



ODEX

Drill and case deep holes simultaneously
in all types of formation



Overburden Drilling

As much as 90% of the land surface of the earth is covered with loose, unconsolidated material such as soil, clay, silt, sand, gravel, and boulders, which varies in depth from a few centimeters to hundreds of meters.

Drilling through this so-called overburden is often problematic, due to the tendency of the earth to cave in behind the drill bit. This makes it difficult to retrieve the drill string after the hole has been drilled. In practice, the bore hole is often lost before a casing tube can be inserted to support it.

Other problems are caused by cavities or porous ground, which interfere with the circulation of the flushing medium and prevent the drill cuttings from being flushed out of the hole.

In places where overburden strata are mixed, or when the 'drillability' is unknown, it is difficult for the driller to decide what tools to use to get the best overall results without risking the loss of equipment in the hole.

ODEX G2 equipment is designed to overcome such problems.



The ODEX Method

ODEX equipment enables you to drill and case deep holes simultaneously in all types of formation, even those with large boulders. Casing diameters from 114mm (ODEX 90) to 273 mm (ODEX 240) can be used – 90 and 240 in the ODEX code stands for pilot outer diameter.

The method is based on a pilot bit and eccentric reamer, which together drills 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.

When using ODEX, 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 into the hole without the pipe rotating. When the casing enters far enough into the bedrock, drilling is stopped briefly by lifting off bottom, with reverse rotation applied carefully, which causes the reamer to turn in, thus reducing the overall diameter of the drill bit assembly.

When this has been accomplished, the entire drill string can be pulled up through the inside of the casing tubes, leaving the latter embedded in the bedrock. Drilling can then be continued into the bedrock using a conventional drill string.

To improve flushing, the ODEX guide device has backward pointing flushing holes. In difficult conditions, a foaming additive can be added to the compressed air to further improve flushing performance.

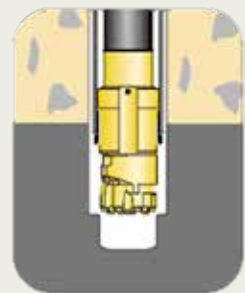
Commercially available steel tubes in standard dimensions are used for the casing. They are welded together and left in the ground after the hole has been completed (ODEX W).

For applications where the casing is to be reused, it generally pays to use threaded casing tubes (ODEX-T).

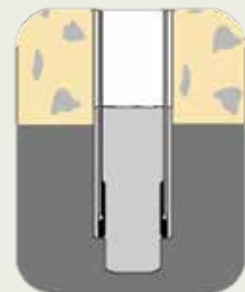
Optimum utilization of any product is naturally dependent on correct handling. Service and training are therefore an important part of our product program. TerraRoc can offer complete training packages for operators and maintenance personnel.



1. When drilling starts, the ODEX reamer swings out and reams the pilot-hole wide enough for the casing tube to slide down behind the drill bit assembly.



2. When the required depth is reached, rotation is reversed carefully, whereupon the reamer swings in, allowing the drill bit assembly to be pulled up through the casing.



3. Casing tubes that are to be left in the drill hole should be sealed at the bottom of the hole by means of cement grout or some other sealing agent.



4. Drilling continues to the desired depth in the bedrock using a conventional drillstring.

ODEX G2 FOR DTH

Rock Drill Recommendations

All ODEX systems require drill rigs with independent, reversible rotation, with sufficient torque to match the hole diameter and depth requirements.

The following ODEX dimensions are available for down-the-hole drilling:

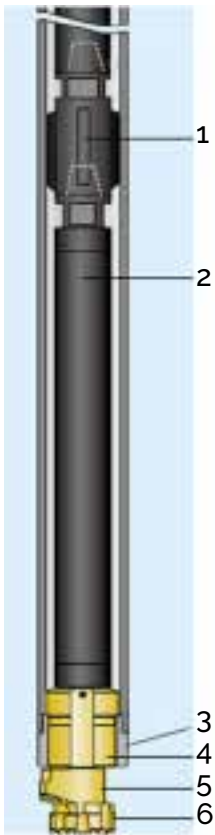
- ODEX 90 for 3" hammers
- ODEX 115 for 3" and 4" hammers
- ODEX 140 for 4" and 5" hammers
- ODEX 165 for 5" and 6" hammers
- ODEX 190 for 6" and 8" hammers
- ODEX 240 for 8" hammers.

Guide devices are available to fit most common hammer shanks.

ODEX 90 and 115 for top hammers are characterized by using a guide device with impact shoulder that drives the casing via the casing shoe.

ODEX for DTH					Recommended casing dimensions	
	Shank	Drill pipes diameter	Pilot diameter	Reaming diameter	Weldable casing	Threaded casing
ODEX 90	DHD3,5	76 mm	90 mm	123 mm	Recommended diam- 114,3 mm (max-115 mm) Inner diam- min 102 mm Max wall thickness-6,5 mm	Outside diam = 114,3 mm Wall thickness= 6,3 mm Right-hand thread
ODEX 115	QLX 40 TD40 Cop44G DHD 340	76 mm 89 mm	115 mm	152 mm	Recommended diam- 139,7 mm (max-142 mm) Inner diam- min 128 mm Max wall thickness-7 mm	Outside diam = 139,7 mm Wall thickness= 5,8 mm Right-hand thread
ODEX 140	QL50 DHD 350 DHD340 QLX40	89 mm	140 mm	181 mm	Recommended diam- 168,3 mm (max-171 mm) Inner diam- min 157 mm Max wall thickness-7 mm	Outside diam = 168,3 mm Wall thickness= 6,3 mm Right-hand thread
ODEX165	QL60 DHD 360 DHD 350 QL 50	114 mm	165 mm	209 mm	Recommended diam- 193,7 mm (max-196 mm) Inner diam- min 183 mm Max wall thickness-6,5 mm	Outside diam = 193,7 mm Wall thickness= 6,3 mm Right-hand thread
ODEX 190	QL60 DHD 360	114 mm	190 mm	237 mm	Recommended diam- 219,0 mm (max-222 mm) Inner diam- min 205 mm Max wall thickness-8,5 mm	Threaded casings not available for this size
ODEX 240	QL 80 DHD 380	114 mm	240 mm	306,5 mm	Recommended diam- 273,0 mm (max-280 mm) Inner diam- min 260 mm Max wall thickness-10 mm	Threaded casings not available for this size

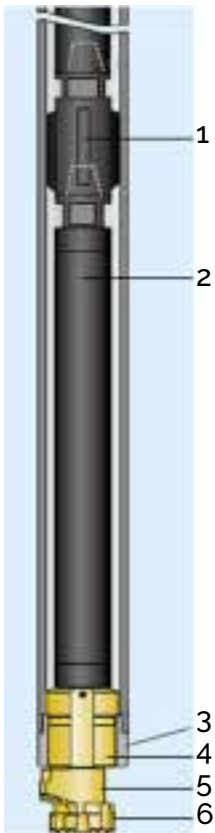
DTH ODEX FOR CASING ADVANCEMENT



ODEX 90-G2			Std.Shank	
			DHD 3.5	COP 34
	Description	Specifications	Prod. No.	Prod. No.
1	Guide sleeve	2 3/8 API Reg. S/S 225 mm Wrench flats 65 mm	8484014040	Not Available
2	DTH-hammer	Terranox 3 Thread 2 3/8 API Reg. Pin	8393082635	
3	Casing shoe	Standard	8393819141	
		Surface hardened	8393819142	
4	Guide device		8393860206	8393860207
	Spare part	Foot valve	0795927900	
		Locking kit	0795201101	
5	Reamer	** Reaming diameter 123 mm	8393860202	
6	Pilot bit	**Diameter 90 mm	8393860201	

Threaded casing Left hand for DTH	Threaded casing, hand for DTH Length mm	Prod. No.	Wall Thickness	Steel Grade
Casing female/male	1000	8393819101	6.35	Drillmax 550
Casing female/male	1500	8393819111		
Casing female/male	2000	8393819121		
Casing female/male	3000	8393819131		
Starter casing incl. casing shoe	1000	8393819153		
Starter casing incl. casing shoe	2975	8393819154		

DTH ODEX FOR CASING ADVANCEMENT



ODEX 115-G2			Std.Shank	
			DHD 340	TD40
	Description	Specifications	Prod. No.	Prod. No.
1	Guide sleeve	2 3/8 API Reg. S/S 225 mm Wrench flats 65 mm	8484014143	
2	DTH-hammer	Terranox 3 Thread 2 3/8 API Reg. Pin	8393082635	
3	Casing shoe	Standard casing shoe	8393817803	
		Surface hardened casing shoe	8393817804	
4	Guide device		8393860303	8092403507
	Spare part	Foot valve	8092401203	8092402514
		Locking kit	0795201102	
5	Reamer	** Reaming diameter 123 mm	8393860302	
6	Pilot bit	**Diameter 90 mm	8393860301	

Threaded casing Left hand for DTH	Length mm	Prod. No.	Wall Thickness	Steel Grade
Casing female/male	500	8393817858	5.85	N80
Casing female/male	750	8393817857		
Casing female/male	1000	8393817856		
Casing female/male	1500	8393817807		
Casing female/male	2000	8393817849		
Casing female/male	3000	8393817815		
Starter casing incl.casing shoe	1200	89980271		

DTH ODEX FOR CASING ADVANCEMENT

ODEX 140-G2			Standard shank size			Optional shank size	
			DHD 350	QL50	QL50	DHD340	TD40
	Description	Specifications	Prod. No.	Prod. No.	Prod. No.	Prod. No.	Prod. No.
1	Guide sleeve	2 3/8 API Reg. Ø 156mm eff. 225 mm Wrench flats 65 mm	Not applicable			8484014144	
		3 1/2 API Reg box - 2 3/8 API Reg Pin. Eff. 295 mm Wrench flats 95 mm	On request (varies with wall thickness)			Not applicable	
		3 1/2 API Reg box - 3 1/2 API Reg Pin. S/S 250 mm Wrench flats 95 mm	On request (varies with wall thickness)			Not applicable	
2	DTH- hammer	Terranox 5, 3 1/2" API Reg Pin	8393082650				
		T-Rox 5, 3 1/2" API Reg Pin		7031800080			
		Terranox 4				8393082640	
3	Casing shoe	Standard casing shoe	393818093				
		Surface harden casing shoe	393818094				
4	Guide device	Complete	8393860403	8393860410	8393860405	8393860404	8092403095
		Foot valve	8092401204	8092401227	8092401217	8092401203	8092402514
		Locking kit	0795201103				
5	Reamer	** Reaming diameter 181 mm	83938600402				
6	Pilot bit	**Diameter 140 mm	8393860401				

Threaded casing Left hand for DTH	Length mm	Prod. No.	Wall Thickness	Steel Grade
Casing female/male	750	8393818038	6.3	N80
Casing female/male	1000	8393818029		
Casing female/male	1500	8393818037		
Casing female/male	2000	8393818045		
Casing female/male	3000	8393818052		
Starter casing incl. casing shoe	1000	8393818089		
Starter casing incl. casing shoe	1450	8393818095		
Starter casing incl. casing shoe	2980	8393818088		

DTH ODEX FOR CASING ADVANCEMENT

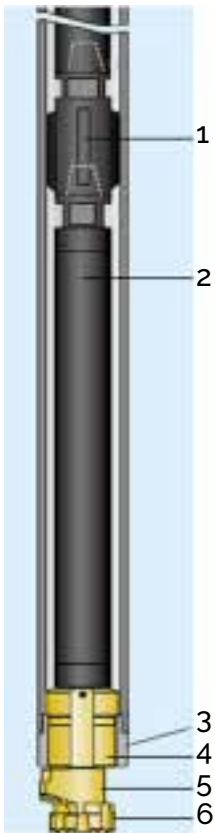
ODEX 165-G2			Std.Shank		Opt. shanks	
			DHD 360	QL 60	DHD 350	QL50
	Description	Specifications	Prod. No.	Prod. No.	Prod. No.	Prod. No.
1	Guide sleeve	3 1/2 API -3 1/2 API Reg. S/S 250 mm Wrench flats 95 mm	On request (varies with wall thickness)			
		3 1/2" API-2 3/8" API Reg S/S 300 mm Wrench Flats 65 mm	On request (varies with wall thickness)			
2	DTH-hammer	Terranox 6, 3 1/2" API Reg Pin	8393082660			
		Terranox 5, 3 1/2" API Reg Pin			8393082650	
3	Casing shoe	Surface hardened Included in Start casing (3a)	8393817954			
4	Guide device		8393860503	8393860509	8393860506	8393860510
		Foot valve	8092401205	8092401228	8092401204	8092401227
		Locking kit	0795201104			
5	Reamer	** Reaming diameter 209 mm	8393860502			
6	Pilot bit	**Diameter 165 mm	8393860501			
*	Drill pipe Ø 114.3 mm 3 1/2" API Reg	Length (mm)				
		1000	7010010042			
		1500	7010010017			
		2000	7010010032			
		3000	7010010031			

Threaded casing Left hand for DTH	Length mm	Prod. No.	Wall Thickness	Steel Grade
Casing female/male	1000	8393817955	6.3	N80
Casing female/male	1500	8393817963		
Casing female/male	2000	8393817971		
Casing female/male	3000	8393817989		
Starter casing incl. casing shoe	2980	8393817999		

DRILL AND CASE DEEP HOLES SIMULTANEOUSLY IN ALL TYPES OF FORMATION

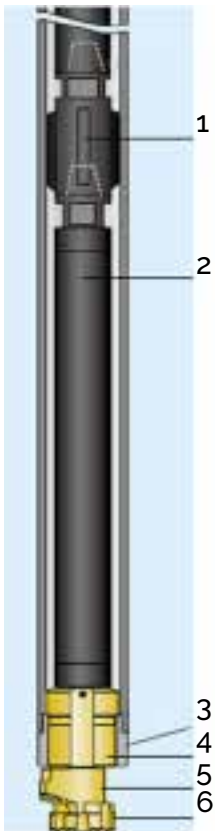


DTH ODEX FOR CASING ADVANCEMENT



ODEX 190-G2			Std.Shank	Opt. shanks
			DHD 360	QL60
	Description	Specifications	Prod. No.	Prod. No.
1	Guide sleeve	3 1/2 API Reg -3 1/2 API Reg. S/S 250 mm Wrench flats 95 mm	On request (varies with wall thickness)	
		2 3/8 API Reg -2 3/8 API Reg. S/S 225 mm Wrench flats 95 mm	On request (varies with wall thickness)	
2	DTH-hammer	T-Rox 6, 3 1/2" API Reg Pin		7031800001
		Terranox 6, 3 1/2" API Reg Pin	8393082660	
3	Casing shoe	Surface hardened	8393818202	
		Not surface hardened	8393818201	
4	Guide device - Foot valve		8393860603 8092401205	8393860609 8092401228
	Locking kit		0795201105	
5	Reamer	** Reaming diameter 237 mm	8393860602	
6	Pilot bit	**Diameter 190 mm	8393860601	
*	Drill pipe Ø 114,3 mm 3 1/2" API Reg	Length (mm)		
		1000	7010010042	
		1500	7010010017	
		2000	7010010032	
		3000	7010010031	

DTH ODEX FOR CASING ADVANCEMENT



ODEX 240W-G2			Std.Shank	
			DHD 380	QL 80
Description	Specifications	Prod. No.	Prod. No.	
1	Guide sleeve	4 1/2 API -3 1/2 API Reg. S/S 317 mm Wrench flats 120 mm	On request (varies with wall thickness)	
2	DTH-hammer	Terranox 8 Thread 4 1/2 API Reg. Pin	8393082660	
3	Casing shoe	Surface hardened	8393828222	
		Not surface hardened	8393828221	
4	Guide device -Foot valve		8393860704 8092401207	8393860706 8092401803
	Locking kit		0795201106	
5	Reamer	** Reaming diameter 306 mm	8393860702	
6	Pilot bit	**Diameter 240 mm	8393860701	
*	Drill pipe Ø 114,3 mm 3 1/2" API Reg	Length (mm)		
		1000	7010010042	
		1500	7010010017	
		2000	7010010032	
		3000	7010010031	

TH FOR CASING ADVANCEMENT

Top Hammer			Odex 76
	Description	Specifications	Prod. No.
1	Driving sleeve	R38-R38	7989151200
		T38-R38	7989151900
		T45-R38	7989151700
2	Spacer	D = 76 mm, L = 180 mm	8484014054
4	Adapter sleeve		8484014049
	Start casing	R.H thread, OD 88,9 mm wt 5,5 mm L=1220 mm	8393817906
3	Wing coupling	D = 76 mm, L = 180 mm	7994307600
	Drill rod	R38 Pin-Pin L=1220 mm	7020000003
		R38 Pin-Pin L=280 mm	7020000004
	Coupling sleeve	R38 Box-Box	7020000005
6	Guide device	R38	7989407600
		T38	8092402507
7	Reamer	** Reaming diameter 96 mm	7588509640
8	Pilot bit	**Diameter 76 mm	7588407040

Threaded casing Right hand for TH	Length mm	Prod. No.	Wall Thickness	Steel Grade
Casing female/male	1220/4 ft	8393817906	5.5	Drillmax 550
Casing female/male	1000	8393817907		
Casing female/male	1525	8393819130		
Casing female/male	2440	8393819114		
Casing female/male	3050	8393819122		

TH FOR CASING ADVANCEMENT

Top Hammer			Odex 90	Odex 115
	Description	Specifications	Prod. No.	Prod. No.
1	Drill rod	R38 Pin-Pin L=1220 mm	7020000003	
4		R38 Pin-Pin L=280 mm	7020000004	
3	Wing coupling	D = 89 mm, L = 180 mm	7994307600	
	Coupling sleeve	R38 Box-Box	7020000005	
	Casing shoe	Not hardened	8393819141	8393817803
		Hardened	8393819142	8393817804
6	Guide device	T45	8092403983	
		T51		8092403142
		R38	8393860223	
	Locking kit		0795201101	0795201102
7	Reamer	** Reaming diameter 123 mm	8393860222	
		** Reaming diameter 152 mm		8393081595
8	Pilot bit	**Diameter 90 mm	8393860221	
		**Diameter 115 mm		8393081594

Threaded casing Right hand for TH	Length mm	Odex 90	Odex 115	Wall Thick...ness	Steel Grade
Casing female/male	1220/4 ft	8393819156	8393081635	5.5	Drillmax 550
Casing female/male	1000	8393819155			
Casing female/male	1525	8393819114			
Casing female/male	2440	8393819154			

Product Code Explanation

The product code can help you to identify what product to choose as a customer. Alternatively, contact your local TerraRoc sales representative.



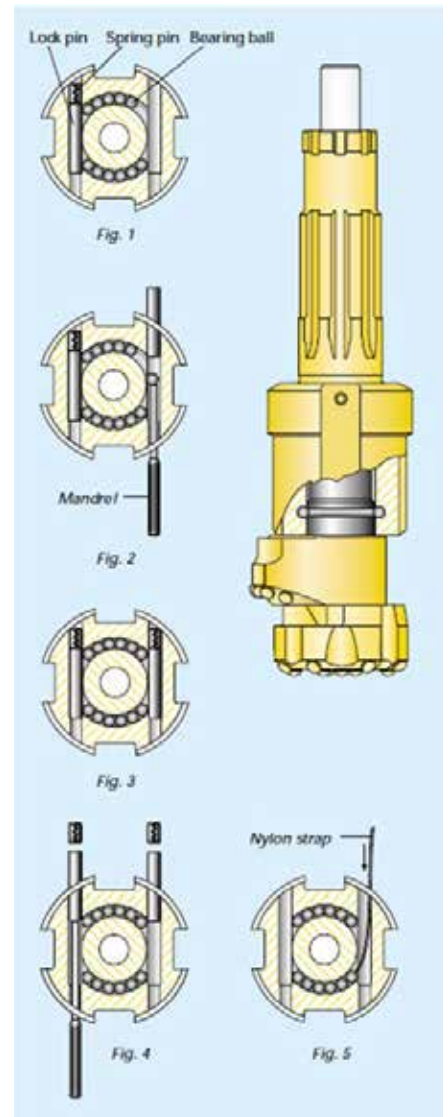
ODEX Ball Locking System

Assembly

1. Coat the pilot pin thread with TerraRoc thread grease.
2. Thread the pilot bit into the guide device by hand.
3. Insert a lock pin into one of the holes for the locking system (Fig.1). Make sure the lock pin is in bottom position of hole.
4. Hammer spring pin into position. Use suitable size of mandrel to prevent damages on guide device, when lock pin gets near the edge of the guide device.
5. Seat the spring pin against the lock pin.
6. Load bearing balls into the hole without lock pin. Use the mandrel to guide the bearing balls into the groove (Fig. 2). Fill groove with no of bearing balls as shown on next page.
7. Load the last lock pin into hole (Fig. 3).
8. Hammer spring pin into position.
9. Before start to drill, tighten up the pilot thread by using a suitable Pilot bit wrench.

Disassembly

1. Remove all spring- and lock pins, by using a hammer and suitable mandrel (Fig. 4).
2. The bearing balls will then easily be guided out of the groove, by using a nylon strap or flexible steel wire (Fig. 5).
3. Open the pilot bit thread by using a suitable pilot bit wrench.
4. Unthread the pilot bit.
5. Free the reamer from the pilot bit.



RECOMMENDATION DTH HAMMERS

Torque requirement

Drill rigs must have sufficient torque for drilling with ODEX.

This table shows minimum required torque for the different ODEX sizes.

ODEX	90	115	140	165	190	240
Minimum torque, Nm	900	2000	3000	4000	>5500	>5500

Rotation speed

Rotation speed depends on the size of ODEX and on formations drilled.

The rotation speed may have to varied as the formation changes.

This table shows recommended rotation speed for the different ODEX sizes.

ODEX	90	115	140	165	190	240
Rotation speed r/min	20-30	20-25	15-20	15-20	10-15	10-15

Drilling depths

Obtained casing driving depth with ODEX depends on factors such as formation type, available drilling equipment, and drillers experience.

Experience has shown that below table and even deeper holes can be drilled with ODEX.

ODEX	90	115	140	165	190	240
Max. hole depth in soil (m)	60	100	100	100	100	100

Air pressure

Maximum recommended air pressure is 14 bar.



TerraRoc is a market leader in geotechnical drilling consumables operating in Europe, North America and Asia. The company specializes in casing advancement systems, down-the-hole hammers and core drilling.

Three manufacturing plants in Finland, Scotland and the United States, supported by a global supply chain, provide a range of products, services and customized solutions for engineers to overcome the most challenging rock formations faced in drilling and excavation works.

Customized Geotechnical Solutions.

Full range of drilling tools and consumables for casing advancement systems, down-the-hole hammers and core drilling, all customized to your needs.

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Finland

Pihtisulunkatu 1 A
33330 Tampere
Finland

UK

McCafferty Way
McCafferty Way Ind Est
Grangemouth FK3 8EG
United Kingdom

USA

7500C Shadwell Drive,
Roanoke VA 24019,
USA