Reaming shells

Diamond drillers' guide

Epiroc



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Introduction

A lot has been written about the importance of choosing the right core bit for a drilling project. In addition to the core bit, other drilling tools must also be chosen with care. Many drillers use one size of reaming shell almost exclusively, although there are different sizes, types and features that should be considered.

This guide will explain the role of the reaming shell, its features, sizes and features, things to be considered when choosing, as well as tips and advice.

Overview

The reaming shell is part of the drilling system that also includes the core bit, the core barrel assembly, the drill rods (or drill string) and the drill rig.

The reaming shell has the following main functions:

- It acts as a coupling between the core bit and the outer barrel.
- It reams the hole to the proper size and stabilizes the bottom of the drill string.
- It holds the inner tube stabilizer in the counter bore of the box thread.

Reaming shell features

Length

Reaming shells come in different lengths which are also referred to as heights. They are available in industry standard lengths of 6 inches (15 cm), 10 inches (25 cm) and 18 inches (46 cm). Longer reaming shells are better for maintaining a straight hole, which is very important to manage. When using a longer reamer, it is important to note that an inner tube extension is required. Whatever you do to the outer tube must be done to the inner tube.

6-inch reaming shells

The 6-inch reaming shell is the standard that is used for every kind of rock hardness or ground condition. It is the minimum reamer requirement to provide minimum stabilization.

The 6-inch reaming shell has one diamond ring, which is standard and is effective in the majority of competent holes.



10-inch reaming shells

The 10-inch reaming shell has two diamond rings so it offers a greater number of contact points than standard reaming shells. This allows it to provide better stabilization and increased lifespan.

The 10-inch reaming shell is also mainly used with 3-meter and 6-meter core barrels.

18-inch reaming shells

Drillers switch to an extended reaming shell, such as the 18-inch, when they have to keep their hole on target and avoid any hole deviation. The more diamond rings that are on the reaming shell, the greater the number of contact points. More rings will give you greater control on hole deviation and hole diameter. The 18-inch reaming shell features 3 diamond rings.

In most cases, the ones in the front will maintain the precise diameter of the bore hole as they have a higher concentration of diamonds. The next rings have a higher concentration of carbide wear pads that help stabilize the rod string.

Diamond rings

As mentioned above, reaming shells of different lengths will come with different numbers of rings. Reaming shells with more than one ring will provide better bore hole stability.

Diamond rings at the front have more wear pads as this is what prevents premature wear and increases tool life. The second diamond ring is identical to the first but does not have extra wear pads. The third ring is made with wear pads (carbide inserts). In the case of White Rhino reaming shells, tungsten carbide inserts are found on the leading edges of the ring.



1st diamond ring with extra wear pads (carbide inserts).



2nd diamond ring without extra wear pads (carbide inserts).



3rd diamond ring is made with wear pads only (carbide inserts). There are no diamonds on it.

Diamonds

Most reaming shells have a combination of natural and synthetic diamonds embedded in sections. Natural diamonds are usually individually set in an array or row while the much smaller synthetic crystals are distributed across the surface to provide full coverage.

Premium reaming shells will have both natural and synthetic diamonds.

A premium reaming shell such as the RS++ is reinforced with both natural and synthetic diamonds and also features an embedded wear indicator and Suprasherical diamond technology for optimal reaming of the bore hole.

Size

Reaming shells are offered in all standard industry sizes.

In addition, oversize reaming shells are available to go with oversized core bits to use when drilling in special ground formations.

Oversize reaming shells are popular in the western USA because of fractured ground that is found there. In very broken ground, drillers can drill a larger hole with a larger core bit and reaming shell so that there will be more space between the drill rod and the interior walls of the hole, making it easier to flush the cuttings out of the hole.

Types of reaming shells

A regular reaming shell goes right behind the core bit and its purpose is to provide a mechanical link between the bit and outer tube. It maintains a consistent hole diameter and it provides a place for the brass inner tube stabilizer.

A backend reaming shell is like a locking coupling with diamond rings on it. Its purpose is to stabilize the backend of your core barrel. It is not uncommon to run a backend reaming shell when you need to keep a bore hole straight, but it is best to use it with a full hole outer tube and equipment.



Things to consider

Many drillers use the 6-inch reaming shell pretty exclusively, although there are situations and conditions where other reaming shells may be a better choice.

Bore hole deviation

Once bore hole deviation becomes an issue, drillers should consider a longer reaming shell. Longer reaming shells provide additional core barrel stabilization that will help control and reduce deviation. Often a 10-inch reamer is a good compromise between the 6-inch and the 18-inch.

Ground conditions: swelling clay

When drilling is done in difficult ground conditions, such as swelling clay, a shorter reamer is a good choice as it can get through this type of ground with less chance of squeezing the barrel.

Ground conditions: fractured ground

In very broken ground, drillers should drill a larger hole with a larger reaming shell so that there will be more space between the drill rod and the interior walls of the hole.

Deeper Holes

The RS++ is an excellent choice when digging deep holes. With its SupraSherical technology, the RS++ offers longer life. The embedded Wear Indicator Bar also indicates when it needs to be changed.



Tips for use

- A reaming shell's lifespan is generally longer than a core bit's lifespan, but reaming shell wear should be monitored at every rod pull.
- To help monitor wear, drillers should have a "go/no go" gauge, and ideally you should have one for every size. Every time the reaming shell comes out of the bore hole you should run it through the go/no-go gauge to determine if it can still be used.
- Use of a product such as Torqueless should help increase the lifespan of your reaming shell. The use of polymers can also prevent premature wear of the reaming shell by encapsulating the cuttings and flushing them from the bottom of the hole.
- You can use an 18-inch reaming shell on the front end and a diamond type locking coupling on the back to make sure you have good stabilization of the core barrel. You can also use two 18-inch reamers when you have a longer core barrel (6 meters or more). It can act as a core barrel extension allowing you to get more core into the tube at one time.
- What you do to the outside of the core barrel you need to do the inside as well. If you choose to use an extended reaming shell, then you need to incorporate an inner tube extension. Refer to the chart here for examples and to learn how to calculate the right size.
- When deciding what length of reaming shell to choose, you should do a calculation of the cost per foot or meter of the reaming shell. For example, an 18-inch reaming shell can represent a drilling cost ranging anywhere from 0.40$/meter to 1.50$/meter. These calculations can guide you in choosing the right length.



Matex Torqueless: Rotary and diamond drilling product for in hole torque reducing.

Chart

How to pick the right inner tube extension

Epiroc no.	Item	Extension length
9469706202	BWL I/T EXT for the 10" reaming shell	3 9/16" shoulder to shoulder
9469706204	BWL I/T EXT for the 18" reaming shell	11 13/16'' shoulder to shoulder
9469706245	BTW I/T EXT for the 18" reaming shell	11 5/8'' shoulder to shoulder
9469706190	NWL I/T EXT for the 10" reaming shell	3 1/4'' shoulder to shoulder
9469706205	NWL I/T EXT for the 18" reaming shell	11 5/8'' shoulder to shoulder
9469706221	NWL2 I/T EXT for the 10" reaming shell	3 1/4" shoulder to shoulder
9469706192	HWL I/T EXT for the 10" reaming shell	2 13/16'' shoulder to shoulder
9469706164	HWL I/T EXT for the 18" reaming shell	11 13/16'' shoulder to shoulder
9469706262	HWL I/T EXT for the 36" reaming shell	28" shoulder to shoulder

Calculating the size of your inner tube extension

To determine the proper length of an inner tube extension for 10-inch or 18-inch reaming shell, follow these steps:

- Measure the length of a standard 6 inch reaming shell from the shoulder to the shoulder, for example: it could be 5 ⅛ inches.
- Measure the length of the longer reaming shell from shoulder to shoulder, for example in the case of an 18-inch reaming shell it could be 16 ¾ inches.
- Subtract the shoulder to shoulder length of a standard 6-inch reaming shell from the shoulder to shoulder length of the longer shell to get the length of the inner tube extension that you need.

Example for an 18-inch reaming shell:

Length of 18-inch reaming shell	16 ¾
Length of 6-inch reaming shell	5 ⅛
Length of inner tube extension	11 ⅝ inches

Conclusion

Whether it be mastering deep hole drilling, improving penetration rates or learning how to mix drilling fluid additives, Epiroc's goal is to make drillers' lives easier and improve drilling performance.

We have a selection of useful how-to guides that are available here

Should you ever need more precise technical assistance, you can always contact our knowledgeable technical team.

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