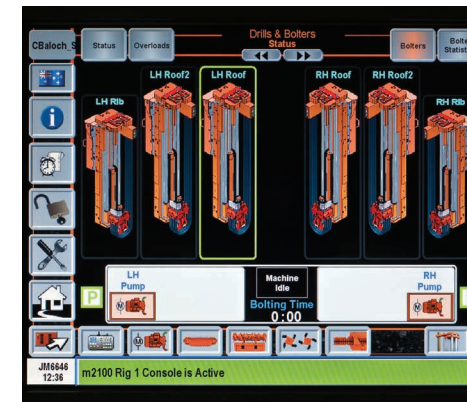
E-bolter control

As all drilling parameters are continuously monitored, several advanced functions are available including adaptive drilling (where the drill feed speed is adapted to the roof conditions), anti-stall (if the drill speed slows, the feed thrust will reduce), prevention of drill steel bending (the feed pressure is monitored depending on the type of drill steel and depth of collaring into the drill hole) and prevention of water blockage (the water flow is monitored and the feed rate is slowed if the water flow slows). A full event log of every drill cycle is also available.

Push button control auto operation...



The simple push button control station allows two-handed control for all fully automated operations including drilling and bolt insertions. Two-handed control ensures the operator cannot interact with rotating parts when initiating a drill cycle.



The electronic control of the E-Bolter has a number of other advantages. Various parameters can be set interactively on the display screen, e.g., the chemical set time. There are also many diagnostic features such as the 'fault and transactions' log and adaptive drilling features to regulate the drill speed if either hard or soft material is encountered. Also the feed travel can be monitored to enable various checks including that the drill and bolt have reached full stroke.

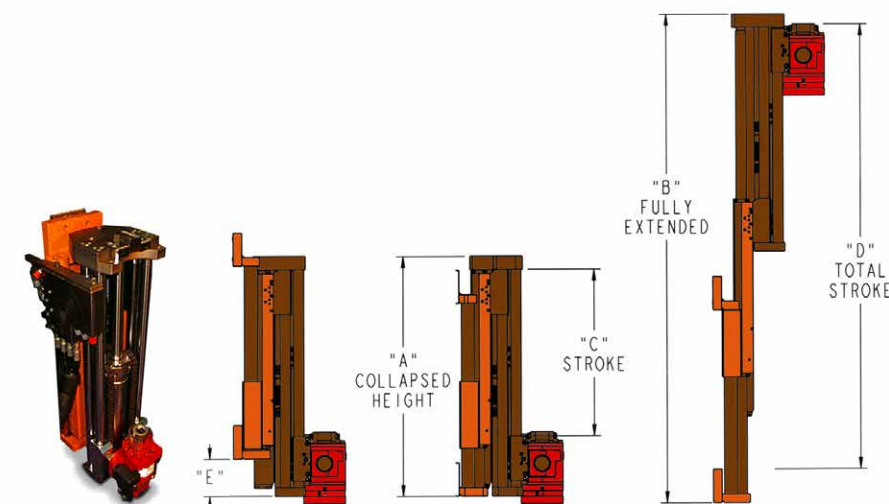
The E-Bolter enhances operator safety as locating the drill steel or bolt in the chuck avoids the need for the operator to interact with the rig and the controls at the same time. In addition, the control console can be easily mounted in an ergonomic position to suit the operator. The rig is available on the 190, 210, 240, 280, 310 and 340 AFX models with single pass drill feed ranges from 1.9 to 3.4 metres.

HGX - low height feed

The Joy HGX drill feed is a low height, three stage drill feed designed for use in restricted height operations. With a collapsed height of only 1082 mm, this feed is ideal for seam heights of 1.3 to 2.0 metres.

HGX feed series 2 (triple stage) - dimensions

Model	Overall length (mm)			Total stroke (mm)		Mass (kg)
	A	B	C	D	E	F
210	1082	2212	745	2041	168	350



Technical specifications

Feed thrust	140 k	0 - 28.4 kN
	210 bar	0 - 42.6 kN
Feed speed - drilling	0 - 6 m/min	
Feed speed - bolt insertion	25 m/min	
Feed speed - retraction	25 m/min	
Feed oil	0 - 9 Lt/min	
Consumption drilling	0 - 9 Lt/min	
Feed oil	37 Lt/min	



Facebolter 3040

The Joy longwall Facebolter is an AFC-mounted, hydraulically-propelled roofbolting machine specifically designed for longwall face bolting during salvage or installation or in the presence of severe adverse geologic conditions. This bolter mounts directly onto the AFC and is powered by hydraulic energy from the longwall roof supports supplied through a sprocket meshed into the AFC rack bars. It incorporates maximum roofbolting flexibility allowing a wide coverage of roofbolter positions by permitting the two roofbolting rigs to move on sliding mechanisms both forward and backward (toward and away from the face) and also to raise and lower. A rotary actuator also allows the roofbolt rig to roll over to install bolts into the longwall face.

General specifications

Number of roofbolting rigs	Two (2), one on either end
Facility to load on and off AFC	By LHD
Hydraulic Power	Hydraulic PTO or from longwall roof supports
Operating height range (std platform)	2.1 m - 3.2 m
Bolt centres (extendable platform)	3.0 m - 4.0 m
Machine length (adjustable range)	4.3 m - 5.3 m
Machine width	2000 mm
Operator's platform width	970 mm
Machine height during tram	1900 mm
Bolter slide in line with face	500 mm
Bolter slide toward face	400 mm
Drive	Hydraulic motor and sprocket on longwall rack bars
3 Speed tram	1st 10 m/min, 2nd 15 m/min, 3rd 20 m/min
Tractive effort	7 - 12 tonne
TRS (Temporary Roof Support)	Operator canopy
Roof drill rig type	Joy HFX190
Drill rig controls	Cabinet-mounted



Facebolting versatility
Faceside roofbolts and facebolts...



Roofbolts can be placed on the faceside or angled into the longwall face in a variety of different positions and different bolt centres.

JoySmart Solutions

Integrated JoySmart Solutions help solve customers' toughest challenges using data-driven intelligence, collaboration

Joy Global service facilities have given world-class service a new home.

through partnership and experienced-based service execution. They are a way of partnering with customers to help reduce costs and increase productivity, in line with customers' operating and financial goals.

JoySmart Service Centers are strategically located around the world in order to conveniently serve our customers. With each new service center built, Joy Global products and people are becoming more connected, allowing for expanded benchmarking. Located strategically in zones of mining activity, each service center brings local support that is world-class. Services offered are structured to fulfill the lifecycle of mining equipment, optimizing equipment for productivity and safety.

Our commitment to world-class service is delivered through world-class processes and metrics. Our Joy OpEx processes bring operational excellence by prioritizing the elimination of waste, simplifying processes, automating and removing people from harm's way. We leverage those principles throughout our network, with the ability to rapidly customize locally, helping customers work smarter, worldwide.



JoySmart Solutions are integrations of smart connected Joy Global products and systems, advanced analytics and direct services customized to solve customers' toughest challenges.

JoySmart Solutions at work:

Costs

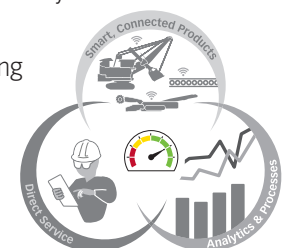
- Lower cost per unit produced by reducing overall parts and consumables expenditures
- Optimize costs for power/fuel, labor and rebuilds

Safety

- Automate processes and controls
- Increase awareness through training and standard setting

Productivity

- Improve system availability, performance, utilization and consistency
- Leverage extensive Joy Global engineering knowledge to solve problems



JoySmart Solutions



Joy Global worldwide locations

JOYGLOBAL



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EN-MBP001-0616-V1

12CM30

Miner bolter





12CM30 rapid entry development miner bolter

The Joy 12CM30 miner bolter fully integrates the early installation of high strength roof bolts with the latest improvements in machine design and roof bolting technology.

Close bolt to face distance

Models fitted with a plough in place of the CLA (Centrifugal Loading Arm) gathering head system offer the closest vertical bolt placement to face distance. The bolt to face distance ranges between 2 — 2.5 metres depending on the model and specification. By angling the bolters forward toward the cut face and undercutting the cut face with the cutter head at the bottom, the bolt to face distance can be even further reduced. Reducing the bolt to face distance and enabling the early application of roof and rib bolts helps prevent the strata from separating and helps reduce strata movement. This can improve roadway stability and assist in reducing the need for secondary bolting.

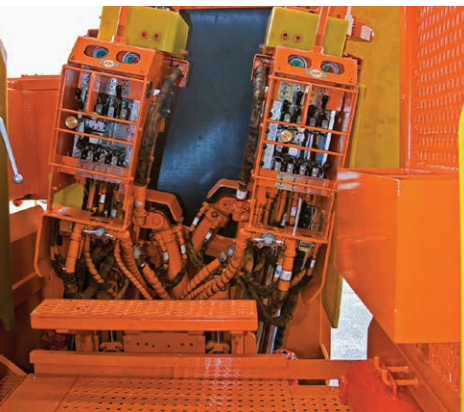
Rib and rib bolting capability

Up to four roofbolters mounted with swing and tilt cylinders provide maximum flexibility for a large number of vertical bolts, with inclined bolts at the roadway rib sides and over the central area of the roadway. The standard machine is equipped with one rib bolter on either side of the machine. The rib bolters can be mounted on a raise and lower and tilt mechanism to allow the maximum number of rib bolts to be placed in the rib and as close to horizontal as possible. A rib protection shield helps protect the safety of operators.

The 12CM30 miner bolter is equipped with Joy's reliable range of drill feed units and hydraulic rotation units. Depending on the specification, single pass drill lengths can be achieved from 1.5 metres to over 3.4 metres. The roofbolt drill rigs have integrated control units which are directly mounted via manifolds onto the drill feed and internally ported in order to provide excellent ergonomic control together with the elimination of all hoses to the control unit. This greatly improves safety, operator control and reliability. Two speed control, semi-automatic operations and two handed control are standard.

Options

Optional extras include integrated on-board ventilation ducting, integrated dust scrubber, mesh handling rails, on-board mesh rack storage and on-board materials storage pods.



Each roofbolter is equipped with a mast-mounted integrated control unit with semi-automated operation. The operator platform area is large for ease of operations and improving safety.

Joy 12CM30 miner bolter



The 12CM30 miner bolter has a wide installed base in longwall entry development applications in Australia, with an increasing presence in the Eurasian market. Over 15 years of continuous improvements and developments are incorporated in the latest models.



12CM30 Features

The Joy 12CM30 miner bolter is a single-pass machine designed for fixed roadway cutting widths with differing model options having drum extended widths of 4.8 or 5.0 or 5.2 or 5.4 meters.

Two gathering head choices are available: plough or centrifugal loading arm (CLA). Plough-type gathering optimizes the bolt-to-face distance while scrolling webs on cutter drums achieve simple and effective loading of coal onto the conveyor. CLA-type gathering uses proven high performance loading technology with gathering spinners common to other models in the Joy Global range.

Hydraulic extensions on either side of the machine cutter head retract by 300 mm on each side, reducing the total cutting width by 600 mm to enable ease of tramming and withdrawal of the machine and to allow greater flexibility in cutting corners.

General specifications

Operating height range (depending on model)	From 2.4 to 4.6 meters
Loading rate	Up to 27 tonnes/min
Approximate weight	85 tonnes
Cutting widths (extended drums)	4800, 5000, 5200, 5400 mm
Cutting widths (retracted drums)	4200, 4400, 4600, 4600 mm
Conveyor	
Width	762 mm
Conveyor depth	305 mm
Chain pitch	83 mm
Speed	2.45 m/min
Nominal voltage supply	1040 V or 1100 V
Cutter head power	2 x 170 kW
Conveyor power	1 x 37 kW
Traction power	2 x 60 KW VFD drive
Hydraulic pump power	2 x 45 kW
Total machine power	587 kW

Multilingual display

On a standard control platform...

The Faceboss control platform can be configured to display a variety of languages. In combination with local field personnel, this multilingual control platform helps Joy equipment to achieve the goal of operating at the lowest cost per tonne, regardless of where the equipment is located.

This platform is standard across all Joy underground equipment, reducing inventory to support a typical fleet. This common platform reduces training requirements and enables ease of maintenance and trouble-shooting.



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JOYGLOBAL



14BU27 Loader Product Overview



JOYGLOBAL
Service Leader



Delivering world-class mine performance

At the core of our commitment to customers is providing world-class solutions through our unique direct service network. This allows us to **collaborate with customers**, developing innovative parts, products, consumables and systems that lower their total cost of ownership while safely maximizing production.



Our commitment to quality and reliability is supported by our focus on Operational Excellence. We use Joy OpEx principles to eliminate waste, simplify the process, automate and remove people from harm's way.



Joy 14BU27 loader

Today's new generation Joy loader was designed on the foundation of safety, durability and reliability found in the Joy continuous miner. It leverages several proven continuous miner designs including the Optidrive traction system, latest crawler chain, gathering gearcases and conveyor system technology. The 14BU27 loader was created as a utility machine for use in both production and auxiliary activities and with its solid platform allows greater flexibility to suit individual mine requirements.

Allows greater flexibility to suit individual mine requirements

14BU27 loaders include the quiet conveyor and patented, dual sprocket conveyor chain, which minimize operating noise and provide a safer work environment. Its 965 mm (38 inch) wide 1500 mm (59 inch) diameter centrifugal loading arms (CLAs) improve productivity by maximizing loading capacity. Optional gathering arm style system also available. Optional radio remote control gives mine personnel greater flexibility when working around hazardous zones.

14BU27 loaders can also be fitted with a variety of option accessories including an onboard bolting rig for auxiliary and center bolt capabilities, also an automated temporary roof support (ATRS) system and full bolter canopy. The 14BU can also be fitted with dual on-board cameras to improve operator visibility and optional rock duster.

Features

- Dual-drive gathering head with high output clā's
- Proven all-gear Optidrive traction system
- Replaceable wear runners on crawler frames
- Faceboss control platform
- Quiet conveyor package including patented dual sprocket conveyor chain, quiet tail and hydraulic tensioning system
- Emergency shut-off tape switch on each side

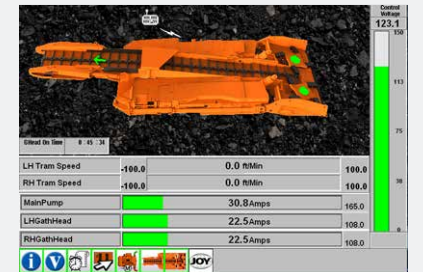
General Specifications

14BU27

Dimensions:	5100003830	
Basic chassis height	1067 mm	42 inches
Seam height	1651 mm minimum	65 inches minimum
Ground clearance	203 mm	8 inches
Capacity - tonnes per minute	up to 36 TPM	up to 39.7 tons per minute
Flex. Sideboards	203 mm high	8 inches high
Weight - base machine	31,600 kg approximate	69,700 lbs approximate
Bolter option	34,500 kg	76,100 lbs
Gathering head motors	2 @ 40 Kw	2 @ 54 hp
AC traction motors	2 @ 45 Kw	2 @ 60 hp
Pump motor	1 @ 30 Kw	1 @ 40 hp
Installed power	200 Kw	268 hp
Cooling system	Air cooled motors Thermo-syphon cooled controller	
Crawler chain	508 mm wide x 178mm pitch	20 inches wide x 7 inches pitch
Recommended trailing cable	244 m length - Size #2	267 yd length - Size #2



Faceboss Maximum flexibility...



Using a combination of operator assistance tools, automated sequences, advanced diagnostics and machine performance monitoring and analysis tools, the Faceboss control platform enables operators to consistently operate their Joy machinery at the optimal balance of production rate and cost.

Optidrive Increased productivity...



The Optidrive power-matched, integrated drive transmission includes gear-box, AC electric motor, Variable Frequency Drive (VFD) and control technology. The holistic design approach provides an optimal, rugged and reliable solution for shearer traction systems.



Joy Global worldwide locations

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EN-14BU27L01-0616-V3

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JOYGLOBAL



Drifter Conversions

Product Overview



JOYGLOBAL
Service Leader



Delivering world-class mine performance

At the core of our commitment to customers is providing world-class solutions through our unique direct service network. This allows us to **collaborate with customers**, developing innovative parts, products, consumables and systems that lower their total cost of ownership and maximize production without impacting safety.

JOY Operational Excellence
Taking us to the next level



Our commitment to quality and reliability is supported by our focus on Operational Excellence. We use Joy OpEx principles to eliminate waste, simplify the process, automate and remove people from harm's way.

Drifter conversions

Joy Global is a premier provider of Montabert drifter conversions in the field. Our extensive experience and unique level of conversion knowledge means we are able to handle virtually all drifter conversions, regardless of the drill manufacturer. Our experts determine the best solution to match required specifications through an established customer inquiry process along with our selection tools.

Joy Global drifter conversions result in improved reliability, reduced production cost and consumable cost, improved penetration rates, lower noise level and lower maintenance costs.

Montabert drifters have been designed with extensive engineering knowledge of transmission and percussion mechanism theory, utilizing new concepts such as progressive blow energy and hydraulic dampening.



Conversion benefits








- 1**
 - Wide range of drifters and cradles make adaptations simple on competitors' units (bit size, hole length)
 - Lower noise levels and less vibration enhance operator environment
- 2**
 - Increased tool life (striking bar, bits and coupler) decrease your cost
 - Stronger rotation systems for better reliability
 - Maintenance free accumulators
- 3**
 - Reduction in vibration (less wear on drifter body sections and pins, bushings, boom, etc.)
 - Lowest maintenance drifter on market

Cradle adaptations

Joy Global utilizes enhanced engineering designs and innovative material for our cradles to produce a robust and reliable cradle that will stand up to the toughest environments.



There are many Montabert drifter models available to be utilized in conversions:

Model	Weight	Percussion power	Impact rate	Percussion flow pressure	Rotation flow pressure	Application	Hole range
HC20 	60-71 kg 132-157 lbs	4 Kw	3000 BPM	45 l/min 140 bar	30-48 l/min 175 bar	Light bolting, drilling	25-51 mm 1" - 2"
HC25 	71 kg 157 lbs	8 Kw	3900 BPM	65 l/min 110-150 bar	30-48 l/min 175 bar	Light face drilling, bolting	38-64 mm 1 1/2" - 2 1/2"
HC50 	102 kg 225 lbs	13 Kw	2700-4400 BPM	80-105 l/min 150 bar	25-52 l/min 150 bar	Face drilling, bolting	45-76 mm 1 3/4" - 3"
HC95 SA 	170kg 375lbs	21 Kw	3800 BPM	90-120 l/min 160-200 bar	48-75 l/min 210 bar	Face drilling, long hole, bolting, scale	45-102 mm 1 3/4" - 4"
HC109 	142 kg 313 lbs	18 Kw	2900-3500 BPM	100-135 l/min 135 bar	30-60 l/min 150 bar	Face drilling, long hole, bolting, scale	45-102 mm 1 3/4" - 4"
HC110 	200 kg 441 lbs	27 Kw	3800-4800 BPM	90-170 l/min 165-225 bar	65-75 l/min 175 bar	Face drilling, long hole, tunneling, shaft drilling	51-89 mm 2" - 3 1/2"
HC112 	248 kg 547 lbs	27 Kw	2500-2750 BPM	170 l/min 180 bar	70-80 l/min 175 bar	Long hole	76-127 mm 3" - 5"

Energy recovery valve

This valve allows the piston rebound energy to be utilized for the next blow, giving a definite advantage to HC series drifters:

- Better efficiency
- No internal peak of pressure source of cavitation
- Best drifter position

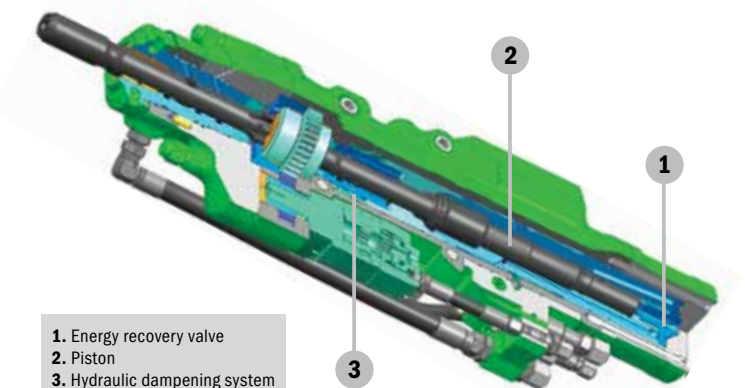
Piston

The unique design of the piston generates a perfect, long shock wave of a trapezoidal shape:

- Better transmission of energy at the couplings
- Minimum stress into the drilling rods
- Better bit penetration

Hydraulic dampening system

- Optimum shock wave transmission
- Protection of the drifter and tools
- Reduced vibrations



Reverse percussion device (optional)

The optional hydraulic reverse percussion system ensures real back hammering:

- Tool extraction in fractured ground

Contact a local Joy Global service representative for more information on drifter conversions or visit www.joyglobal.com



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EN-DC01-0317-V3

JOYGLOBAL



Entry Development Product Overview



Systems approach

Leveraging the approach taken in longwall systems, Joy Global works with clients to tailor complete development systems to meet the goals of high levels of safety, productivity and lower operating costs.

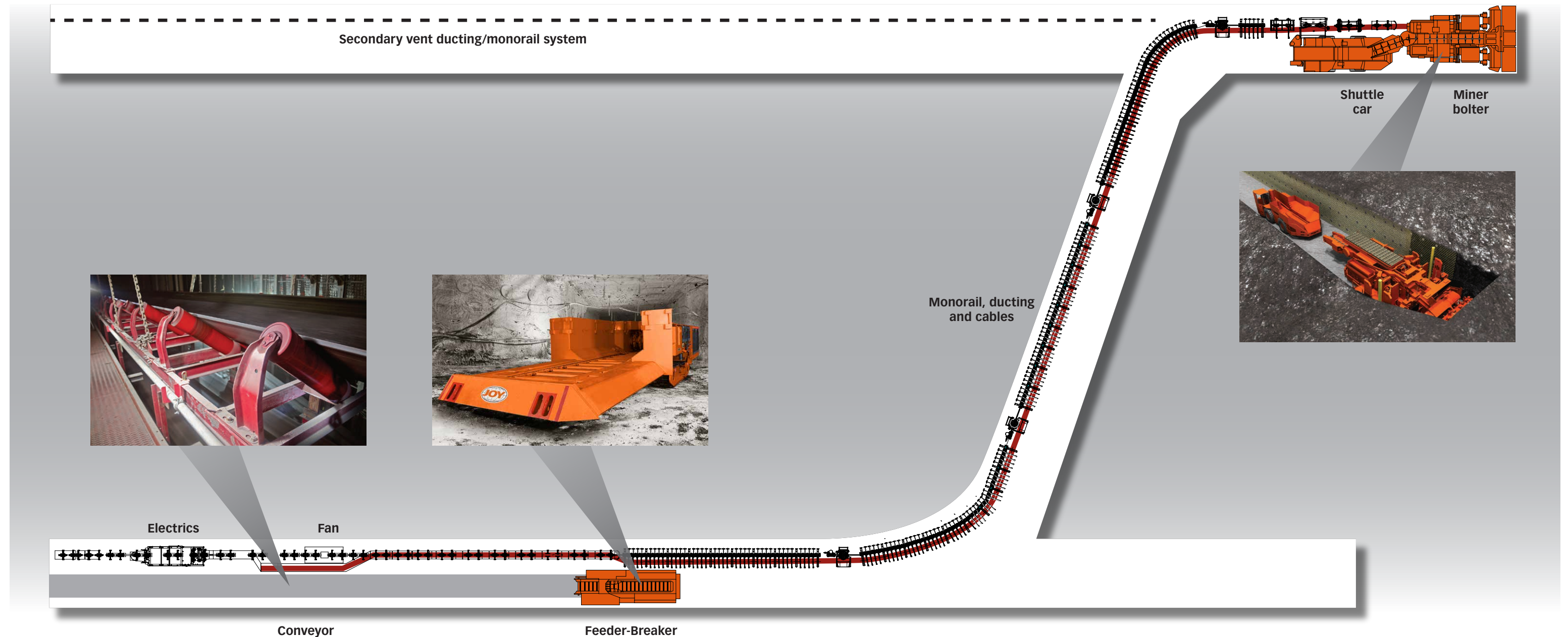
Working from our wide suite of equipment and with key subcontractors, we can provide a complete system with high

levels of integration and compatibility to drive predictable mining outcomes.

The performance of an entry development system may be constrained by haulage, bolting or a range of other items. Viewing the entire system as a single unit, rather than discrete machines, allows us to optimize the system and address the bottlenecks.



Typical twin entry development





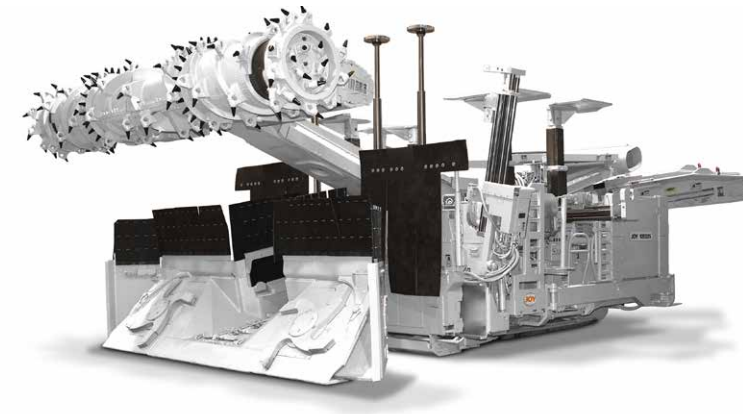
12ED25 miner bolter

The 12ED25 miner bolter is the second of a new generation of miner bolters in the Joy Global product line. The new generation incorporates the latest developments and technology from Joy Global, and offers simultaneous cut and bolt capabilities.

Simultaneous cut and bolt capabilities

The ED25 range of miner bolters was conceived in 2005 when Joy Global launched a project to produce the 'Next Generation' of machines for longwall entry development. Key highlights of the product line are as follows:

- A model range consisting of two height models for varying applications – the 14ED25 miner bolter for lower seam heights typical in the United States, and the 12ED25 miner bolter for higher seam applications in Australia and other countries. Both models share a significant number of components
- Simultaneous cut and bolt capabilities
- Use of proven technology hardware components where possible, including Joy Global's proven cutter technologies, Optidrive AC VVVF drive traction system, motors, conveying and gathering systems
- A new generation of hydraulic system to provide an optimized solution for today's miner bolter needs, including high efficiency, space and heat and noise reduction
- The Faceboss electronic control platform, common to all new Joy Continuous Miners, to ensure the highest level of reliability
- Availability of global parts and service support



Integrated bolting system

The 12ED25 miner bolter launches Joy Global's new Electro-Hydraulic Bolting System, which has been developed to meet key industry needs of safety, productivity and reliability.

Zero harm mentality

- Reducing direct contact with the drill rig
- Reducing operator judgment in bolting process
- Ergonomic operator interface
- Improved safety

Productivity

- Repeatable roof support installation with programmable parameters
- Repeatable cycle times
- Capability of integrated surface reporting system to monitor each bolt installed
- Predictable outcomes

Reliability

- Use with proven Joy Global feeds and rotation units
- Reduction in hydraulic hoses
- Integrated valve assemblies
- Flameproof solenoid valves and processor enclosure
- Diagnostic reporting capability

Product optimization

The Faceboss control platform from Joy Global can maximize continuous miner productivity in a variety of ways -

Optimized cutting rates are automatically kept as high as possible during sump and shear cycles by ensuring maximum cutter motor current draw through control of the power delivered to the traction motors and the hydraulic proportional shear valve, respectively.

High availability feedback control loops are designed to protect all electric motors on the continuous miner from jam and thermal overloads, ultimately extending motor life and minimizing machine downtime.

Automated sequences generate consistency in machine operation in the face of changing operators and changing conditions. For example, "one-touch-shear" automatically controls the position of the cutter boom using a boom angle sensor and helps to properly maintain the floor and roof levels.

Maximum flexibility allows different operating parameters for typical cycle cutting requirements (e.g. box cut and slab cut) which can be pre-defined and are easily and quickly selected via the continuous miner remote station to prevent unnecessary delays.

Push button control

Auto operation...

The simple push button control station allows two-handed control for all fully automated operations including drilling and bolt insertions. Two-handed control ensures the operator cannot interact with rotating parts when initiating a drill cycle.





12CM30 miner bolter

The 12CM30 miner bolter system from Joy Global fully integrates the early installation of high strength roof bolts with the newest Joy Continuous Miner drive

Incorporates the latest improvements in machine design and roof bolting technology

system, incorporating the latest improvements in machine design and roof bolting technology.

The critical path for most longwall installations is gate road development. In both single-entry and multi-entry gate road development, when the roof is weak and early installation of roof bolts is required, roof support becomes the primary bottleneck (the longest cycle time event).

The Joy 12CM30 miner bolter offers a range of features and configurations to service mid to high seam mines with proven high performance cutting and bolting technologies.

12CM30 features

The Joy 12CM30 miner bolter is a single-pass machine designed for specific roadway cutting widths of 4.8, 5.0, 5.2 or 5.4 meters.

Two choices are available for the gathering systems: plough or centrifugal loading arm (CLA). Plough-type gathering optimizes bolt-to-face distance while scrolling webs on cutter drums help to achieve effective loading of coal onto the conveyor. CLA-type gathering uses proven high performance loading technology common to other models in the Joy range.

The hydraulic extensions on the machine cutter head, 300 mm on each side, reduce the cutting width by 600 mm to enable ease of withdrawal of the machine and greater flexibility in cutting corners. Also, hydraulic rib bolters can be mounted on the tilt or lift-and-tilt cylinders, depending on the configuration, to allow the maximum number of rib bolts to be placed in the rib and as close to horizontal as possible. To provide full flexibility for a large number of vertical bolts, the semi-automatic hydraulic roof bolters with swing-and-tilt cylinders are mounted behind the cutter head and placed as near to vertical as practicable.

Proven conveyor system

On models fitted with plough gathering, a single 37kW electric rear drive is fitted to drive the conveyor chain. On models with CLA gathering, 2 x 45kW motors drive the CLAs and the conveyor chain from the gathering head.

The Joy conveyor chain includes universal links to prolong chain life, and the cam style adjusting mechanism automatically compensates for chain slack as the conveyor swings.

Joy Global's latest Dual Sprocket Conveyor Chain is now optional on 12CM30 miner bolters as a further enhancement. This latest innovation is driven on either side by two parallel eight-tooth sprockets. The Dual Sprocket conveyor system provides a chain that is 50% stronger while reducing noise exposure up to 3dB, as compared to the conventional 3.25" (83 mm) pitch chains.

Ergonomic operator interface

The design of the 12CM30 miner bolters makes effective use of the additional space available in higher seam heights to provide machines with improved access to all components. Furthermore, the electrical controller cases are designed and located for ease of access. With the introduction of fluid system manifolds and hard piping, thirty percent of the hoses have been eliminated and troubleshooting has been simplified.

Advanced diagnostics

The Faceboss control platform includes an on-board graphical display which includes a log of events, messages and alarms. All key machine operating parameters are continuously monitored and recorded during machine operation. By applying the on-board trending and graphing capability to this stored information, the root cause of machine failure can be quickly and easily determined.

On-board service manuals are accessible through the on-board display. Supplementary to the typical service manual information are step-by-step instructions for regular maintenance operations and help text for systematic trouble-shooting.

Multilingual display

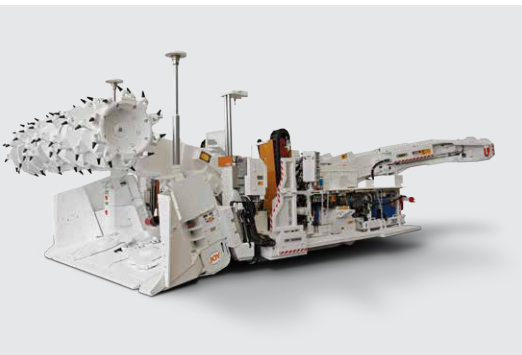
On a standard control platform...

The Faceboss control platform can be configured to display a variety of languages. In combination with local field personnel, this multilingual control platform helps Joy equipment to achieve the goal of operating at the lowest cost per ton, regardless of where the equipment is located.

This platform is standard across all Joy equipment, reducing inventory to support a typical fleet. Common practices reduce training burdens and overall knowledge required for electrical maintenance personnel. This enables maintenance and trouble-shooting performance to rise to a more productive level.



JOY 12CM30 miner bolter



The 12CM30 miner bolter has a wide installed base in longwall entry development applications in Australia, with an increasing presence in the Eurasian market. Over 15 years of continuous improvements and developments are incorporated in the latest models. New gathering options assist in improving roof support for more efficient longwall entry development.



Flexible conveyor train

The Joy Flexible Conveyor Train (FCT) is a truly continuous haulage system that eliminates haulage related bottlenecks from typical underground continuous miner operations. By removing this restriction, the FCT allows today's high-production continuous miners to operate at their maximum capacity.

The FCT allows continuous miners to operate at their maximum capacity.

The key to the effectiveness of the FCT is its patented flexible conveyor and traction system that permits the FCT to be operated as one single unit. The ability to continuously convey material along its length while simultaneously tramming to follow the continuous miner's every move, all with only one operator utilizing radio remote control, is a distinct advantage over all other types of haulage.

The productivity benefits of the FCT are equally applicable to coal-producing room and pillar and longwall development operations, as well as operations utilizing continuous miners to extract industrial minerals, such as salt, trona, potash and gypsum.

Machine safety

The Joy 4FCT flexible conveyor train significantly enhances overall mine safety. It combines all haulage into a single, relatively slow-moving machine that follows a known path of travel, and requires only one operator using remote-control. This reduction in the total number of mobile machines in the section reduces visibility concerns for batch haulage operators and the personnel working on batch haulage sections. Also, less material movement means greater dust control.

Machine performance

The FCT can convey coal at flow rates of up to 27 tons/minute (24.5 tonnes/minute) and salt, trona, gypsum or potash at up to 40 tons/minute (36.3 tonnes/minute). Infinitely variable control of conveyor belt speed permits maximum belt loading and minimum belt speed, consequently extending the wear life of the belt itself.

Life Cycle Management

Taking it to the next level...

The FCT is a product of Joy Global's commitment to enabling customers to consistently produce at the lowest cost per ton over the life cycle of the equipment. Not only does the life cycle cost per ton of the FCT itself compare favorably to other forms of haulage, the increased production and efficiencies that it unlocks in the typical continuous miner section improve the cost per ton performance of the entire operation.



Operational benefits

The chain traction system is distributed along the entire length of the machine, resulting in incredible traction with exceptionally low ground bearing pressure, when compared to other haulage machinery.

Material degradation is minimal due to there being no transfer points along the length of the FCT. The Optidrive variable frequency drive provides infinite speed control to the conveyor belt and lumpbreaker conveyor chain allowing each to be coordinated to prevent spillage.

The lumpbreaker front-end provides ample FCT maneuverability and the material sizing and metering functions not only control the flow on the FCT belt but also negate the need for a separate feeder-breaker in the section.

The Faceboss control system coupled with the Optidrive variable frequency drive provides soft-start functionality for the FCT traction and conveyor belt systems. This significantly reduces the wear and tear on these parts, extending their operating lives and reliability levels.

FCT/DMU configurations

Each FCT system includes a DMU (Dynamic Move-Up) unit. The DMU is the interface between the FCT and the mine's panel belt. The FCT and DMU are available in two configurations. The Side-Discharge configuration is applicable to low seam heights and wide entries whereas the Over-The-Top (OTT) configuration is more suited to higher seams with restricted entry width. The OTT system is a self-advancing unit with remote-controlled panel belt move-ups. This system can also be designed for retreat mining. The side discharge design must be advanced using the continuous miner to pull up.

Total control

Optidrive VFD with Faceboss control...

The traction and belt and chain conveyor motors on the FCT are driven by the Optidrive VFD and the overall system is controlled by the Faceboss control system, Joy Global's standard machine control platform. The Faceboss control system includes a user-friendly, graphical interface with advanced diagnostic capabilities. The Optidrive system provides infinitely variable speed control which permits controlled ramp-up of traction and conveyor motors. Optidrive components and Faceboss components used on the FCT are common and interchangeable with other similarly equipped Joy underground machines.



Joy Global history

Tradition in quality and pride...

With eight global patents, the Joy FCT is the only simultaneous tram-and-convey, single-operator, underground continuous haulage system available in the world today. The continuous pursuit of innovation, extensive design and testing practices, renowned built quality, and machine reliability has kept Joy Global as the world's leader in underground mining systems and services for nearly an entire century.





Introducing the 10SC42

Since the introduction of our first shuttle car in 1938, Joy Shuttle Cars continue to be the mainstay of the industry for batch haulage vehicles. Their exceptional reliability, **Joy Shuttle Cars continue to develop, evolve and improve.** low operating cost and sustained high levels of productivity are unmatched. Through the extensive use of sophisticated computer-aided design systems, Joy Shuttle Cars continue to develop, evolve and improve. An important element in many entry development sections, the current range includes the 10SC32 and 10SC42 models.

The role of haulage equipment is to efficiently remove the cut material from the working face in such a manner as to enhance the performance of the continuous miner and maximize the productivity of the overall section. Joy Global fully understands this role and proactively works with the mining industry to provide comprehensive “system” solutions to suit individual application needs. A range of sizes and configurations are available to meet most mining conditions and performance requirements.

Underground mines are tough places for haulage vehicles to operate – Joy Shuttle Cars are engineered to meet the challenge. Every element of a Joy Shuttle Car is engineered to balance performance and efficiency. Joy Shuttle Cars have a heavy-duty, high-power drive train that enables them to haul loads in extremely arduous conditions. The permanent four-wheel drive system is powered by two 85kW VFD AC traction motors.



JoySmart Solutions

Integrated JoySmart Solutions help solve customers’ toughest challenges using data-driven intelligence, collaboration

Joy Global service facilities have given world-class service a new home.

through partnership and experienced-based service execution. They are a way of partnering with customers to help reduce costs and increase productivity, in line with customers’ operating and financial goals.

JoySmart Service Centers are strategically located around the world in order to conveniently serve our customers. With each new service center built, Joy Global products and people are becoming more connected, allowing for expanded benchmarking. Located strategically in zones of mining activity, each service center brings local support that is world-class. Services offered are structured to fulfill the lifecycle of mining equipment, optimizing equipment for productivity and safety.

Our commitment to world-class service is delivered through world-class processes and metrics. Our Joy OpEx processes bring operational excellence by prioritizing the elimination of waste, simplifying processes, automating and removing people from harm’s way. We leverage those principles throughout our network, with the ability to rapidly customize locally, helping customers work smarter, worldwide.



JoySmart Solutions are integrations of smart connected Joy Global products and systems, advanced analytics and direct services customized to solve customers’ toughest challenges.

JoySmart Solutions at work:

Costs

- Lower cost per unit produced by reducing overall parts and consumables expenditures
- Optimize costs for power/fuel, labor and rebuilds

Safety

- Automate processes and controls
- Increase awareness through training and standard setting

Productivity

- Improve system availability, performance, utilization and consistency
- Leverage extensive Joy Global engineering knowledge to solve problems



JoySmart Solutions



Joy Global worldwide locations

JOYGLOBAL



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EN-ED0601-0616-V1

JOYGLOBAL



Face Drilling Jumbos

Product Overview



JOYGLOBAL
Service Leader



Delivering world-class mine performance

At the core of our commitment to customers is providing world-class solutions through our unique direct service network. This allows us to **collaborate with customers**, developing innovative parts, products, consumables and systems that lower their total cost of ownership while safely maximizing production.

JOY Operational Excellence
Taking us to the next level



Our commitment to quality and reliability is supported by our focus on Operational Excellence. We use Joy OpEx principles to eliminate waste, simplify the process, automate and remove people from harm's way.

Face drilling jumbos

Joy Global delivers a full line of heavy duty development and production drilling jumbos for mining and tunneling. Combined with Montabert HC series drifters, the Joy NV-1,

A long list of innovative features sets Joy jumbo drills apart from the rest.

Vein Runner II, Drift Runner and Ramp Runner jumbo drills continue to lead the industry in reliability and performance. Optional ROPS/FOPS certified environmentally controlled cabs allow the operator to be more

comfortable, productive and secure from all forms of hazards. EPA and MSHA certified engines are available on all Joy hydraulic jumbo drills, demonstrating our commitment to a cleaner, safer environment. The Joy jumbo drill product line is designed to operate in the harshest conditions of underground mining and can drill horizontal, vertical or cross-cut holes. Designed for operator comfort, these units can accommodate all different ground conditions.



Vein Runner II



Joy NV-1 Jumbo

• **Montabert HC series drifter and intelsense drilling control system**

The Montabert HC series drifter and Intelsense drilling control system work seamlessly with all Joy jumbos, ensuring the best possible drilling performance.

• **Powertrain and hydraulics**

In an effort to improve underground air quality, Joy jumbos are available with EPA and MSHA certified engines. A heavy-duty all-mechanical powertrain with load-sensing hydraulics ensures a proven platform and a long service life.

• **Environment controlled ROPS/FOPS certified cabs (optional)**

The ROPS/FOPS certified environmentally controlled operator's cab insulates the operator from noise, dust and vibration.

• **Lightweight aluminum JGF Feed with replaceable wear strips**

The Joy Global Feed (JGF) is a lightweight aluminum extrusion using a hydraulic cylinder cable feed design. JGF feeds are operator and mechanic friendly. The JGF feed comes in different lengths to accommodate a range of steel from 2.4 m (8 ft) to 4.87 m (16 ft) and features replaceable wear rails and guides. Used with either the SB, MB, LB, or JGB series booms, the JGF feed is designed for fast accurate holes.

• **Booms**

Designed for harsh underground environments, these booms come with automatic parallelism feature that is designed into the hydraulic system of the booms.



Ramp Runner 1 MB Jumbo



Ramp Runner 2 MB Jumbo



Drift Runner 1 SB Jumbo



Drift Runner 2 SB Jumbo

Drift runner 1 SB and 2 SB jumbo

The Joy drift runner series single-boom hydraulic rig is designed for drilling vertical, horizontal and angled holes in underground production or development headings. It features one hydraulic percussion drifter designed to drive headings 5.46 m by 5.46 m (17 ft 11 in by 17 ft 11 in).

The Joy drift runner series two-boom jumbo is designed for drilling vertical, horizontal and cross-cut holes in underground production and development headings. It features two hydraulic percussion drifters designed to drive headings 5.49 m by 7.04 m (18 ft by 23 feet 1 in).

Standard features

- Montabert HC 50 percussion drifter
- Montabert Intelsense drilling control
- JGF feed c/w replaceable wear strips
- Dana R20000 transmission c/w torque converter
- EPA and MSHA certified engines
- 45 kW (60 hp) electric motor driving pumps for percussion/rotation
- Direct lever controls
- Boom parallelism

Options

- Montabert HC 109 drifter (56 kW / 75 hp electric motor)
- Montabert HC 110 drifter (74.5 kW / 100 hp electric motor)
- Optional feed lengths
- Telescopic feeds
- ROPS/FOPS cab with climate control
- Telescopic ROPS/FOPS canopy
- Automatic lubrication system
- Engine options
- Fire suppression system
- Tire options
- Air compressor
- Water booster

General specifications

	DR-1 SB jumbo		DR-2 SB jumbo	
Weight	14,880 kg	32,800 lbs	18,370 kg	40,500 lbs
Maximum width	2.06 m	6 ft 9 in	2.08 m	6 ft 10 in
Turning radius				
Inside	4.19 m	13 ft 9 in	3.76 m	12 ft 4 in
Outside	6.48 m	21 ft 3	6.68 m	21 ft 11 in
Turning angle	38°		38°	
Boom guide rollover	360°		360°	
Boom extension	914 mm	36 in	914 mm	36 in
Feed extension	1.52 m	60 in	1.52 m	60 in
Boom coverage				
Height	5.46 m	17 ft 11 in	5.49 m	18 ft 0 in
Width	5.46 m	17 ft 11 in	7.04 m	23 ft 1 in
Drifter	Montabert HC 50		Montabert HC 50 (2%)	
Tires	12.00 x 20		12.00 x 20	
Cable reel - type G-GC	76.2 m	250 ft	76.2 m	250 ft

Ramp runner 1 MB and 2 MB jumbo

The Joy ramp runner series one-boom hydraulic rig is designed for drilling vertical, horizontal and cross-cut holes in underground production and development headings. It features one hydraulic percussion drifter designed to drive headings 6.07 m by 5.69 m (19 ft 11 in by 18 ft 8 in).

The Joy ramp runner series two-boom hydraulic rig is designed for drilling vertical, horizontal and cross-cut holes in underground production and development headings. It features two hydraulic percussion drifters designed to drive headings 6.07 m by 8.28 m (19 ft 11 in by 27 ft 2 in).

Standard features

- Montabert HC 50 percussion drifter
- Montabert Intelsense drilling controls
- JGF feed c/w replaceable wear strips
- Dana R20000 series transmission c/w torque converter
- EPA and MSHA certified engine
- 45 kW (60 HP) electric motor driving pumps for percussion, rotation and high pressure
- Direct lever controls
- Boom parallelism

Options

- Montabert HC 109 drifter (56 kW / 75 hp electric motor)
- Montabert HC 110 drifter (74.5 kW / 100 hp electric motor)
- Optional feed lengths
- Telescopic feeds
- ROPS/FOPS cab with climate control
- Telescopic ROPS/FOPS canopy
- Automatic lubrication system
- Engine options
- Fire suppression system
- Tire options
- Air compressor
- Water booster

General specifications

	RR-1 MB jumbo		RR-2 MB jumbo	
Weight	16,545 kg	36,400 lbs	19,780 kg	43,600 lbs
Maximum width	2.06 m	6 ft 9 in	2.16 m	7 ft 1 in
Turning radius				
Inside	4.19 m	13 ft 9 in	3.76 m	12 ft 4 in
Outside	6.48 m	21 ft 3 in	6.68 m	21 ft 11 in
Turning angle	38°		38°	
Boom guide rollover	360°		360°	
Boom extension	1219 mm	48 in	1217 mm	48 in
Feed extension	1524 mm	60 in	1524 mm	60 in
Boom coverage				
Height	6.07 m	19 ft 11 in	6.07 m	19 ft 11 in
Width	5.69 m	18 ft 8 in	8.28 m	27 ft 2 in
Drifter	Montabert HC 50		Montabert HC 50 (2)	
Tires	12.00 x 20		12.00 x 20	
Cable reel - type G-GC	76.2 m	250 ft	76.2 m	250 ft

Vein runner II hydraulic drill jumbo

The Joy vein runner series single-boom hydraulic rig is designed for drilling vertical, horizontal and angled holes in underground production or development headings. It features a hydraulic percussion drifter designed to drive headings 5.77 m by 5.1 m (18 ft 11 in by 16 ft 9 in).

Standard features

- Heavy duty all mechanical powertrain
- Montabert HC 50 percussion drifter
- JGB series boom
- Montabert Intelsense drilling control
- Lightweight aluminum JGF feed
- Dana R20000 transmission with torque converter
- EPA and MSHA certified engines
- 45 kW (60 hp) electric motor driving pumps for percussion/rotation
- Direct lever controls
- Boom parallelism

Options

- Montabert HC 109 percussion drifter
- Montabert HC 110 percussion drifter
- Optional feed lengths
- Telescopic feeds
- ROPS/FOPS cab with climate control
- Telescopic ROPS/FOPS canopy
- Diesel drilling
- Engine options
- Fire suppression system
- Large protective operators compartment
- Rail mounted
- Air compressor
- Water booster

NV-1 hydraulic drill jumbo

The Joy NV-1 series single-boom hydraulic rig is designed for narrow vein drilling, from vertical to horizontal and angled holes in underground production or development headings. It features one hydraulic percussion drifter designed to drive headings 3 m by 3 m (10 ft by 10 ft).

Standard features

- Hydrostatic drive and carrier
- Montabert HC 20 percussion drifter
- JGB series boom
- Montabert Intelsense drilling control
- Lightweight aluminum JGF feed
- EPA certified engines
- 45 kW (60 hp) electric motor driving pumps for percussion/rotation
- Direct lever controls
- Boom parallelism

Options

- Montabert HC 25 percussion drifter
- Montabert HC 50 percussion drifter
- Optional feed lengths
- Telescopic feeds
- ROPS/FOPS cab with climate control
- Telescopic ROPS/FOPS canopy
- Fire suppression system
- Air compressor
- Water booster

General specifications

	Vein Runner II jumbo		NV-1 jumbo	
Weight	10,955 kg	24,100 lbs	9,091 kg	20,000 lbs
Maximum width	1.42 m	4 ft 8 in	1067 mm	3 ft 6 in
Turning radius				
Inside	3.05 m	10 ft	2.61 m	8 ft 7 in
Outside	5.08 m	16 ft 8 in	4.43 m	14 ft 6 in
Turning angle	40°		40°	
Boom guide rollover	360°		360°	
Boom extension	914 mm	36 in	914 mm	36 in
Feed extension	1219 mm	48 in	914 mm	36 in
Boom coverage				
Height	5.1 m	16 ft 9 in	3 m	10 ft
Width	5.77 m	18 ft 11 in	3 m	10 ft
Drifter	Montabert HC 50		Montabert HC 20	
Tires	10.00 x 20		8.25 x 15	
Cable reel - type G-GC	76.2 m	250 ft	76.2 m	250 ft

Contact your Joy Global service representative for more information on face drilling jumbos or visit www.joyglobal.com

Montabert drifters

Joy Global offers Montabert HC 20, HC 25, HC 50, HC 109 and HC 110 drifters on all Joy hydraulic drill jumbos. Combined with Intelsense drilling controls, Joy jumbos have the highest availability and the fastest drilling rates in the industry.

The workhorse of any drill rig is the drifter. The Montabert HC series can provide our customers the lowest cost for drilling maintenance and consumables.

Joy Global also offers drifter conversion program to retrofit Montabert drifters on other manufacturer's units.

Montabert drifter range

	HC 20	HC 25	HC 50	HC 109	HC 110
Weight kg (lbs)	62-71 (137-157)	71 (157)	102 (225)	142 (313) 170 (375)	200 (441) 229 (505)
Piston weight daN	1.9	2	3.4	6.3	6.3
Percussion output Power kW	5	9	13	18	33
Percussion flow/press L/mn (bar)	45 (140)	65 (150)	105 (130)	135 (135)	135 (225) 125 (230) 170 (190)
Applications	Surface drilling	Mining, bolting	Mining, bolting	Mining, bolting, long holes	Mining, bolting, long holes



Joy Global worldwide locations

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EN-FDJ01-0616-V3

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JOYGLOBAL



Hybrid Diesel LHD



JOYGLOBAL
Service Leader



Delivering world-class mine performance

At the core of our commitment to customers is providing world-class solutions through our unique direct service network. This allows us to **collaborate with customers**, developing innovative parts, products, consumables and systems that lower their total cost of ownership and maximize production without impacting safety.

JOY Operational Excellence
Taking us to the next level

Our commitment to quality and reliability is supported by our focus on Operational Excellence. We use Joy OpEx principles to eliminate waste, simplify the process, automate and remove people from harm's way.

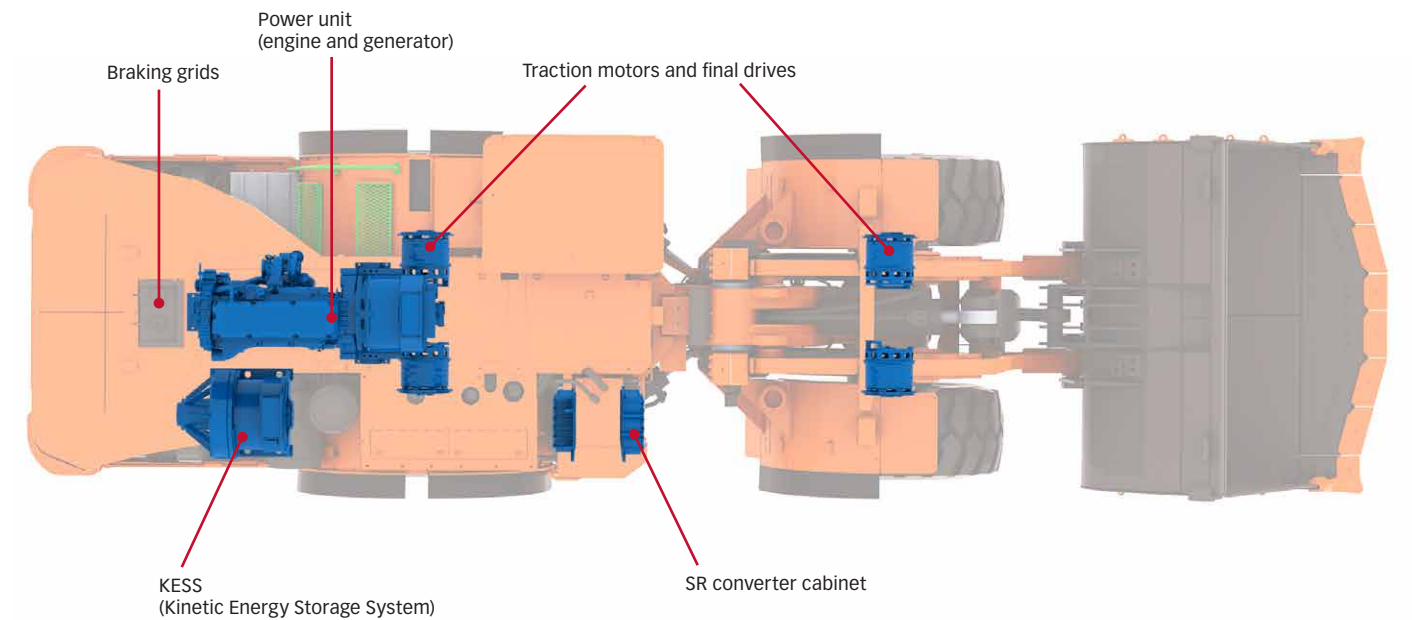
A bottom line breakthrough

The Joy 18- and 20-metric ton diesel LHDs are load haul dumps featuring electric drives. Compared to other LHDs in their class, these machines offer faster acceleration, lower fuel consumption, lower heat rejection and best-in-class breakout and rimpull — all of which contribute to the lowest total operating costs of any LHD in their class.

These key advantages are enabled by our patented JOY SR Hybrid Drive system's unique ability to store energy and put it to use when most needed. This energy recovery delivers several benefits that contribute to a significant reduction in our customers' Total Cost of Ownership (TCO):



- Productivity: improved work cycle time
 - Higher acceleration and equivalent cycle performance
 - Smoother operation (no gear changes)
 - Smart traction system
- Reduced operating cost
 - High efficiency electric driveline
 - 30% or more reductions in operating costs achieved compared to mechanical drive LHDs
- Increased reliability / durability
 - Joy Global has decades of proven performance with SR technology on mining duty machines due to LeTourneau legacy
 - P&H surface wheel loaders historically display utilization rates 10-20% higher than underground production LHDs
- Reduced engine size
 - Reduced emissions
 - Reduced heat load



How does the JOY SR Hybrid Drive system work?

- During propulsion, diesel energy is converted to electric energy; an SR generator provides power to the motors in the wheels to make the machine move
- During braking, when the operator eases off the gas pedal, the flow of diesel energy stops; machine momentum keeps the motors rotating
- Energy now flows from the motors to be stored in the Kinetic Energy Storage System (KES) unit as the traction system slows the machine
- After the machine has stopped digging or dumping its load and is ready to move again, the operator presses on the gas pedal
- The KES starts to supply stored energy, while at the same time, the diesel engine also begins supplying energy
- Two sources of energy work simultaneously to provide the equivalent of one 400hp engine being boosted by another 550hp engine

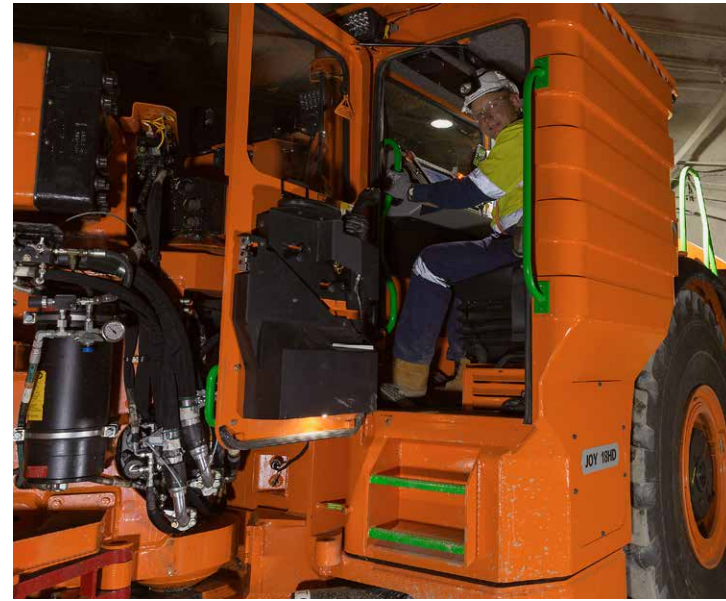
This recapture, storage and redirection of energy can lead to a significant productivity increase. A typical block cave mining operation requires these machines to make many stops, starts and turns. The Joy SR Hybrid Drive system enables the 18HD and 22HD to accelerate much faster than comparable machines, which allows them to get from the draw point to the crusher and back again much quicker. Over the course of time, that can lead to as much as a 20% increase in tons moved. These significant increases in productivity can be achieved while using less horsepower and consuming far less diesel fuel – in some cases, up to 33% less.

Using less fuel reduces overall cost of operation and offers additional benefits related to human health and safety: primarily, reductions in diesel emissions and heat. This contributes to the protection of the mine's most valuable human assets while potentially reducing its costs related to ventilation requirements. The mine could have the option of either: operating with a lower level of ventilation than would be required with other machines or operating a larger number of Joy LHDs without increasing ventilation.

Key features

Safety

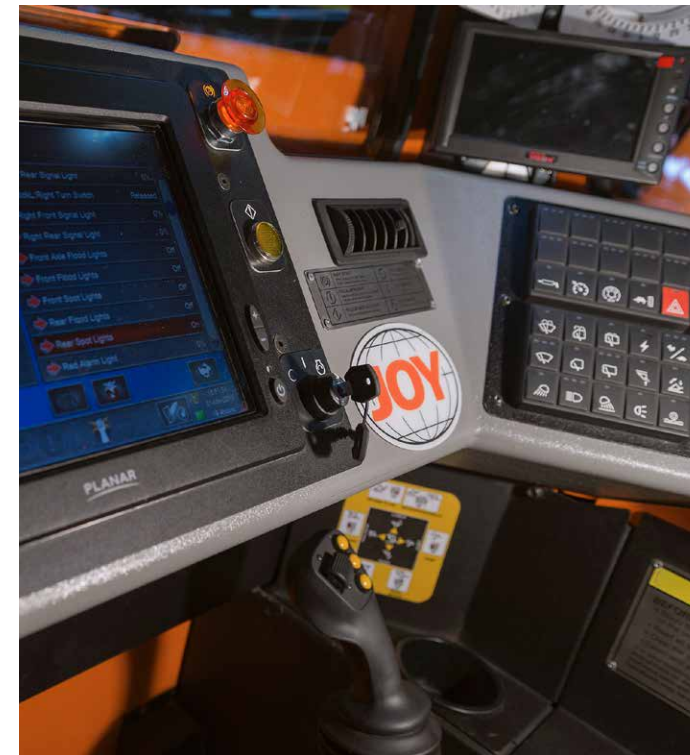
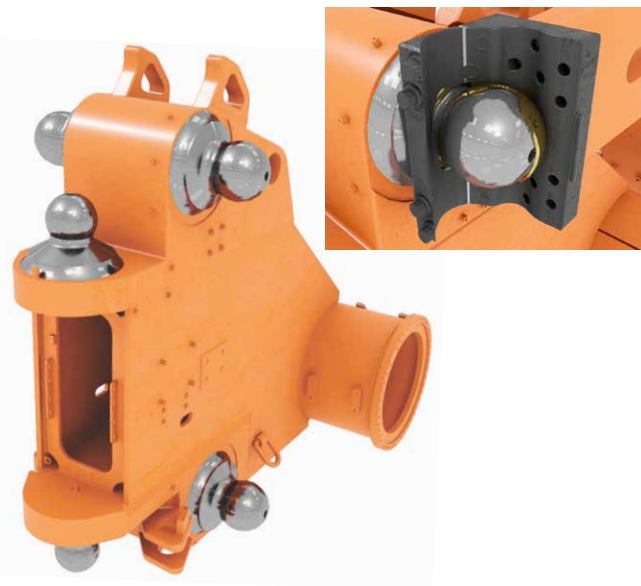
- ROPS/FOPS operator's cabin
 - Certified protection of the operator
- Failsafe braking systems
 - Redundant braking systems provide layers of protection in the event of a single point brake failure
- Platforms, steps, stairs and hand rails
 - Designed to the world's best standards
- Emergency stop
 - Safety Integrity Level 2 (SIL 2) rated system
 - Multiple e-stop switches situated in key locations around machine
- Lockable battery and starter isolation for the protection of maintenance and service personnel
- Emergency braking system



Reliability

- Rugged steel frame structures
 - Built strong for long life and reduced maintenance
 - Protection from impact and wear
- Ball and socket joints
 - Long life and proven high reliability design
- SR Hybrid Drive System
 - Low operating cost, high reliability and performance
- Hydraulic systems with piston pumps
 - Cooler operation, longer life

- Modular low voltage electrics
 - P67, modular double insulated wiring system using standardized componentry to reduce downtime and operating cost
- Central auto lubrication
 - Minimizes scheduled service activity and protects critical structural linkages and joints
 - Long life grease tank
 - LINCOS II notifies operator of grease system performance



Productivity

- Easy to use operator controls
 - Simple control suite allows the operator to concentrate on maximizing productivity
 - Automated control functions such as return to dig and return to carry allow the operator to perform complex functions at a button press
 - Intuitive human to machine interface provides the operator with up to the moment productivity and machine performance information
- Switched Reluctance Hybrid Drive
 - Capture and re-use of braking energy
 - Class leading acceleration
 - Shorter cycle times
 - Greater fuel efficiency
- Heavy duty design
 - Less failures, more uptime
- Bucket design
 - Easy filling, low wear

18HD Operating capacities, weights and dimensions		
Bucket capacity*	7.2 m ³	9.42 yd ³
Static tipping loads	396 kN	88,890 lbs
Breakout force (tilt)	349 kN	78,500 lbs
Operating weight	49,900 kg	110,000 lbs

*Standard rock bucket based on a material density of 2,500 kg/m³ (4,213 lb/yd³).

Working ranges		
Engine rated power		
Production	280 kW	375 hp
Development	360 kW	482 hp
Hybrid power**	410 kW	550 hp
Payload	18,000 kg	39,700 lbs

Bucket capacity: 8.2 m³/10.7 yd³ and 9.0 m³/11.8 yd³ bucket options available

**Hybrid power available for acceleration events.

Fluid capacities		
Fuel	757 L	200 gal
Hydraulic	473 L	125 gal
SR converter cooling system	18.9 L	5 gal
Engine cooling system	56.8 L	15 gal
Engine oil	37.8 L	10 gal
Planetaries (each)	7.6 L	2 gal

22HD Operating capacities, weights and dimensions		
Bucket capacity*	9.0 m ³	11.8 yd ³
Static tipping loads	48.2 kN	10,6350 lb
Breakout force (tilt)	350 kN	78,000 lb
Operating weight	58,968 kg	130,000 lb

*Standard rock bucket based on a material density of 2,500 kg/m³ (4,213 lb/yd³).

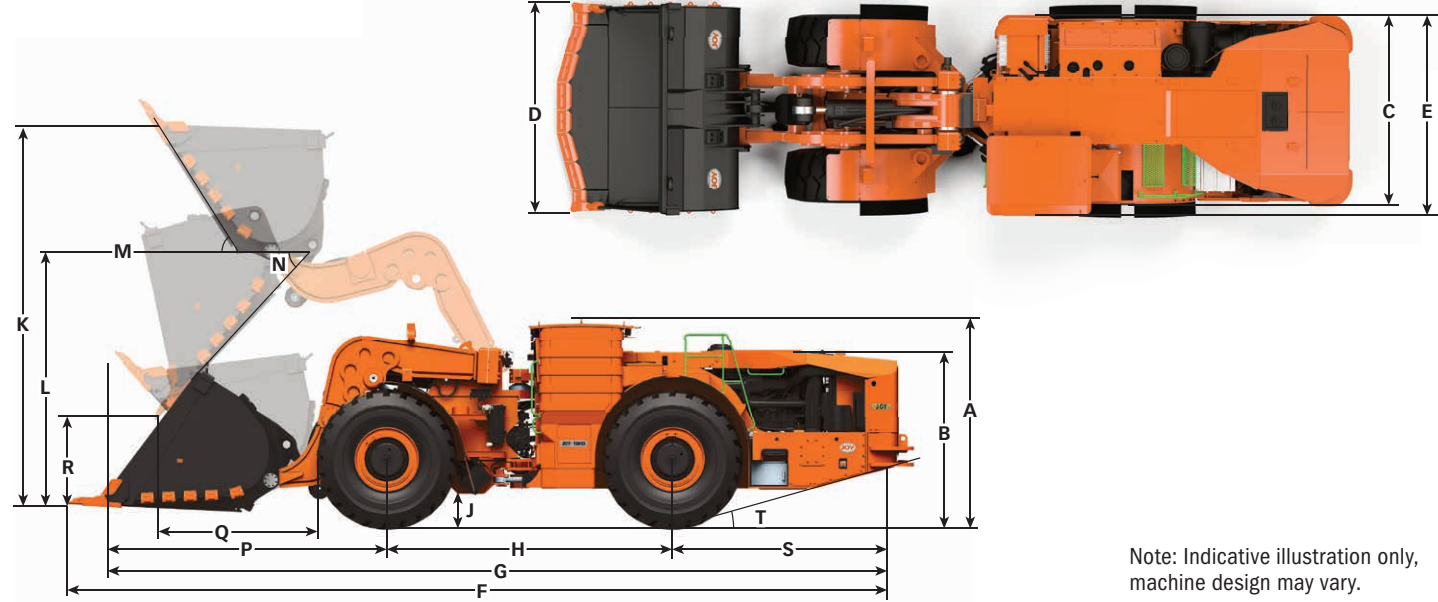
Working ranges		
Engine rated power		
Production	320 kW	429 hp
Development	380 kW	509 hp
Hybrid Power**	410 kW	550 hp
Payload	22,000 kg	48,500 lbs

Bucket capacity: 10.0 m³/13.1 yd³ and 11.0 m³/14.4 yd³ bucket options available

**Hybrid power available for acceleration events.

Fluid capacities		
Fuel	757 L	200 gal
Hydraulic	473 L	125 gal
SR converter cooling system	18.9 L	5 gal
Engine cooling system	75.7 L	20 gal
Engine oil	147.6 L	39 gal
Planetaries (each)	7.6 L	2 gal

18HD and 22HD



Note: Indicative illustration only, machine design may vary.

Overall dimensions	18HD (7.2 m ³ bkt)		22HD (9.0 m ³ bkt)		22HD (11.0 m ³ bkt)	
A Height over cabin	2.9 m	9 ft 5 in	2.9 m	9 ft 7 in		
B Height over power unit	2.5 m	8 ft 1 in	2.5 m	8 ft 3 in		
C Vehicle width across tires	2.8 m	9 ft 2 in	2.8 m	10 ft 6 in		
D Width across bucket	3.1 m	10 ft 2 in	3.2 m	10 ft 9 in		
E Max. rear frame width	2.8 m	9 ft 2 in	2.8 m	9 ft 2 in		
F1 Vehicle length digging (GET)	11.4 m	37 ft 4 in	11.7 m	38 ft 5 in	11.7 m	38 ft 3 in
G1 Vehicle length hauling (GET)	11.0 m	36 ft 0 in	11.2 m	36 ft 9 in	11.3 m	36 ft 11 in
F2 Vehicle length digging (No GET)	11.2 m	36 ft 8 in	11.5 m	37 ft. 10 in.	11.5 m	37 ft 8 in
G2 Vehicle length hauling (No GET)	10.8 m	35 ft 6 in	11.0 m	36 ft 3 in	11.1 m	36 ft 4 in
H Wheelbase	4.1 m	13 ft 4 in	4.1 m	13 ft 5 in		
J Ground clearance	0.4 m	1 ft 4 in	0.5 m	1 ft 7 in		
K Bucket height fully raised	5.9 m	19 ft 4 in	6.9 m	22 ft 8 in		
L Hinge pin height	4.1 m	13 ft 6 in	5.0 m	16 ft 6 in		
M Roll back angle	48°		47°			
N Dump angle	53°		45°			
P1 Wheel center to bucket - carry (GET)	3.6 m	11 ft 9 in	3.8 m	12 ft 7 in	3.9 m	12 ft 8 in
P2 Wheel center to bucket - carry (No GET)	3.4 m	11 ft 2 in	3.3 m	10 ft 10 in	3.7 m	12 ft 1 in
Q1 Tire to bucket - dump (GET)	1.9 m	6 ft 1 in	2.0 m	6 ft 8 in	1.9 m	6 ft 2 in
Q2 Tire to bucket - dump (No GET)	1.8 m	5 ft 9 in	2.0 m	6 ft 7 in	1.5 m	5 ft 10 in
R Dump height	1.5 m	5 ft 1 in	3.2 m	10 ft 7 in		
S Wheel center to rear bumper	3.3 m	10 ft 11 in	3.3 m	10 ft 10 in		
T Departure angle	15°		15°			

Power module

Diesel power options

MTU Detroit diesel engine Model	US tier IV final/EU stage IV Series 1100, 10.6 litre Six cylinders	US tier IV final/EU stage IV Series 1300, 12.8 litre Six cylinders
Type	Four-cycle turbo charged	Four-cycle turbo charged
Rated engine power (18HD)	280 kW (375 hp) @ 1800 rpm	360 kW (482 hp) @ 1800 rpm
Rated engine power (22HD)	300 kW (400 hp) @ 1800 rpm	380 kW (509 hp) @ 1800 rpm

Note: The lower hp engine option is most suitable for production level operations such as block/panel caving, where fuel efficiency and emission output are highly critical. The higher hp engine option is most suitable for multipurpose applications where the machine is required to work on declines or steep grades.

The independent power module mounting system, consisting of the engine coupled to the SR generator, is cradled within the rear frame by a three-point isolation system.

Radiator/oil cooler module

- Replaceable tube type, over-under split flow
- Thermostatically controlled, variable speed hydraulic motor-driven, radiator-mounted fan

Exhaust system

MTU Tier IV final exhaust after treatment catalyst box

Control system-LINCS II

CAN Based Vehicle Control Unit incorporating high speed monitoring and advanced diagnostics including integrated data logging and storage.

LINCS II uses a dash mounted full color touch screen display as the operator interface. Out of range conditions will cause an audible alarm along with a message screen that is color coded to indicate severity.

In addition, the touch screen display provides repair technicians with operational data and fault messages.

LINCS II load weigh

Displays real-time load data, cycle times, production rates and operational profile.

- Memory capable of retaining months of production information
- JoySmart remote monitoring connectivity available for additional diagnostics and productivity analysis
- Capable of interfacing with radio dispatch systems for on-site real-time monitoring

Steering and hoisting system

Steering

Steering function is controlled by a single joystick. Constant engine rpm assures full hydraulic steering response.

Articulation angle	46°				
	18HD		22HD		
Turning radius	Outside	7.3 m	23 ft 11 in	7.53 m	24 ft 8 in
	Inside	3.4 m	11 ft 1 in	3.21 m	10 ft 6 in
Standard/high lift cycle	Hoist	8.2 seconds		8.4 seconds	
	Dump	2.2 seconds		2.0 seconds	
	Float	3.4 seconds		4.0 seconds	
	Total	13.8 seconds		14.4 seconds	

Hoist and bucket control

Hoist and bucket control functions are incorporated into a single joystick control. The proportional electro-hydraulic controlled hoist and bucket system is independent of the steering system.



With proven JOY SR Hybrid Drive technology, the 18HD and 22HD can re-energize your bottom line.

For more information, contact a Joy Global representative or visit www.joyglobal.com



Joy Global worldwide locations

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JOYGLOBAL



Haulage Trucks

Product Overview



JOYGLOBAL
Service Leader



Delivering world-class mine performance

At the core of our commitment to customers is providing world-class solutions through our unique direct service network. This allows us to **collaborate with customers**, developing innovative parts, products, consumables and systems that lower their total cost of ownership while safely maximizing production.



Our commitment to quality and reliability is supported by our focus on Operational Excellence. We use Joy OpEx principles to eliminate waste, simplify the process, automate and remove people from harm's way.

Joy haulage trucks

Joy four-wheel-drive trucks, ranging from 6.6 to 31.8 tonnes (7 to 35 tons), have been designed with operator safety, productivity and reliability as top priorities. The simple and rugged design provides for ease of use and maintenance with impressive features and options that help to drive down operating costs.

Safety

- ROPS/FOPS Canopies and Cabins for certified operator protection
- Spring applied brakes - Fail safe system activated on low hydraulic oil pressure or electrical failure
- Three point mounting and anti-slip foot steps help prevent slips and falls
- Hot component isolation
- Interlocks and safety systems protect person and machine
- Ground level maintenance

Reliability

- Rugged steel frame structures built strong for long life
- Collet style pins for ease of maintenance and longevity
- Heavy-duty mechanical power train - proven performance underground
- Hydraulic systems with piston pumps - cooler operation, longer life
- Severe duty electric system - quality MIL spec components
- Centralized lubrication gets grease to the right places
- Ease of maintenance helps ensure long life

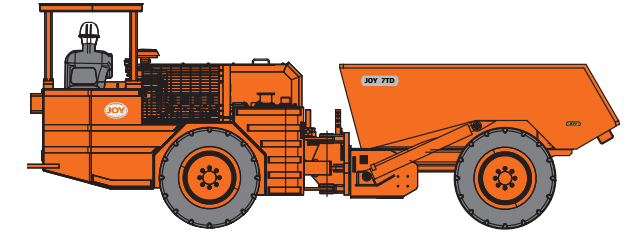
Productivity

- Heavy-duty all mechanical power train featuring Dana components deliver efficient power to the ground and maximize tractive effort
- Robust design means fewer failures and more uptime
- Ergonomically designed large operator's compartment with excellent visibility and easy to operate controls

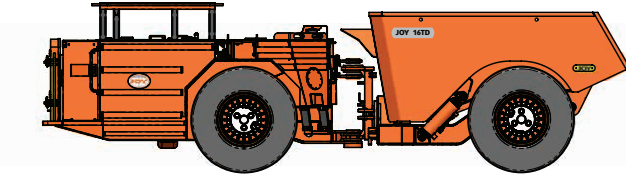
Joy haulage trucks include models to suit a range of small to large openings with additional capacity for heavier materials. A variety of options are available for a custom solution:

- Various dump box volumes
- Tailgate
- Cummins or MTU engine options
- Enclosed operators compartment with air conditioning
- Automatic lubrication system
- Manual or automatic fire suppression systems
- Rear view camera

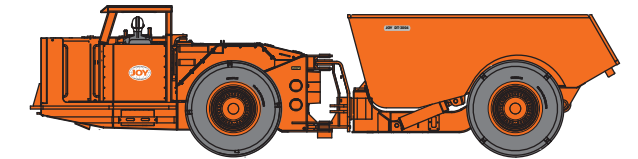
7TD		
Rated load capacity	6,600 kg	14,520 lbs
Standard box volume	3.3 m ³	4.3 yd ³
Operating weight	8,120 kg	17,864 lbs
Dimensions (L x W x H)	6,217 x 1,549 x 2,084 mm	245 x 61 x 82 in
Engine power	72 kW	96 hp



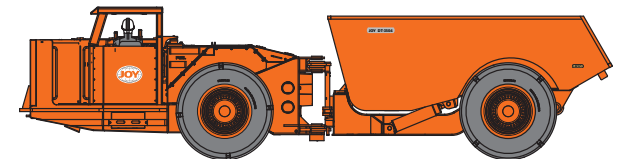
16TD		
Rated load capacity	16,000 kg	35,200 lbs
Standard box volume	8 m ³	10.4 yd ³
Operating weight	17,900 kg	39,380 lbs
Dimensions (L x W x H)	7,734 x 2,318 x 2,345 mm	304 x 91 x 92 in
Engine power	164 kW	220 hp



DT-3004		
Rated load capacity	27,215 kg	60,000 lbs
Standard box volume	15.9 m ³	20.7 yd ³
Operating weight	25,000 kg	55,000 lbs
Dimensions (L x W x H)	9,754 x 2,946 x 2,565 mm	384 x 116 x 101 in
Engine power	298 kW	400 hp



DT-3504		
Rated load capacity	31,751 kg	70,000 lbs
Standard box volume	17.4 m ³	22.7 yd ³
Operating weight	25,000 kg	57,000 lbs
Dimensions (L x W x H)	10,271 x 2,946 x 2,565 mm	404 x 116 x 101 in
Engine power	298 kW	400 hp



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EN-HT01-0616-V3

JOYGLOBAL



Load Haul Dump (LHD) Loaders

Product Overview



JOYGLOBAL
Service Leader



Delivering world-class mine performance

At the core of our commitment to customers is providing world-class solutions through our unique direct service network. This allows us to **collaborate with customers**, developing innovative parts, products, consumables and systems that lower their total cost of ownership and maximize production without impacting safety.



Our commitment to quality and reliability is supported by our focus on Operational Excellence. We use Joy OpEx principles to eliminate waste, simplify the process, automate and remove people from harm's way.

Joy Underground Loaders (LHD)

Joy four-wheel drive, articulated loaders ranging from 2 to 10 tonnes (2.2 to 11 tons) have been engineered with operator safety, productivity and reliability as top priorities. The simple and robust design offers low maintenance and long life with impressive features and options that help drive down operating costs

Safety

- ROPS/FOPS canopies for certified operator protection
- Spring applied brakes: fail safe system activated on low engine, transmission and hydraulic oil pressure
- Three (3) point mounting and anti-slip steps help design out slips and falls
- Hot component Isolation
- Interlocks and safety systems protect person and machine
- Ground level maintenance

Reliability

- Robust steel frame structures built strong for long life
- Collet style pins for ease of maintenance and increased life between replacement
- Heavy duty mechanical powertrain - proven performance underground
- Hydraulic systems with piston pumps - cooler operation for longer life
- Severe duty electric system - quality MIL spec components
- Centralized lubrication gets grease to the right places
- Ease of maintenance helps ensure long life

Productivity

- Heavy-duty all mechanical powertrain featuring Dana components deliver efficient power to the ground and maximize tractive effort
- Robust design helps lead to fewer failures and more up time
- Bucket geometry allow for easy filling
- Cast bucket cutting edges for lower wear
- Ergonomically designed large operators compartment with excellent visibility and easy to operate controls

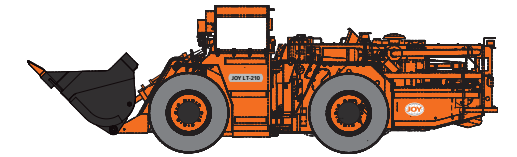
The suite of Joy loaders includes models that suit a range of small-to-large openings with additional capacity for heavier materials.

A variety of standard options are available for a custom solution:

- Bucket volumes matched to material density
- Ejector bucket
- Quick attach systems for forks or other attachments
- Cummins, Deutz or MTU engine options
- Enclosed operator's compartment with air conditioning
- Automatic lubrication system
- Manual or automatic fire suppression systems

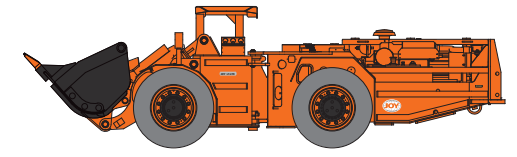
LT-210

Rated load capacity	2,041 kg	4,500 lbs
Standard bucket volume	0.76 m3	1.0 yd3
Operating weight	6,700 kg	14,770 lbs
Dimensions (L x W x H)	6,152 x 1,499 x 1,934 mm	247 x 59 x 76 in
Engine power	55 kW	74 hp



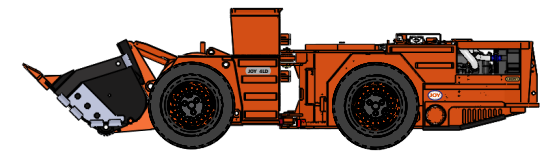
LT-270

Rated load capacity	2,722 kg	6,000 lbs
Standard bucket volume	1.2 m3	1.5 yd3
Operating weight	9,670 kg	21,100 lbs
Dimensions (L x W x H)	6,365 x 1,514 x 1,895 mm	250 x 59 x 74 in
Engine power	74 kW	99 hp



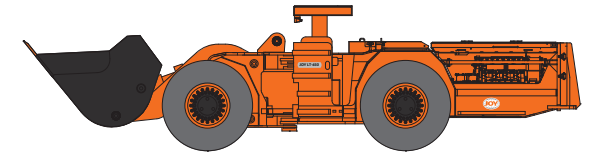
4LD

Rated load capacity	4,000 kg	8,800 lbs
Standard bucket volume	1.9 m3	2.5 yd3
Operating weight	14,562 kg	32,104 lbs
Dimensions (L x W x H)	7,648 x 1,778 x 2,072 mm	301 x 70 x 82 in
Engine power	97 kW	130 hp



LT-650

Rated load capacity	6,591 kg	14,500 lbs
Standard bucket volume	3.1 m3	4.0 yd3
Operating weight	19,700 kg	43,400 lbs
Dimensions (L x W x H)	8,947 x 2,033 x 2,164 mm	352 x 80 x 85 in
Engine power	164 kW	220 hp



LT-1051

Rated load capacity	10,000 kg	22,000 lbs
Standard bucket volume	4.6 m3	6.0 yd3
Operating weight	31,750 kg	61,460 lbs
Dimensions (L x W x H)	9,746 x 2,685 x 2,447 mm	384 x 106 x 96 in
Engine power	209 kW	280 hp



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EN-LHD01-0117-V5

HC 25

Hydraulic Drifter



- Innovative design
- Versatile and flexible
- Light and powerful

Spend less

- Easy maintenance with long intervals and maintenance kits available
- Simple fixing plate and low installation cost
- High input/output efficiency ratio, for reduced and optimized energy consumption

Trouble-free

- In line rotation patented system with no gear box and high torque
- No tie rods; single body drifter prevents seizing and breakage issues
- Reinforced front bushing for better life span

Highly versatile

- Uses integral steel or standard rods
- Suitable for air or water flushing

Weight and dimensions	
Weight	72 kg
Overall length without shank	694 - 702 mm
Overall length with shank	779 - 839 mm
Overall width	200 mm
Height	191.5 mm
Height above shank axis	83.5 mm

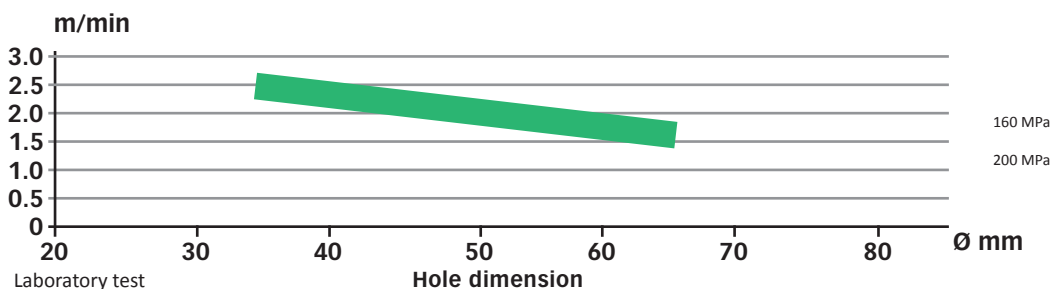
Impact rating	
Maximum output	6 - 8 kW
Input range	16 kW
Percussion flow range (max)	65 l/min
Percussion pressure range (max)	150 bar
Maximum impact frequency (max)	3,900 bpm
Maximum impact energy (max)	117 J

Other versions are available; please contact the drilling technical support team for more information.

Rotation specs	100cc	125cc	160cc
Maximum rotation speed (RPM)	300	300	300
Oil flow (l/min)	30	37.5	48
Maximum pressure (bar)	175	175	175
Maximum torque (Nm)	251	313	401

Flushing flow and pressure	
Water flushing	20 - 50 l/min
Front end lubricating air consumption at 3bar	300 l/min

Penetration rate



Shank adapters	CPN
D45 H25 F	86758661
D45 R28 F	86720976
D45 R32 F	86711421
D45 R32 M	86711439
D45 R38 M	86716032

Overhaul kits	CPN
Seal kit	CPN depending on configuration
400 impact hours kit	CPN depending on configuration
800 impact hours kit	CPN depending on configuration
1,600 impact hours kit	CPN depending on configuration
3,200 impact hours kit	CPN depending on configuration



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JOYGLOBAL



Longwall Systems Product Overview



JOYGLOBAL
Service Leader

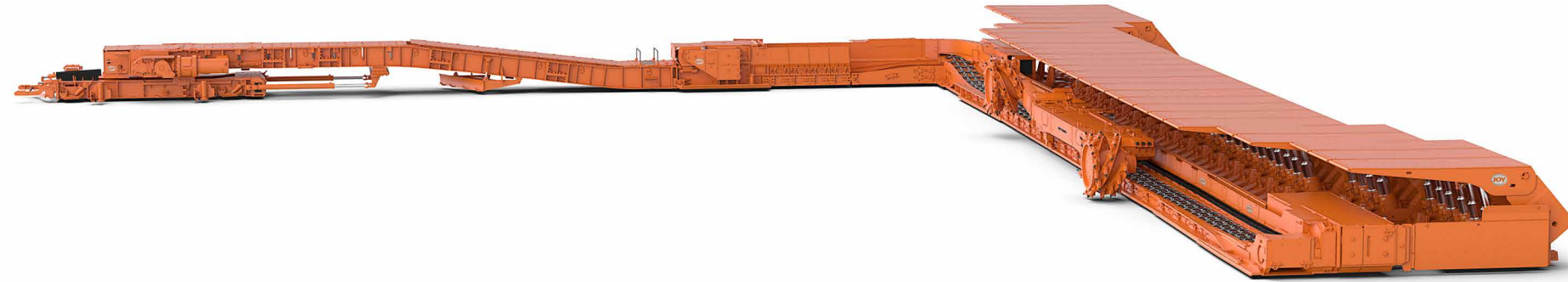


Delivering world-class mine performance

At the core of our commitment to customers is providing world-class solutions through our unique direct service network. This allows us to **collaborate with customers**, developing innovative parts, products, consumables and systems that lower their total cost of ownership while safely maximizing production.



Our commitment to quality and reliability is supported by our focus on Operational Excellence. We use Joy OpEx principles to eliminate waste, simplify the process, automate and remove people from harm's way.



Complete longwall systems

Joy Global offers a complete range of longwall equipment to suit the needs of mining operations worldwide. Globally recognized as the leading manufacturer of complete longwall systems, Joy Global provides its customers with a single, accountable source for shearers, roof supports, face conveyors, stageloaders, crushers and mobile belt tail pieces.

Globally recognized as the leading manufacturer of complete longwall systems.

All of the elements of modern, high production longwall systems are provided in an integrated manner for maximum productivity gains and lowest cost per ton. In addition to developing the most technologically advanced products, Joy Global provides professional project management capability to deliver an integrated system on-time, to specification and on-budget.

When only the best will do . . .

Complete longwall systems from Joy Global represent the ultimate solution for high production longwall mining. Joy Global incorporates the best-of-breed shearers, roof supports, face conveyors, stageloaders, crushers and mobile belt tail pieces to deliver a complete longwall system that is in a class of its own. Output productivity of this integrated system simply cannot be matched by integration of stand-alone components. When a mining operation calls for the most productive, most reliable longwall system, there is only one place to find it.

- Individual product design improvements are made with system implications already considered, balanced and optimized
- Complete electronic systems maximize communication, diagnostics and monitoring signals
- Personalized and dedicated engineering and service representatives produce unrivaled system optimization

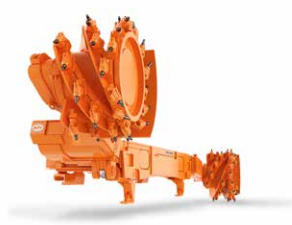


Joy Global is a leader in the development of innovative mining technology and equipment designed to help mining operations become the most productive mines in the world while operating more safely and at the lowest cost per ton.

Industrial minerals
Mechanizing extraction...



Joy Global offers complete longwall systems designed specifically for the rock densities of salt, potash, gypsum and trona. Fully mechanizing the extraction of industrial minerals improves safety while increasing productivity. Customers utilizing these advancements have seen up to 40% cost savings versus the traditional drill-and-blast method.



Longwall Shearer
The most technologically advanced and productive shearers in the industry.



Armored Face Conveyor
Available for all seams with capacities up to 6,000 tons (5,400 tonnes) per hour.



Powered Roof Support
Custom designed to meet exacting cycle and operating requirements.



AFC Optidrive System
An Intelligent variable speed and torque drive solution for your AFC and BSL.



Stageloader
Moves continuously and provides necessary overlap to suit mining conditions.



Crusher
Extremely rugged and trouble-free with little maintenance required.



Longwall automation

The Faceboss control platform enables operators to consistently operate at the optimal balance of production rate and cost.

Faceboss is the standard control platform across all Joy Global underground product lines. In longwall mining applications, this platform enables users to utilize proven machine control as well as the latest advancements in automation for maximum productivity. The control software is designed to minimize an operator's exposure to dust, water spray and noise by keeping personnel on the upwind side of the machine.

The latest development within Faceboss is the integration and data exchange between the shearer and roof support systems which provides a more automated longwall. This integration and data exchange results in the most consistent and efficient cycle times while minimizing the need for human intervention and improving overall safety on the longwall face.

Advanced shearer automation

Further increasing productivity and reducing operator exposure to dust and noise, this newest level of shearer steering technology allows for the programming of fully-automated cutting sequences, including gate end turnarounds. The latest feature included with advanced shearer automation is the ability for the user to create an initial cutting profile and extraction heights by use of a graphical offline planner. With this plan, the machine automatically replicates the profile until conditions change. The operator then has the ability to override control of the roof drum to follow the preferred horizon. Utilizing this new roof horizon data, the remainder of the cutting sequence is fully automated per the pre-defined extraction heights. This advanced level of automation enables the most efficient cycle times possible while providing consistency from one day to the next.

Remote operation

The HHX remote uses reliable two-way radio communication to control the shearer and display operational and diagnostic information on an integrated LCD screen. As an integral part of the Faceboss platform the remote fully supports Advanced Shearer Automation. The large capacity, removable battery pack allows long intervals between recharging on the dedicated charging station. With an ergonomic design and minimal complexity, the HHX remote offers comfortable operation and high reliability.



Faceboss RS20s

The Faceboss RS20s system requires no special gate-end computer for control and is the fastest and most powerful shield control system ever supplied by Joy Global. These systems are globally fitted on the most automated and productive longwalls.

The RS20s system is supplied with a complete automation library of over 100 face cutting sequences to suit virtually all conditions. Using shearer initiation with gate-end automation, no operators need to be specifically deployed for shield operation.

Surface data communication link

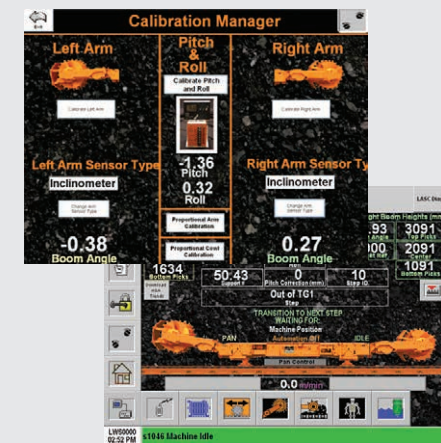
With the Surface Data Communication Link, real-time operational information is transmitted via an ethernet connection to the surface. This information is identical to the information available underground. The Surface Data Communication Link includes a data storage feature that allows recorded data to be played back for in-depth analysis without affecting production.

Many mines are now using mine-wide Supervisory Control And Data Acquisition (SCADA) systems to monitor the production process. The Joy Outby System provides an Object Linking for Process Control (OPC) interface that enables information from Joy Global equipment to be easily transferred to the mine's SCADA system. All major manufacturers of SCADA systems support OPC.

User friendly interface

Simplified setup...

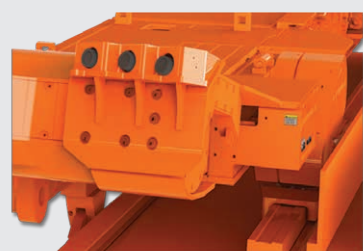
Standard on the Faceboss platform, a graphical onboard interface with intuitive screens provides simplified commissioning tools, user configurable options and real-time diagnostics.

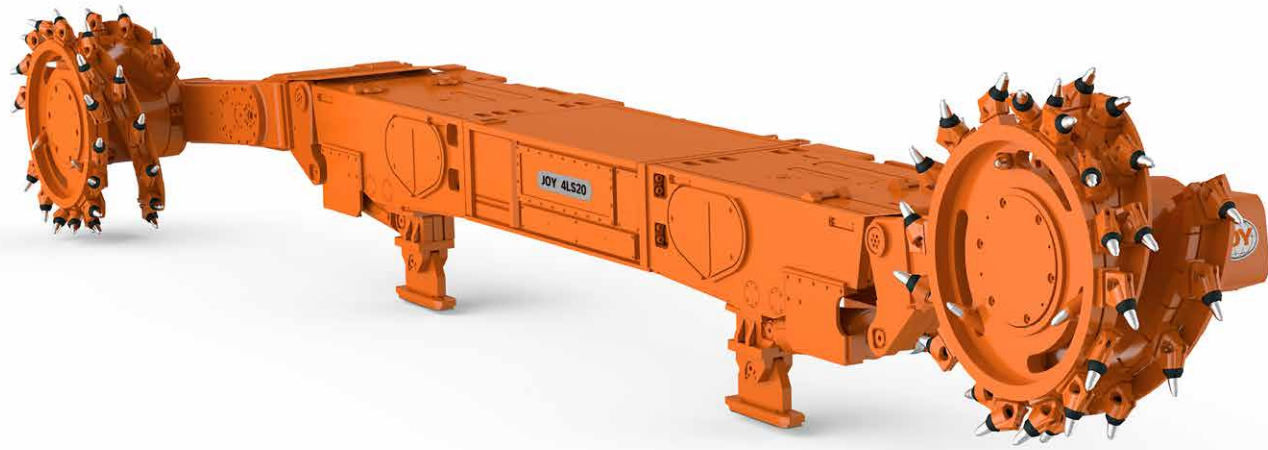


Remote visualization

Zero harm mentality...

This optional feature provides real time video using cameras that are integrated into the design of the ranging arm chassis. Video signals are displayed at the Remote Operation Center on independent monitors. With automated water sprays to keep the camera lenses clean, this feature enables the possibility of operating the machine from a remote location with a familiar handheld device.





Longwall shearers

Joy Global built the first all-electric shearing machine in 1976. Today, Joy Shearers are utilized around the world by the most productive mines, in the most demanding environments. A wide range of shearer models is offered to accommodate seam ranges from one and a half to seven meters. The advantages of the modular design, Optidrive variable frequency drive and new Advanced Shearer Automation system provide high productivity with lower costs and a focus on a zero harm mentality.

Modular design advantages

Joy Global's modular design consists of five main structural elements.

The body of the shearer consists of three high tensile steel fabrications bolted together to form a slim main section with no under-frame. This design provides maximum under-body clearance for material passage in a given seam thickness. The elimination of the under-frame also makes underground transportation easier.

The controller case, which forms the center section, contains the electric control system. The Joy Global design features gob-side access to the electrical controller section and motors which means that normal maintenance can be carried out in a safer working environment.

Two traction sections are bolted and doweled to each end of the controller case. The down-drives are bolted to the traction cases in an arrangement that permits the custom fitting of the shearer within the AFC and roof support envelope. A wide selection of Joy Global designed and manufactured down-drives can be fitted to the shearer to suit mining conditions and AFC selection.

High tensile steel ranging arm castings house the cutter motors and cutter gearcases. Ranging arm cylinders are made using technology from the Joy Powered Roof Support product line. These cylinders have double the pressure rating when compared to the industry norms. In-house manufacture of bit holders and cutter drums creates a higher degree of integration and allows engineers to better understand the drum's affect on machine performance. Gearing is designed and manufactured in our own factories using proprietary processes which contributes to maximum performance.

Drums

Custom designed...



At Joy Global, drums are custom designed to meet your unique conditions. Joy drums are manufactured using our own patented design three-axis digital lacing machine to achieve precise bit locations and angles. The bit positions for each drum are digitally recorded for traceability. Final machining of drum bores is accomplished with state-of-the-art CNC turning centers to achieve a precise fit for your Joy longwall shearer.



Rugged, reliable and easy to maintain

The modular construction of Joy longwall shearers allows for efficient manufacture and rebuild. The Joy shearer is designed to be as simple and easy to maintain as possible with special tools rarely required.

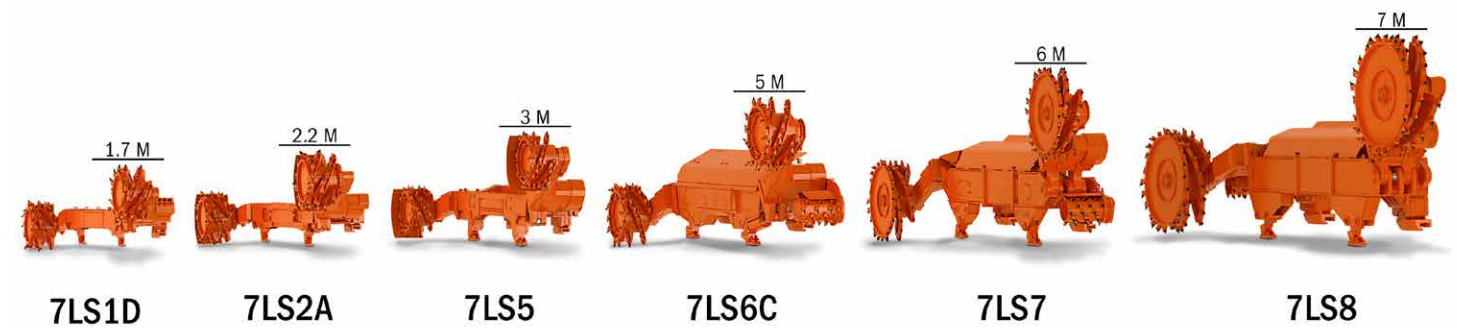
The Joy shearer is designed to be as simple and easy to maintain as possible.

Joy Global also integrates the cowl turning mechanisms into the ranging arm designs creating rugged components.

Optidrive transmission

Increased productivity...

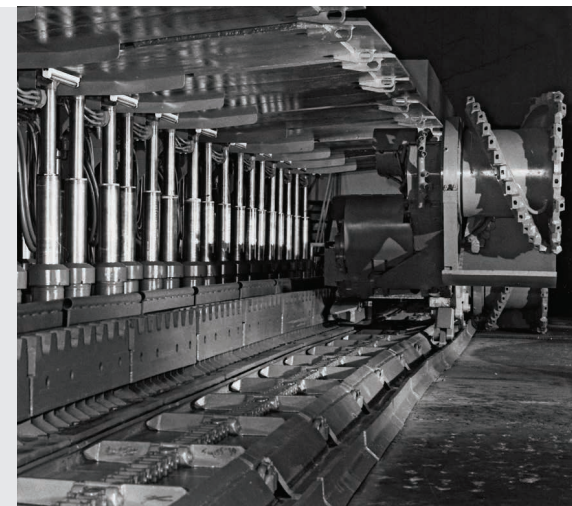
The Optidrive transmission from Joy Global is a power-matched, integrated drive transmission that includes gear-box, AC electric motor, Variable Frequency Drive (VFD) and control technology. The holistic design approach provides an optimal, rugged and reliable solution for shearer traction systems.



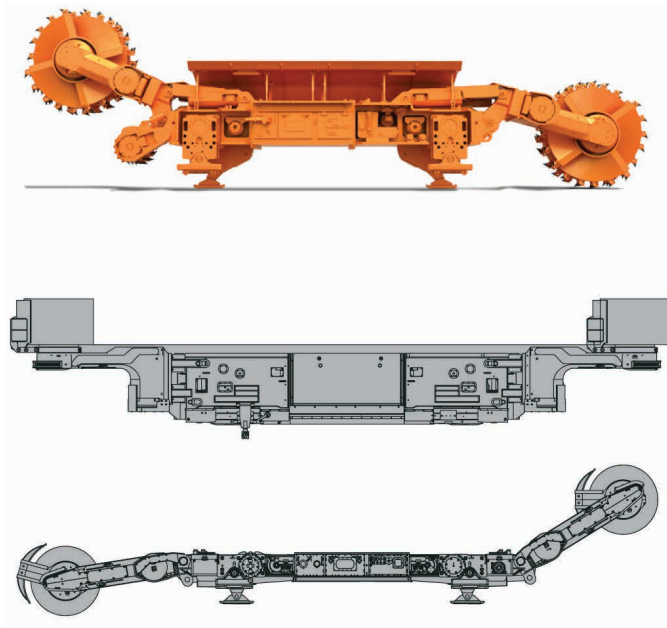
Joy Global history

Tradition in quality and pride...

The Joy shearer, introduced in 1976, was the first multi-motor shearer and this design concept became the global standard for all longwall shearers. Joy Global expanded its worldwide market presence by providing safer, productive, reliable machines that produce at the lowest cost per ton. Joy shearers are supported with first class service and through Life Cycle Management agreements, replacement refurbished machines, built to OEM specifications, are available for exchange at panel moves. In addition, Joy Global provides the highest level of face automation that allows customers to benefit from safer, consistent, repeatable operation.



Joy longwall shearers



	7LS1D		7LS2A		7LS3A		7LS5	
Cutting height	1.5 m - 3.0 m	4.9 ft - 9.8 ft	1.6 m - 3.5 m	5.2 ft - 11.5 ft	2.0 m - 4.0 m	6.6 ft - 13.1 ft	2.0 m - 4.5 m	6.6 ft - 14.8 ft
Machine height	1.0 m - 1.3 m	3.3 ft - 4.3 ft	1.0 m - 1.3 m	3.4 ft - 4.3 ft	1.45 m - 1.70 m	4.8 ft - 5.6 ft	1.5 m - 1.9 m	4.9 ft - 6.2 ft
Machine weight	52,000 kg	114,640 lbs	59,000 kg	130,073 lbs	60,500 kg	133,380 lbs	81,700 kg	180,118 lbs
Frame thickness	498 mm	19.6 in	520 - 590 mm	20.50 - 23.2 in	520 - 590 mm	20.50 - 23.2 in	590 mm	23.2 in
Haulage pull	800 kN	179,847 lb	800 kN	179,847 lb	800 kN	179,847 lb	800 kN	179,847 lb
Maximum haulage speed	32 m/min	98.4 ft/min	33 m/min	98.4 ft/min	34 m/min	98.4 ft/min	30 m/min	98.4 ft/min
Pump motor	2 @ 11kW	2 @ 14.8 hp	2 @ 11kW	2 @ 14.8 hp	2 @ 11kW	2 @ 14.8 hp	2 @ 20 kW	2 @ 26.8 hp
Haulage motor	2 @ 65 kW	2 @ 87.2 hp	2 @ 80 kW	2 @ 107.3 hp	2 @ 80 kW	2 @ 107.3 hp	2 @ 110 kW	2 @ 147.5 hp
Lumpbreaker motor	NA		65kW (575V)	87 hp (575V)	65kW (575V)	87 hp (575V)	65 kW	87 hp
Available ranging arms	J450E J450F J525E		J450E J450F J525E J525F		J525F		J525F J750A	

	J450E		J450F	
Length of ranging arm	2249 mm	88.5 in	2249 mm	88.5 in
Cutting motor 60 Hz (max)	420 kW	563 hp	420 kW	563 hp
Minimum drum diameter	1450 mm	57 in	1450 mm	57 in
Minimum drum width	940 mm	37 in	880 mm	34.6 in
Drum speed (60 Hz)	55, 60, 66 RPM		66 RPM	

	J525E		J525F		J750A	
Length of ranging arm	2483 mm	97.8 in	2483 mm	97.8 in	2601 mm	102.4 in
Cutting motor 60 Hz (max)	600 kW	725 hp	675 kW	905 hp	750 kW	1005 hp
Minimum drum diameter	1550 mm	61 in	1650 mm	65 in	1750 mm	68.9 in
Minimum drum width	960 mm	37.8 in	940 mm	37 in	1040 mm	40.9 in
Drum speed (60 Hz)	47, 56, 61, 66 RPM		38, 45, 49, 53 RPM		38, 43, 52 RPM	



Roof supports

Joy Global has over 60 years of experience designing and manufacturing longwall roof supports and has achieved ISO 9001 2008 certification. Our development and test facility has UKAS Accreditation. With installations around the world, Joy Global has met or exceeded the customer's rigorous requirements with ratings up to 1750 tonne (2000 tons); in widths of 1.5, 1.75 and 2.05 meters; for height ranges from 0.8 up to 7.8 meters.

Structural design is a particular strength of Joy roof supports. The design and the attention to detail of the structures has been recognized throughout the mining industry. These detailed and controlled fabrications enable Joy roof supports to provide reliable service with a lower cost of ownership and fewer rebuilds required during their service life.

Leg construction

Joy roof support legs are designed and tested to achieve extended life. Our bespoke internal seals work with the cylinders to provide a long service life between rebuilds with leg bore sizes ranging from 125mm to 480mm plus. Single, double and triple telescopic designs can be provided depending on support range requirements. Along with the FEA and fatigue analysis software, Joy Global also uses the very latest CAD technology to enable the design of galleries and feed pipes to maximize flow and minimize pressure drops and turbulence. This is an important feature in optimizing hydraulic efficiency and keeping support cycle times to a minimum.

For large bore diameter legs that require high flow and hence large feed pipes combined with high fatigue life requirements, Joy Global has developed a new leg design that allows large capacity feeds to be used by the legs. To achieve high fatigue life, no welds are used on the leg cylinder and the feed is attached by a patented locking system. This system is designed to contain the highly pressurized fluid to the cylinder without the use of life-limiting weld methods for the attachments.

Hydraulic system design

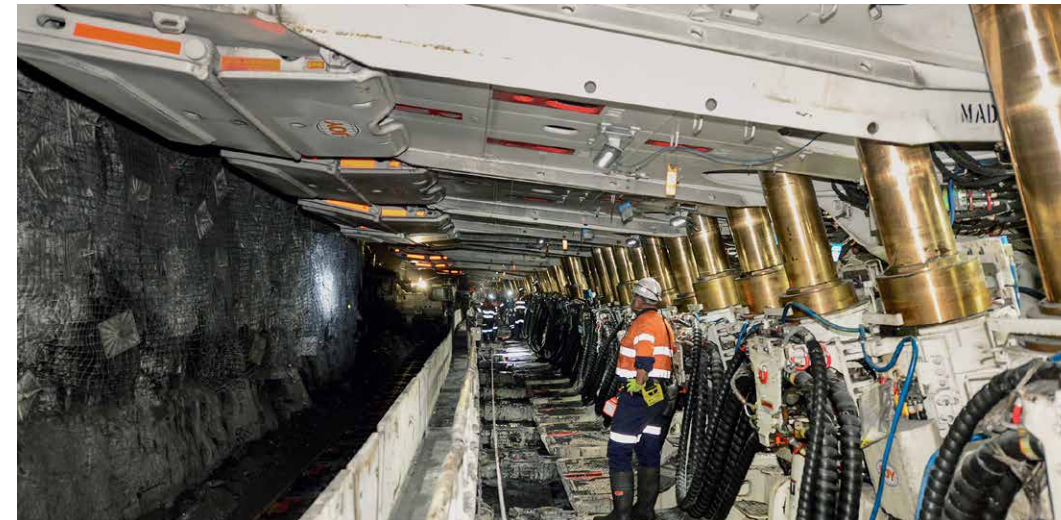
Cycle time is an important feature of roof supports ensuring that on high production longwalls, the roof control does not slow the shearer cutting rate. Joy Global uses the latest technology available to calculate pressure drops, optimize fluid velocity, calculate flow rates and optimize hose sizes to give the best solution whilst complying with international standards.



Roof support ergonomics *Improved safety and comfort...*



Memory flexible inserts are used around all leg interfaces to keep areas free from debris build-up that can lead to undesirable bending loads being seen by legs and leading to breakages. The use of such inserts also assists on longwall face changes, enabling easier closure of the roof supports for transport between longwall panels. The walkways on the units incorporate special self cleaning anti-slip mats to help the longwall crew travel on the face without slipping and reduce operator fatigue.



Roof support electronics

Joy roof supports are controlled using the Faceboss electronic control system which integrates into the longwall and mine-wide system to enable automatic control of the longwall operation, including fully automatic shearer and roof support gate turn rounds. All the information from the longwall system can be transmitted to the surface and viewed throughout the mine network and with the mine's agreement relayed in real-time back to Joy Global enabling utilization of our "JoySmart Services."

Joy roof supports provide reliable service with a low cost.

Compak valve system

Compak, Joy's hydraulic control system, is a well established, proven and reliable valve system for controlling modern automatically operated longwall roof supports. The system provides multifunctional control with solenoid-actuated pilot circuits receiving instructions either by operator push button or more normally, automatically from the Faceboss electronic control system. Manual spools provide operators with a proportional control capability.

Faceboss Compak

Joy's latest distributed valve system, utilises serial solenoids and allows valve gear to be sited next to the function it controls, this reduces hoses by up to 32%, improves on the ergonomics and assists with flows and pressures.

Quality assurance

All Joy structural fabrications undergo detailed finite element analysis with experienced in-house engineers. Structures undergo overload of up to 200% and are fatigue-tested at up to 120% their rated load to verify the intended life. The structural testing is conducted at the Joy Global testing laboratory, which houses the world's largest rated purpose design rig. The roof supports are also subjected to lateral fatigue testing in combined tests. Joy Global designs and delivers roof supports that are tailored to the mine's life requirements from 15,000 to 90,000 plus cycles.

Physical prototype

Hands-on training...

Sessions are held with customers, using exact 3D solid models of their roof supports, to establish optimal valve positioning and cable runs to best ergonomic principles. This helps to promptly deliver the best solution.

To increase ease of maintenance and setting of mine auxiliary items, Joy Global conducts a physical exercise with the maintenance and engineering staff of all customers.





Armored face conveyors

Joy Global manufactures all the key elements for the armored face conveyor (AFC) including the head and tail frames, line pans, gear boxes, sprockets, couplings and shearer haulage systems.

Cast design provides tighter tolerance assurance.

The design of the Joy AFC uses cast steel sigma sections with exacting tolerances. This casting technology eliminates the weld fabrication of clevis and pan connections, which are less reliable. The cast design provides tighter tolerance assurance which is

essential in today's marketplace. Joy Global's high specification abrasion-resistant upper deck plates, selected to meet pan life requirements, result in maintenance free, long life fabrications.

AFC linepans

Joy AFC linepans have become the linepan of choice for heavy duty applications. The simple but rugged linepan construction is superior in fatigue resistance compared to other construction techniques, and includes the option of standard or machined pan joints. Linepans are fully tested for articulation and horizon control characteristics. Customizable cast side sections allow material to be placed where needed to match customer-required service life. Highly abrasion-resistant materials are used in construction to achieve wear longevity.

AFC transmissions

All Joy AFC transmissions are continuously rated at the maximum stated capacity. Transmissions can be used in conjunction with a variety of coupling solutions. A full monitoring package is available on all transmissions. Sizes are available for all AFC capacities including 11kV electric motors up to 1800kW. These advanced transmissions are specifically designed for low cost overhauls.

Broadband long life chain

Available in five sizes from 38mm up to 60mm diameter, Joy Broadband long life chain provides proven extended wear resistance without detriment to chain weight and conveying characteristics. This chain delivers new levels of conveying efficiency and reduced operating cost.

First installed in 2004, over the last eight years the chain has conveyed over 80 million tonnes on AFC and BSL applications in high productivity longwall installations operating in many major markets. Joy Broadband long life chain provides the greatest opportunities to longwall operators planning their future developments or upgrade requirements.



Innovative solutions *'S' shaped center post...*



Broadband chain now comes with an innovative 'S' shaped center post on the vertical link (patent pending) which is designed to prevent knuckling of the chain and therefore reduce the likelihood of chain wreck events.



AFC driveframes *Innovative design...*

In addition to the premium materials and world-class processes used in construction of Joy AFC driveframes, innovative design is utilized to achieve extreme reliability and reduced maintenance. Plug and play upgrades are also available for future power density increases.



AFC couplings

Since 1994 the Turbo Transmission Technology (TTT) coupling has been supplied on Joy AFC equipment and is still in service today. TTT coupling is capable of high frequency heavy load starts without overheating or equipment damage. These ultra-reliable units have no bearings or seals, require very little maintenance and minimize the cost of overhauls. These units are extremely fault-tolerant and exhibit no loss of torque under normal voltage drop situations. Couplings come with onboard water filtration and the latest control valve has separate pilot filtration to help prevent problems caused by water quality. The latest version of the Joy couplings can be de-mounted in one convenient unit.

Turbo Transmission Technology

Joy Global has supplied Turbo Transmission Technology (TTT) couplings in various forms since 1994 and these couplings have become the coupling of choice for all the major mining companies on a worldwide basis due to the simplicity, ease of operation, high performance and reliability of the units. The TTTF is the latest variant of this high performance coupling and like its predecessors is only available from Joy Global.

The latest features of the TTTF include the ability to dismount the unit in one piece from the gear train, a robust filtration system and updated valve design to cope with fluctuations in water quality.

The TTTF range of couplings is made up of the 562 and 650 size units. This range allows for up to 30,000 Nm of torque transmission and provides future upgrade opportunities for wider and higher production capability.

Optidrive

The Medium Voltage (MV, 3300 or 4160 V) integrates the Variable Speed Drive (VSD) with the motor to achieve better speed and torque control – resulting in a softer start and stop and faster acceleration. The variable chain speeds that match production conditions allow for increased capacity, improved cutting cycles, and the ultimate efficiency for your longwall system.



Outby equipment

Stageloaders

Joy Stageloaders are manufactured using a fully customized approach that incorporates proven design technologies. An extensive range of features is available to suit the longwall environment and the customer's needs. Machined joints are fully sealed for dust and noise limitation. Ultra-reliable crusher designs are available including pick shaft and high inertia impact style units.

Crushers

Joy Global manufactures a complete range of stageloader crushers designed to be extremely rugged and trouble-free with little maintenance required. Built for difficult conditions, these crushers can efficiently handle lump coal and oversize rock which eases conveying and improves system productivity. To suit customer preference, Joy Crushers are available in a direct gear-drive or a V-belt drive.

All Joy Crushers incorporate a frame fabricated from heavy steel plate and strengthened by heavy ribs for maximum rigidity. Easy access to the crusher roll is provided through an inspection door in the top of the frame. Models are available that allow the top of the frame to be completely removed in order to lower the transportation height. Product size adjustment is accomplished by vertical movement of the roll shaft assembly, which is carried out by means of hydraulic cylinders that facilitate rapid adjustments.

Mobile belt tail pieces

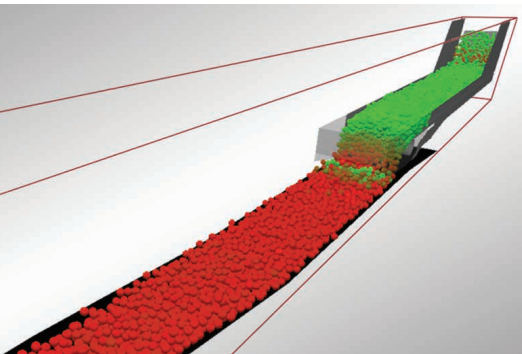
The complete range of Joy mobile belt tailpieces enables longwall retreats to take place without stopping the belt or interrupting the flow of coal from the longwall face. Various models are offered for low, medium or high seam applications in either a "Matilda" style, or a self-propelled crawler and skid-mounted unit.

The two basic types of self-propelled units are those driven directly from the shield support hydraulic system, and those that have an "on-board" hydraulic pump. The crawler-mounted units are complete with heavy-duty replaceable pads and are internal planetary gear driven. Roof jacks and belt wipers are standard equipment and leveling jacks are located on each corner.



Bulk material simulation

Optimize, improve and increase...



Joy Global has invested in bulk materials simulation software for use in design of the AFC product line. This software provides the simulation and analysis required to enhance innovation and helps design engineers optimize the performance of bulk materials handling including:

- Optimizing conveyor transfer points
- Improving the performance of linepan control
- Increasing efficiency of crusher design
- Improving design of discharge hoods and hoppers to control throughput

JoySmart Solutions

Integrated JoySmart Solutions help solve customers' toughest challenges using data-driven intelligence, collaboration

Joy Global service facilities have given world-class service a new home.

through partnership and experienced-based service execution. They are a way of partnering with customers to help reduce costs and increase productivity, in line with customers' operating and financial goals.

JoySmart Service Centers are strategically located around the world in order to conveniently serve our customers. With each new service center built, Joy Global products and people are becoming more connected, allowing for expanded benchmarking. Located strategically in zones of mining activity, each service center brings local support that is world-class. Services offered are structured to fulfill the lifecycle of mining equipment, optimizing equipment for productivity and safety.

Our commitment to world-class service is delivered through world-class processes and metrics. Our Joy OpEx processes bring operational excellence by prioritizing the elimination of waste, simplifying processes, automating and removing people from harm's way. We leverage those principles throughout our network, with the ability to rapidly customize locally, helping customers work smarter, worldwide.



JoySmart Solutions are integrations of smart connected Joy Global products and systems, advanced analytics and direct services customized to solve customers' toughest challenges.

JoySmart Solutions at work:

Costs

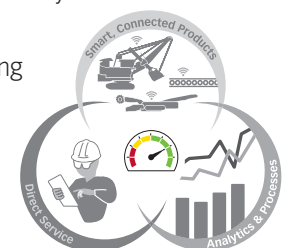
- Lower cost per unit produced by reducing overall parts and consumables expenditures
- Optimize costs for power/fuel, labor and rebuilds

Safety

- Automate processes and controls
- Increase awareness through training and standard setting

Productivity

- Improve system availability, performance, utilization and consistency
- Leverage extensive Joy Global engineering knowledge to solve problems



JoySmart Solutions



Joy Global worldwide locations

JOYGLOBAL



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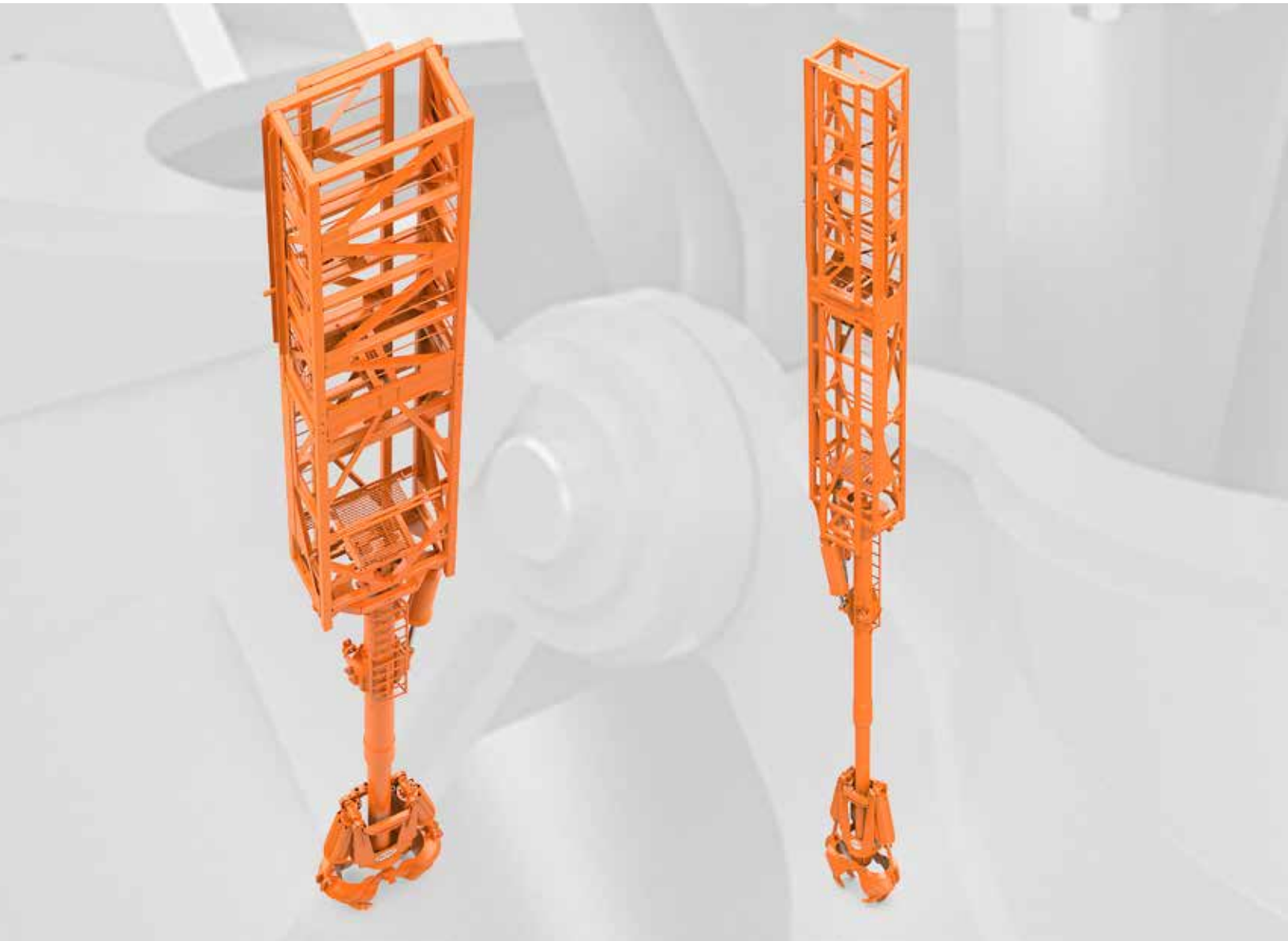
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EN-LSP001-0616-V1



Shaft Sinking Equipment Product Overview



JOYGLOBAL
Service Leader



Delivering world-class mine performance

At the core of our commitment to customers is providing world-class solutions through our unique direct service network. This allows us to **collaborate with customers**, developing innovative parts, products, consumables and systems that lower their total cost of ownership while safely maximizing production.

JOY Operational Excellence
Taking us to the next level



Our commitment to quality and reliability is supported by our focus on Operational Excellence. We use Joy OpEx principles to eliminate waste, simplify the process, automate and remove people from harm's way.

Shaft sinking equipment

Shaft muckers – key features

- 4.3 meter main cylinder stroke - increased coverage area and capacity
- Self-cleaning main cylinder - improved reliability and safety
- Specialized outer tube steel specification
- Removable grease fittings and bushings for ease of maintenance
- Shock absorbers for bucket cylinders
- Simple, hydraulic operator controls
- Low operating cost

Specifications-VSM 14	
Bucket capacity	0.5 yd ³ 0.75 yd ³
Length	54 ft 2 in
Boom extension	14 ft
Width	5 ft
Depth	3 ft 2 in
Extension	3,600 lbs
Cage	5,700 lbs
Boom	9,700 lbs
Total weight	19,000 lbs



Shaft jumbos – key features

- Equipped with Montabert drifters, lowest in-class operating costs
- Hydraulic pilot control
- 360° rotation at top turret - maximizes boom coverage
- JGF Joy Global Feed - lightweight, durable and available in 3.6 - 5.5 m steel
- Stainless steel electrical panel - water resistant for shaft applications
- Ability to drill at 90° - allows for bolting and ease of starting stations
- Auto-parallel boom - proper alignment of holes
- Hydraulic power pack - ability to run auxiliary systems (jumbos and excavator)

Specifications						
Model	SJ155H	SJ255H	SJ355H	SJ155A	SJ255H	SJ355H
Boom	1	2	3	1	2	3
Drifter	HC 109 or HC 110			S36 or customer supplied		
Lubrication	Auto lube			Air lubricator		
Bucket well	5.18ft. dia.	4.73ft. dia.	2m ²	5.18ft. dia.	5.18ft. dia.	2m ²
Emergency stop	Electrical, 1 @ elect panel, 1 per operator console			Pneumatic, 1 per operator console		
Power unit	100 HP electric / 74.5Kw IP55 rated (1 per boom)			Air motor RM510 30HP/22kW (1 per boom)		
Boom controls	4 and 5 section hydraulic valve (1 per boom)			10 section hydraulic valve (per boom)		
Drill controls	3 Section hydraulic valve (1 per boom)			3 section pneumatic valve (per boom)		
Remote controls	Optional			N/A		
Function	Tandem hydraulic pumps 130CC/60CC (1 per boom)			Gear Pump 44cc (1 per boom)		
Reservoir capacity	40.1 gal	64.4 gal	80 gal	15 gal	30 gal	39.9 gal
Boom coverage one boom only	17.1 ft. Dia.					
Boom swing	-11° To +60° from vertical					
Boom rotation	360°					
Feed advance	60 in.					
Feed rotation	360°					
Feed swing	180°					



Contact your Joy Global service representative for more information on hard rock mining products, or visit www.joyglobal.com



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EN-SSE01-0716-V2