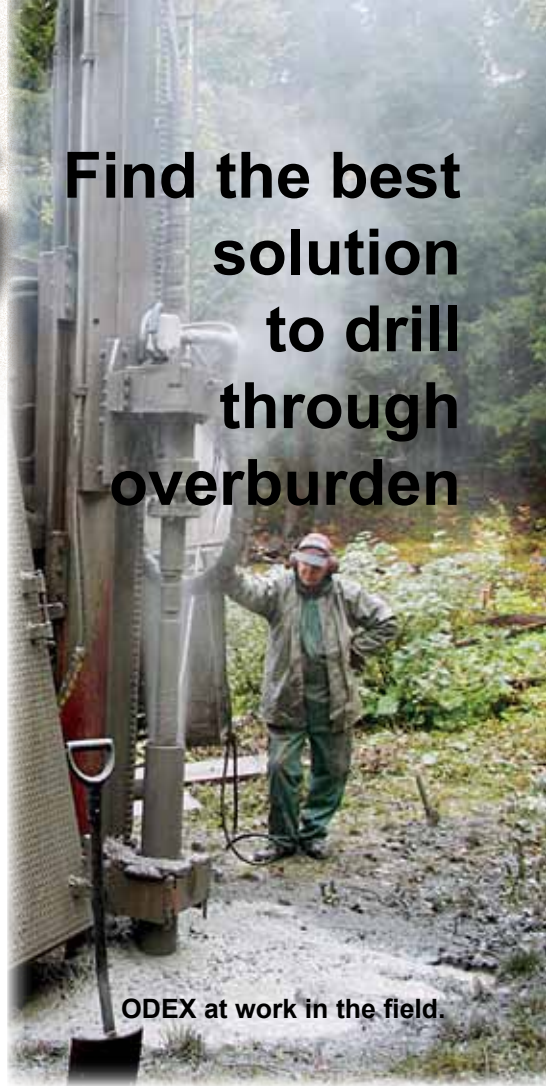


GETTING DOWN

Find the best solution to drill through overburden



ODEX at work in the field.

THE PROBLEMS: As much as 90 percent of the land surface of the earth is covered with loose, unconsolidated material – soil, clay, silt, sand, gravel and boulders. Drilling through this overburden is problematic since the earth often caves in behind the drill bit, making it difficult to retrieve the drill string. In practice, the bore hole is often lost before a casing tube can be inserted to support it.

Cavities in porous ground interfere with the circulation of the flushing medium and prevent drill cuttings from being flushed out of the hole. In places where overburden and cavities are mixed, or when the ground's "drillability" is unknown ... how does a driller decide which tools to use?

THE SOLUTION: Atlas Copco's ODEX and Symmetrix overburden drilling and casing systems.

ODEX is a reliable system that works well with softer formations and boulders when water well drilling. It has a smaller size range, using up to 10½-inch (273 mm) OD casing in depths up to 328 feet (100 m).

Symmetrix provides fast penetration in the toughest conditions up to 984 feet (300 m) deep. Its casing starts at 3 inches (76 mm) and can handle casings up to 48 inches (1.2 m).

Symmetrix is made for the harder formations – even in hard glacial rock and New York schist. It can also drill horizontally.

When allowed by state or national laws, it is possible to reuse casing with Symmetrix. This can be useful in jobs with loop work, such as geothermal. Sometimes ground conditions don't let casing be pulled, however.

THE DETAILS OF ODEX

ODEX enables you to drill and case holes simultaneously. Casing diameters from 3½ inches (89 mm) with ODEX 76 to 10½ inches (273 mm)

with ODEX 240 can be used to a maximum depth of 328 feet (100 m).

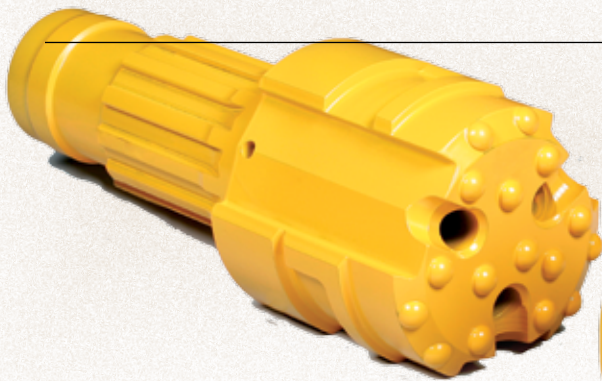
A pilot bit and eccentric reamer drill a hole slightly larger than the external diameter of the casing tube. This enables the casing tube to follow the drill bit down the hole.

Part of the impact energy is diverted to the casing tube via a shoulder on the guide device, which in turn impacts a special casing shoe at the lower end of the casing.

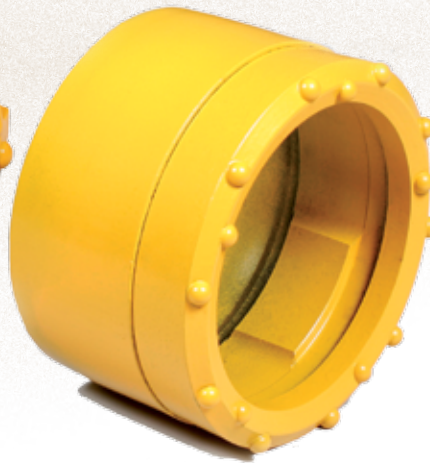
In both DTH and top hammer drilling the casing is driven down without rotation. When the casing enters the bedrock, drilling is stopped briefly, and reverse rotation is applied, which causes the reamer to turn in, thus reducing the overall diameter of the drill bit assembly.



ODEX



Symmetrix



Symmetrix heavy-duty system is shown below with a solitary ring bit, which can be connected to a casing shoe by the optional welding ring.

Heavy-duty Symmetrix Systems:

Intended for breakthrough drilling where the ring bit is recovered for re-use. System can also be used for drilling deep vertical holes if there is no requirement on a large ring bit inner diameter.



Then the entire drill string can be pulled up through the inside of the casing tubes, leaving the casing tubes embedded in the bedrock. Drilling can then be continued into the bedrock using a conventional drill string.

Steel tubes in standard dimensions are used for the casing. They are welded together and left in the ground after the hole is completed (ODEX W). For applications where the casing will be reused, it pays to use threaded casing tubes (ODEX T).

To improve flushing, ODEX has backward pointing flushing holes.

In difficult conditions a foaming additive can be added to the compressed air to further improve flushing performance.

ODEX can be used with any pneumatic or hydraulic top hammer that has independent, reversible rotation, with sufficient torque to match the hole diameter and depth requirements.

FOR TOP HAMMER DRILL RIGS:

- ODEX 76, ODEX 90, ODEX 115

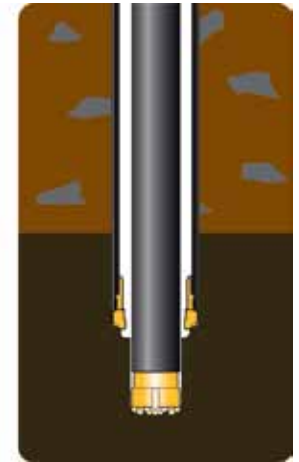
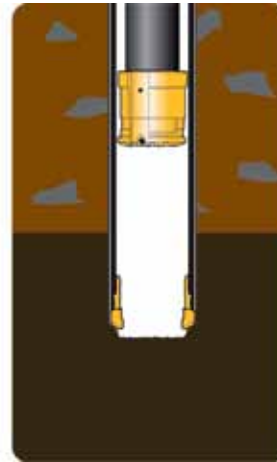
ODEX FOR DTH DRILL RIGS:

Hammer (inches)	Depth
•ODEX 90 — 3"	196 ft (60 m)
•ODEX 115 — 3" and 4"	328 ft (100 m)
•ODEX 140 — 4" and 5"	328 ft (100 m)
•ODEX 165 — 5" and 6"	328 ft (100 m)
•ODEX 190 — 6" and 8"	328 ft (100 m)
•ODEX 240 — 8"	328 ft (100 m)

Guide devices are available to fit all common hammer types.

THE DETAILS OF SYMMETRIX

Symmetrix represents the latest in drilling technology, a symmetrical drill bit system that simultaneously advances casing while drilling the hole.



SYMMETRIX SYSTEM WITH LARGE PASS-THROUGH INNER DIAMETER

1. Casing is installed until bedrock.
2. Drill string is pulled out from the hole.
3. Drilling of the well continues with a DTH bit, which passes through the ring bit.

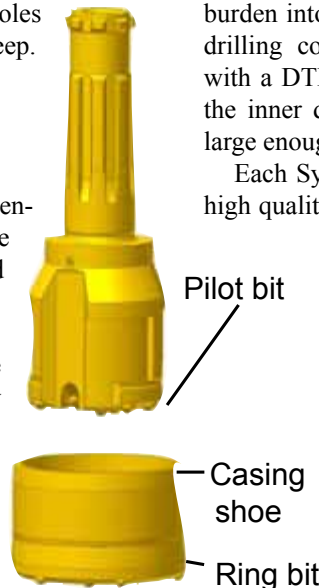
Symmetrix is made for 3-inch (76 mm) casing up to 48-inch (1.2 m) casing for vertical AND horizontal holes 656 to 984 feet (200 to 300 m) deep.

THREE COMPONENTS OF SYMMETRIX PATENTED SYSTEM:

•A **pilot bit** drills away the center part of the hole and guides the drill string. The pilot is attached to any common DTH hammer shank or top hammer rod thread.

•A **casing shoe** welded to the casing pipe is pulled down by the impact of the hammer and pilot bit.

•A **symmetrical ring bit** is locked into the pilot bit drills the void for the casing to advance down the hole.



In well drilling with Symmetrix, the casing is drilled through overburden into the bedrock and then the drilling continues into the bedrock with a DTH bit. This works because the inner diameter of the ring bit is large enough.

Each Symmetrix bit is made from high quality alloy steel, and has been precision machined to produce a perfect bit body, heat treated to the required harness, and fitted with durable tungsten carbide buttons. Ballistic buttons are available upon request and are ideal for cutting clay.