

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.

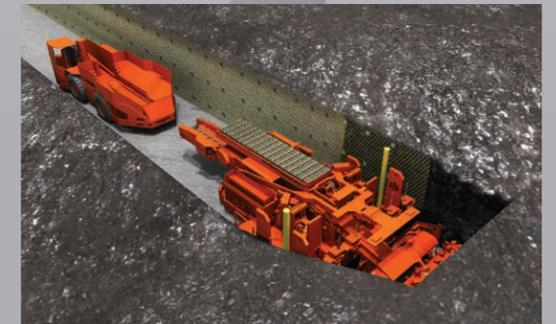


Typical twin entry development

Secondary vent ducting/monorail system

Shuttle car Miner bolter

Monorail, ducting and cables



Electrics

Fan

Conveyor

Feeder-Breaker



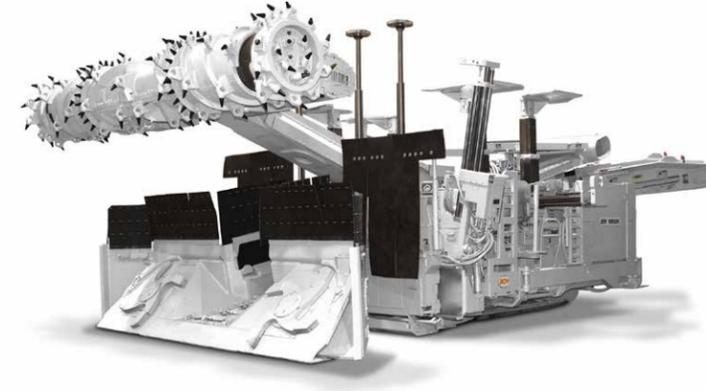
12ED25 miner bolter

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

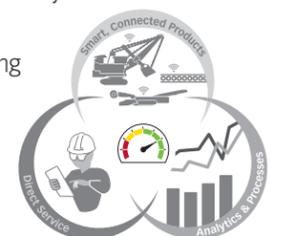
- Lower cost per unit produced by reducing overall parts and consumables expenditures
- Optimize costs for power/fuel, labor and rebuilds

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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