

# Atlas Copco

The Cyclone™ Operating System





# THE CYCLONE™ OPERATING SYSTEM

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TH60



T3W



## THE CYCLONE™ OPERATING SYSTEM

In 1970, the Cyclone™ Drill Co. brought a revolutionary new drilling system to the waterwell market. The TH60 quickly gained a reputation as a rig “designed by drillers, for drillers.”

The system focuses on speed with safety and reducing manual labor. The rigs are flexible enough to handle a wide application range and meet individual operator preferences. Today, this operating system is the core of the T3W and TH60 drilling rigs.

The Cyclone Operating System consists of design features integrated into a flexible, simple method of drilling and casing waterwells. At Atlas Copco, we believe the new T3W and TH60 are the best value package we have ever offered. They combine the best of the older generation rigs with the advantages of new technology. In every way, they are still “designed by drillers, for drillers,” only now, they’re faster, safer and less costly to run.

### DESIGN

The original design featured a single truck engine to power the truck and the drill. This design still applies to today’s TH60. This power train uses a high horsepower truck engine capable of moving the rig at highway speeds and with the torque for off-road mobility. The single-engine design is lighter weight, quieter and allows for a neat deck layout. Operators like the simplicity of operating, servicing and maintaining a single engine. The T3W uses a deck engine to power the drill in addition to the truck engine. Because the hydraulic system and compressor are coupled directly to the deck engine, power efficiency is higher and there are fewer drive train components.

### TOP-HEAD DRIVE

The top head drive is small and compact. Using four motors allows the head to maintain a slim profile while providing excellent speed and torque output. Four motors balance the input load on the main drive gear and reduce tooth loading. The top drive and swivel are separated by an intermediate sub. This spreads the contact between the rollers and the derrick channel, providing better alignment. Pulldown and pullback cables are attached to a heavy-duty swivel yoke. This reduces the load on the top head gear box. A torque limit control allows the driller to pre-set rotary head torque to safely thread up drill pipe or casing.

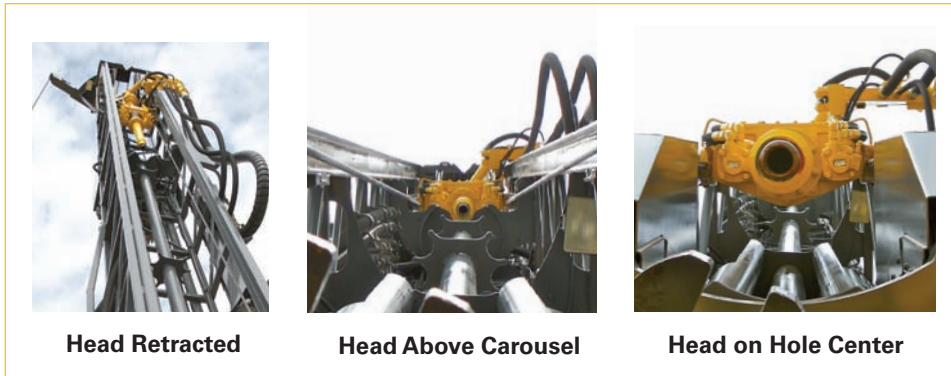


Drilling Position



Retracted Position

The top head drive is retractable. It moves from the drilling track back into the derrick, off the centerline of the hole. When it's retracted, the head is in position to add and remove drill pipe from the internal carousel. This also allows access to the centerline of the hole with the drawworks or sand reel.



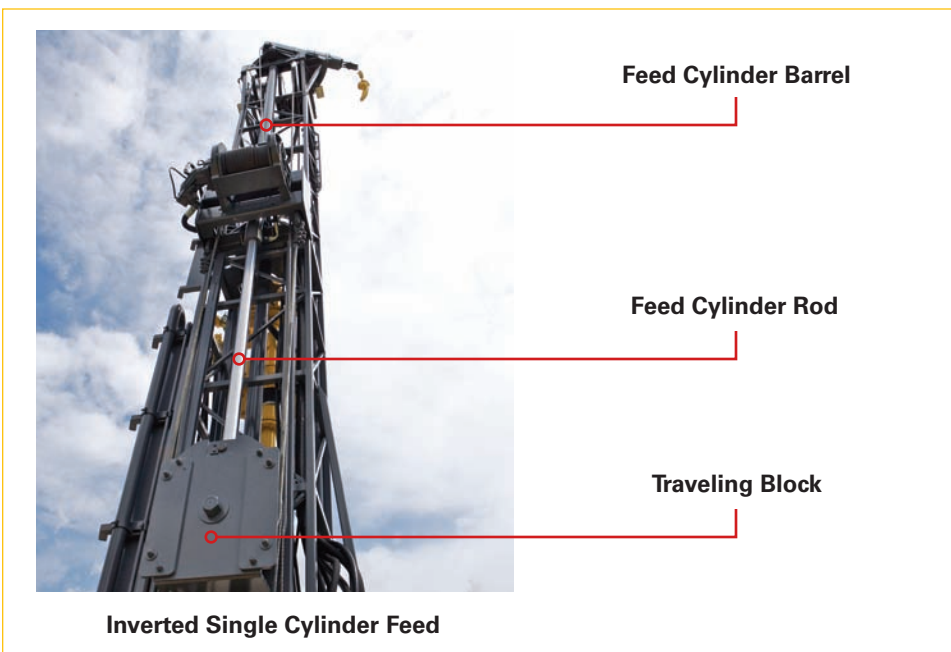
**Head Retracted**

**Head Above Carousel**

**Head on Hole Center**

## FEED SYSTEM

The feed system is a cylinder-operated cable design. One (40,000 lb. / 18 000 kg. pullback) or two (70,000 lb / 32 000 kg. pullback) feed cylinders are mounted on the upper portion of the back of the derrick. The cylinders are inverted to maximize pullback capacity. Feed cables run over large diameter sheaves that assure maximum cable life and low rolling resistance. Using cables instead of chains allows the rotary head to retract and helps absorb drilling shock loads to protect the rotary head. Unlike a chain, cables show visible signs of wear and can be replaced before they break.



**Inverted Single Cylinder Feed**

The feed system is fast and provides good control. Drill feed is fully adjustable and has both pulldown and holdback control to achieve precise bit weight control. Fast feed and the drawworks can be operated at the same time. This reduces pipe handling time and reduces cost.

**The Cyclone Operating system focuses on speed with safety and reducing manual labor.**

## CAROUSEL

The carousel is located inside the derrick. It is used by retracting the rotary head. Because it is fixed inside the derrick, it's out of the way and does not swing through the work area, which would reduce visibility and cause an obstruction. Drill pipe weight is in the center of the derrick during drilling and transport. This reduces strain on the derrick and results in a more balanced load.

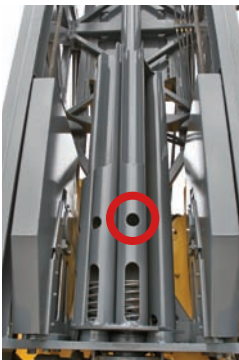


**Internal Fixed Carousel  
Head Retracted - Drawworks on Center**



**Carousel Boots with Springs**

The carousel design features individual boots that store six to nine drill pipe. The boots hold the drill pipe securely and position it under the spindle. The boots are mounted at a slight angle to assure that pipe is secure in the boot and that it aligns with the spindle for a quick positive pipe change. There is a swing-in wrench above the carousel to hold the pipe flats for breakout. When the shoulder of the pipe is in the center of the round hole in each boot, the flats at the top are lined up with the wrench. This means the driller does not have to look up to the top of the carousel to line up the wrench with the flats. The carousel is rotated by a hydraulic motor to position pipe for loading or unloading.



**Top Wrench  
Alignment Hole**



**Top Wrench Extended**



**Head Ready  
to Load Pipe**

## DRILL PIPE

The Cyclone Operating System uses simple flush drill pipe with one set of flats on the box end. Pipe is run in the pin-down position. Breakout tools are fast and easy to use. To change drill pipe, an air-operated holding wrench slides out and engages the pipe flats. This prevents the pipe from dropping and turning. A self-adjusting hydraulic breakout wrench swings in to break the joint. The pipe is spun out with the top head drive. Adding or removing a drill pipe takes about one minute.



**Holding Wrench Extended**



**Breakout Wrench in Position**

## FLEXIBILITY

The Cyclone Operating System is the most flexible system on the market. Pipe changes can be made at the bottom of the hole, like most top head rigs. For mud drilling or air drilling in unstable formations, the rig can change pipe 20 ft. / 6.1 m off the bottom of the hole (like a rotary table rig). After a length of pipe has been drilled to the bottom, the driller pulls back 20 ft. / 6.1 m, breaks out and racks the pipe back into the derrick with the top head. A new pipe is lifted with the drawworks, added to the string and lowered back to bottom. The top head with a joint of pipe comes back out of the derrick and is coupled with the string and drilling begins again.

Additional flexibility is provided by the hydraulic drawworks. When the rotary head retracts into the derrick, the drawworks line is on the centerline of the hole. With either 18,000 lb. / 8 000 kg. or 30,000 lb. / 14 000 kg. single-line pull and a swing/extend jib boom, tripping drill pipe out of the hole or setting casing is fast and convenient. The rig can perform either operation with the rotary head if tight hole conditions require feed, circulation and/or rotation. In clean holes, the rig can pull pipe or set casing with the drawworks. An optional spinner reduces manual labor by spinning the joints when tripping with the drawworks. For heavier drill or casing strings, the drawworks can be set up with a two-part line which doubles the single-line pulling capacity.



**Drawworks**



**Head Retracted - Hoist Line on Center**

**The Cyclone Operating System is the most flexible system on the market.**

## IMPROVED SPEED

A single pipe loader, which allows the driller to position and load drill pipe after the carousel is empty, enhances speed and flexibility. The loader also has a top breakout wrench which can be used to trip pipe out of the hole.



**Single Pipe Loader - Swinging In**



**Single Pipe Loader - In loading Position**

An on-board pipe rack increases the amount of drill pipe the operator can carry to the drill site. The jib boom can be positioned to load or unload the pipe rack. A slide trough speeds up the process by guiding the pin end of the pipe into the pipe rack.



**Pipe Rack and Slide Chute**



**Pipe Rack Angled for Easy Slide**



## PIPE HANDLING SAFETY

A big part of a fast, safe pipe and casing handling system depends on the table. The table is part of the main frame of the drill. Pipe loads are not carried by the derrick, as is the case with other rigs. They are carried by the table, drill frame and main rear cross member. The T3W and TH60 tables are set up to handle a wide range of pipe and casing sizes. With the bushings removed, there is a clear 20 in. / 508 mm opening. This clearance extends all the way up the derrick to the top head so the rig can actually handle large-diameter casing. The main table bushing reduces the 20 in. / 508 mm opening to 10-<sup>3</sup>/<sub>4</sub> in. / 274 mm. All of the pipe bushings, bit breakers and drill accessories fit this opening. For large-diameter work, the front half of the table swings open or can be removed. Additional clearance is achieved by retracting the rear half of the table with a hydraulic cylinder. This allows straight-in access to the hole center with large tools or casing.



**Centralizer Closed**



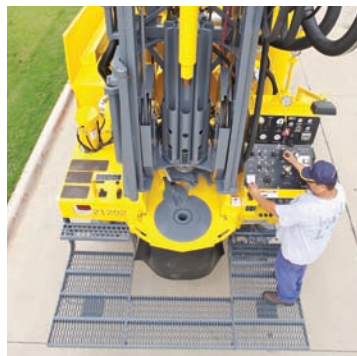
**Centralizer Open and Retracted**

## CONVENIENCE

In addition to speed and safety, operator convenience and reduction of manual labor are key advantages of the Cyclone Operating System. The control console is placed so the operator has arms-length access to the table area. Full-width platforms allow the driller and helper to move freely about the work area. Dual drawworks and auxiliary hoist control options allow the driller or helper to operate the hoists. This flexibility assures speed with safety and comfort.



**Work Area with Platforms**



**Safe and Convenient Position**

**In addition to speed and safety, operator convenience and reduction of manual labor are key advantages of the Cyclone Operating System.**

## SYSTEM ENHANCEMENTS

In addition to the Cyclone Operating System, today's T3W and TH60 use modern technology to improve efficiency and reduce operating cost. Take advantage of these and other enhancements to help your drilling operation be more productive.

### "ON-DEMAND" POWER

Fixed displacement hydraulic pumps are a thing of the past. They pump oil whenever the rig is powered up. Even when no functions are in use, these pumps use fuel and generate heat. These fuel hogs have been replaced with more efficient variable displacement pumps that provide power only when the operator asks for it. We call this "on-demand" power.



**Variable Displacement Pumps**



**"On-Demand" Response**

### HIGH AMBIENT COOLING SYSTEM

The "on-demand" concept also extends to the high ambient cooling system. The cooling fan operates only when cooling is required. The system constantly monitors temperatures and operates the fan (at the required fan speed) to maintain optimum temperature. This "on demand" cooling saves fuel and cost while protecting expensive rig components.



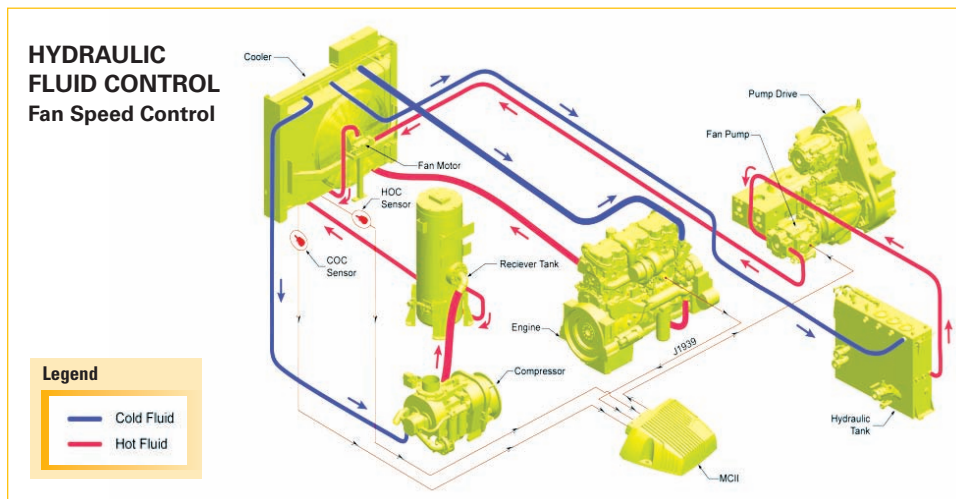
**Side-By-Side Cooler**



**Hydraulic Powered Fan**

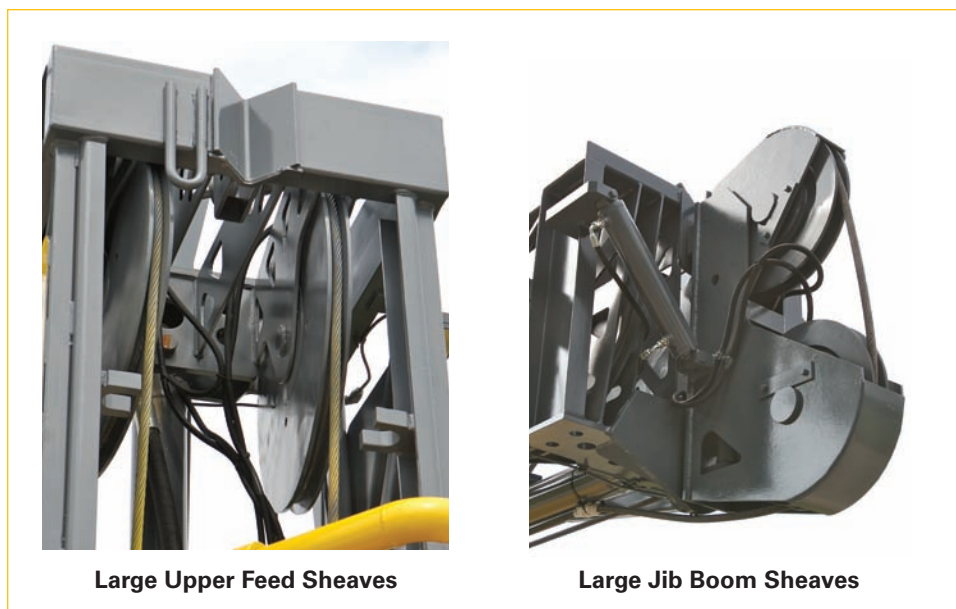
## “ON-DEMAND” AIR REGULATION

“On-demand” technology has been extended to the compressor regulation system. Mechanical regulation devices have been replaced with EARS (Electronic Air Regulation System). This system monitors air requirements and adjusts compressor air inlet to match demand. Because the rigs have the ability for the operator to adjust air volume and pressure at the console, EARS maintains optimum efficiency and saves even more fuel and cost.



## FEED SYSTEM

The feed system not only improves hydraulic efficiency, but has made major gains in mechanical efficiency. Large-diameter nylon composite sheaves with large roller bearings reduce rolling resistance. This means that more of the power (fuel) put into the feed system goes directly into work and performance. The larger sheaves also translate directly into longer cable life. On the RD20 and T3WDH, these large sheave designs have proven extended cable life and the associated time/cost savings. The new jib boom design also features larger sheaves to improve component life and efficiency – only available with 30,000 lb. / 13 608 kg winch option.



**EARS (Electronic Air Regulation System) maintains optimum efficiency and saves even more fuel and cost.**

## OPTIMUM-LENGTH DERRICK

The optimum-length derrick accommodates a casing hammer, dual wall pipe or drive casing with a DHD. This derrick handles all of these drilling methods and is shorter than the old extended derricks. This means better mobility in tight locations.

## CYCLONE OPERATING SYSTEM FEATURES

- Small, compact top-head drive
- Cylinder-operated, cable feed system
- Drill pipe carousel located inside the derrick
- Simple flush drill pipe
- Most flexible system on the market
- Hydraulic drawworks that adds flexibility
- Improved feed and hoisting speeds
- Pipe handling safety
- Operator convenience/reduction of manual labor

## CYCLONE OPERATING SYSTEM ENHANCEMENTS

- Variable displacement pumps
- "On-demand" cooling system
- "On-demand" air regulation
- Efficient feed system
- Optimum-length derrick