

TECHNOLOGY SOLUTIONS

CAT® ROTARY BLASTHOLE DRILLS



SMART DRILLING WITH CAT® TECHNOLOGY



Cat® drills are designed to help you get more out of your drilling operations by increasing productivity, enhancing safety, lowering costs, improving connectivity, providing live data-feeds to support data-driven decision-making and optimizing the entire mining process... and more.

Technology plays a key role in driving these improvements, with a wide range of integrated solutions designed to enhance every aspect of drill performance. Some features are available as

optional enhancements, while others come standard from the factory.

But they all have one thing in common — they're proven, validated and ready to help you face your toughest challenges.

Not all technologies are available on all models. Contact your Cat dealer for more information on available options for your specific machine.



ENHANCE PRODUCTIVITY

Your drills set the pace for all downstream operations, and Cat drills can start your loading tools off on the right foot — and get your overall fixed-plant operations moving faster, leaner and greener.

Several technology offerings help increase drilling accuracy, allowing new operators to achieve results on par with a skilled veteran at the press of a button. These solutions help promote consistent operation, which can lead to higher-quality blastholes, less over- and under-drilling and reduced cycle times. And they help operators stay alert and effective for longer periods.

EASY ACCESS TO INFORMATION

It starts in the cab, with two touchscreens giving operators quick and easy access to machine performance and health information, including:

- Hole depth and angle (and pipe counter in multi-pass drilling)
- Drilling parameters (rotary torque and bit RPM, feed force, bit air pressure)
- Air volume (for flushing the hole) and water flow (for dust control)
- Dynamic machine level and status while tramming
- Leveling jack status
- System and component status, such as oil levels and temperature for hydraulic system, compressor and engine
- Fuel, water and tool-oil tank levels
- Auto lube system status
- Machine hours (broken out by drilling, tramming and idling) and shift statistics
- Conditional status for major components
- Drill Assist and auto functions status



DRILL ASSIST

The in-cab display and joystick controls also give operators control of the machine's automated functions, collectively known as Drill Assist. These features reduce overall drill cycle time and lead to lower production costs while improving hole consistency and operator comfort — resulting in faster, more accurate drill patterns that drive precision blasting, produce better fragmentation and get your loading tools to work faster. They can even help streamline your fixed-plant processing downstream.

AUTO LEVEL

Automatically extends the jacks and levels the drill platform before drilling begins. Auto Level continuously monitors the angles of the drill platform, as well as jack stroke and jack cylinder pressures, to keep the machine stable and level. If it detects a fault, it will automatically halt all drilling functions to protect the machine until the driller corrects the situation. This not only helps improve accuracy; it protects the drill-string and can also extend the life of the drill's mast, main frame and major components.

AUTO JACK RETRACT

Automatically retracts the jacks and lowers the machine back onto its tracks at the press of a single button. The feature is smooth and efficient, and follows best practices to quickly ready the machine for travel to the next hole.

AUTO MAST (RAISE AND LOWER)

Automatically raises the mast to a specified angle (to the selected angle in 5-degree increments) and locks it into place. This makes it quick and simple to execute drill patterns requiring different angles for different holes or rows, as operators only need to ensure they select the correct angle and let Auto Mast take care of the rest. It carefully raises the mast to angle, then gently feathers controls to engage mast-locking pins. The mast is automatically locked in position until Auto Mast is engaged again, at which point it unlocks and moves the mast to a new selected angle, or lowers the tower to the mast rests.

AUTO DRILL

Allows the machine to perform down-the-hole and rotary drilling with no operator intervention in most geological conditions. The machine will drill to the specified depth at the press of a button, moving through the entire drill cycle:

- Touching ground
- Collaring hole
- Production drilling to defined depth
- Executing retraction based on ground conditions and retract settings

Auto Drill constantly monitors drill power input, adapting to ground conditions in real time to deliver optimal penetration rates, extend bit and tooling life and improve overall hole quality. Auto Drill can be used for single-pass or multi-pass applications.

CAT MINESTAR™ TERRAIN FOR DRILLING

Accuracy and consistency can be further improved with Cat MineStar Terrain for drilling, a high precision GNSS satellite guidance system that can help your operators maximize pattern accuracy. That means less variation in the pattern and reduced over- and under-drilling; increasing blasting efficiency and resulting in better material fragmentation. This improves the efficiency of your loading tools and, most importantly, your fixed-plant operations downstream.

An in-cab display guides the driller into position with the precise GPS coordinates of each planned hole, allowing even inexperienced operators to easily find their marks. And it continuously monitors drilling progress to help

ensure holes are drilled to exactly the right depth — resulting in up to four times better pattern accuracy.

Using digital connectivity, drill patterns are remotely downloaded to the machine, reducing the need for surveyors onsite, saving resources and reducing the inherent risks that come with more people on foot around your equipment. Measure While Drilling (MWD) data collection provides a live feed to the mine's control center, giving management a firsthand view of actual ground conditions and strata information to drive data-based decisions for drilling, loading and fixed-plant operations.



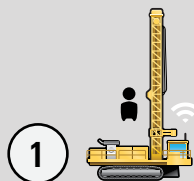
CAT MINESTAR COMMAND FOR DRILLING

Building upon the capabilities of Drill Assist and Terrain for drilling, Command for drilling is a suite of autonomous drilling capabilities that further reduces drilling cycle times, improves hole and pattern consistency, increases machine productivity and improves safety for everyone on your site.

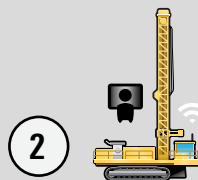
Caterpillar takes a building-block approach to drill autonomy, with levels of implementation that can scale up as your technology infrastructure grows.



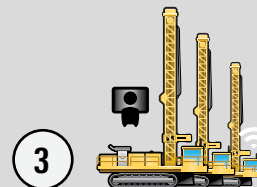
LEVELS INCLUDE:



Operator Machine Assist — in-cab automation of the full drilling cycle



Remote control — gives an operator control of their machine from a safe location, using a tablet or remote operator station



Autonomous drilling — enables one operator to manage multiple drills working a full drill pattern from a single remote operator station, including automated row changes



TRACK, MONITOR AND MANAGE YOUR ASSETS

CAT MINESTAR EDGE

Edge creates an operational ecosystem for your surface mine, giving you visibility to the entire operation and near-real-time access to accurate data about your equipment. Edge automates time-intensive manual processes, capturing multiple data feeds across your fleets and developing value-add reports and messaging that improve fleet utilization and production, helping you quickly adjust your plans to keep machines, people and material moving.

At its core, MineStar Edge leverages the latest technology advancements — including data fusion, machine learning and Artificial Intelligence — so it will continue to get smarter as it collects data, identifies patterns and learns to make decisions with minimal human intervention.

Edge is delivered as a cloud-based, subscription-managed application, which lowers network requirements and the associated costs of deployment, service and training. This also makes it faster to implement, and allows for automatic upgrades, updates and fixes. Sites can also host some applications locally to achieve higher connectivity and lower latency.



CAT MINESTAR FLEET

Fleet automatically records and tracks data up and down your value chain, providing insights that help you identify what's working and fix what's not. Fleet is your single best source for fleet-management information that you can use with compatible machines and systems to measure, manage and help optimize key aspects of your operation.

This includes:

- Seamless tracking, monitoring and management of the entire operation from a central office.
- The ability to run “What if?” simulations to help determine the impact of operational changes.
- Vital monitoring, assignment and tracking tools that serve as the foundation to autonomy.
- The ability to drill down into data for more detailed views and analysis.



IMPROVE SAFETY

The safety of your people is your top priority, and we agree. That's why we design all our machines with a focus on safety, not only for operators but for anyone working in, on or around the machine.



INCREASE OPERATOR AWARENESS

Our world-class drill cab includes full-length windows that improve line of sight to the drill deck and surrounding areas. In addition, standard cameras mounted in key areas improve situational awareness. Cat drills also include various visual and audible alarms for machine movement to help protect personnel working near or on the drill.

CAT MINESTAR TERRAIN FOR DRILLING

Terrain for drilling constantly collects and stores real-time drilling data, which can be used to understand changing ground conditions and rock formations through the pit. Strata-Logger gives mine management a quick, logical look at the changing mechanical properties of the rock. This critical information highlights what's happening below the surface and flags areas susceptible to cave-ins or ground failure. It also indicates areas of extreme hardness or softness in the formation. All this information enables you to make real-time decisions not only for precision blasting, but also on when it's safe for personnel to enter the area being drilled.





CAT MINESTAR COMMAND FOR DRILLING

An operator that's not in the cab is an operator removed from dust, noise, vibration and any other unsafe conditions the drill might encounter. But Command doesn't just improve safety for drill operators, it can help keep other personnel working on your site safe, as well. All Command-equipped machines feature avoidance zones — if an autonomous machine enters an area you've designated as an avoidance zone, it shuts down automatically. This helps prevent autonomous machines from entering areas where their presence could present a danger to your personnel, and also helps keep other equipment away from your drills.



ADDITIONAL SAFETY TECHNOLOGIES

OPERATOR PRESENCE STRATEGY

The Operator Presence Strategy helps ensure drilling functions are only available when the operator is actively in control of the machine. The system uses seat and door interlocks to monitor operator presence and automatically disables feed and rotation functions if the operator leaves the operating position. Auto Drill functions are also disengaged when operator presence is lost or when the drill deck door is opened, helping reduce exposure to rotating components and other drilling hazards.

STABILITY MONITORING

Stability Monitoring uses compound slope angle monitoring during tramming, auto-leveling and drilling to help ensure the machine remains within safe operating limits. The system continuously evaluates machine position and operating conditions to support safe and stable operation across varying ground conditions.

40+ SAFETY & MACHINE PROTECTION INTERLOCKS

More than 40 conditional safety and machine protection interlocks help ensure safe machine operation. These interlocks monitor critical machine functions and operating states, including stability control, mast position and lock status, pipe handling systems, jack position and status, ground pressure, pipe-in-hole conditions and operator presence. When required operating conditions are not met, machine functions are automatically limited or disabled to help prevent unsafe operation and help protect personnel and equipment.



KEEP YOUR MACHINE RUNNING

Nothing slows your operation down like unplanned downtime. But with the right technologies, you can stay ahead of potential issues and keep your machines running smoothly for reduced maintenance costs and increased machine availability. Your drills keep running, which keeps the rest of your downstream operations on track.

MULTIPURPOSE TOUCHSCREEN DISPLAY

The in-cab touchscreens aren't just used to control functions and access performance data; they give operators quick and easy access to critical machine health information. The display logs communicate individual component and sub-system status, as well as warnings and alerts. This allows the driller and maintenance personnel to make the right decisions and prevent small issues from turning into major failures down the line.

Machine status, warnings and fault codes are logged and archived onboard. Using Product Link™ Elite, the customer and dealer can connect to the machine via cell or satellite service to download performance and drill health data to track, review and evaluate.





CAT ELECTRONIC TECHNICIAN (ET)

Cat ET is a service tool that makes electronic troubleshooting fast and easy. It lets your Cat dealer quickly gather key diagnostic data on the machine's digital system so they can proactively plan for and make effective adjustments or repairs.

COMMON ELECTRONIC PLATFORM

All Cat drills share a common electronic platform, not only with each other but with other Cat machines. This lets us bring expertise from across Caterpillar and the Cat dealer network to support your operation. It means fewer electronic and electrical parts, and less hardware needed on hand to support the machine. It's also faster and easier to train technicians across multiple Cat product lines with standardized electrical components, wiring, software design and fault code messaging and troubleshooting information.

CAT PRODUCT LINK™ ELITE

Gathering timely, accurate data about machine performance and health can be the difference between a long, productive shift and a period of unplanned downtime. The Cat Product Link Elite system boosts connectivity and increases the availability of data collected by Cat drills by equipping them with hardware to collect and transmit information into local or cloud-hosted applications for analysis. The system opens the door for industry-leading equipment health and condition monitoring services from Caterpillar and your local Cat dealer and is also a key component of several Cat MineStar solutions.



CAT MINESTAR HEALTH

Health products and services take data transmitted by Product Link Elite and convert it into live user interfaces and reports, enabling proactive maintenance services and predictive equipment analysis. Health can provide notifications and alerts based on machine conditions, or it can be programmed with recommended or preferred service intervals specific to your operation. By staying connected with your machines, you can head off small problems while they're still small and keep your machines running as efficiently as possible for as long as possible.



DRIVE DOWN TOTAL COST OF OWNERSHIP

Cat drills are designed for a long life and a lower total cost of ownership. They're packed with features that help them last longer, burn less fuel and reduce consumable usage. From improved accuracy to more durable structures and components, there are many ways a Cat drill can have an impact on your bottom line.



DRILL MORE WITH LESS

Cat drills take a fully integrated approach to overall machine performance. By refining machine controls and functionality with our digital backbone, we can run the machine and its individual major components at their optimal level.

A fully integrated powertrain with precision controls delivers power where it's needed, when it's needed — and no more. Caterpillar's control strategy drives down fuel burn and emissions output, driving toward a more sustainable world.

Our Cat undercarriage is designed expressly for the toughest applications, with integrated digital controls to provide the driller with smooth and efficient drill movements and control. Cat Electronic Compressor Controls improve performance while reducing fuel burn

by matching the compressor's air output volume to its current needs, gathering input from the drill cycle, and modulating to suit actual ground conditions and the tool being used. The hydraulic system is similar, with demand-based performance that only delivers power when it's needed.

That means less wasted effort, lower engine load factor and reduced fuel consumption, as well as improved cutting tool performance. Cat drills reduce your consumable costs and help you get more out of every bit and hammer. Reduced stress on the engine, compressor and hydraulic system also translates to longer service life, reducing your maintenance costs and improving the availability of the machine.

And the same machine interlocks that help protect operators also protect the machine itself, reducing the risk of damage and helping it last longer.



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For more complete information on Cat products, dealer services and industry solutions, visit us on the web at www.cat.com

Materials and specifications are subject to change without notice. Featured products in photos may include additional equipment. See your Cat dealer for available options.

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