



Terranox down-the-hole hammers





Terranox – DTH hammers for geotechnical applications

DTH drilling is gaining increased interest in geotechnical applications all around the world. With advantages such as improved hole straightness and reliable performance in challenging ground conditions, this method is turning into the number one choice for many construction companies and well drillers. TerraRoc offers a wide range of geotechnical drilling equipment and by introducing the Terranox DTH hammer we create a package with full focus on your application and your demands.

Challenges in urban development

TerraRoc offers a wide range of high performing drilling equipment designed for percussive drilling. In fact, we offer the most productive DTH hammers in the world. DTH drilling as a method is growing in popularity in both foundation works and in well and geothermal drilling. As the global redevelopment of urban areas continues, this trend comes with a challenge – accessing and drilling in populated areas without damaging the existing structures around the work site. It is obvious that our customers in geotechnical operations have very different demands on the equipment than

those working with high production drilling in for example quarrying. The demand for application tailored solutions is increasing.

Low pressure drilling

In production drilling, especially in hard rock, the use of high pressure air is vital in order to flush the drill bit efficiently. In overburden ground conditions, air from DTH drilling might unconsolidate the ground, decreasing the capacity of existing foundations. Construction companies and well drillers are frequently operating in urban areas where existing foundations are sensitive to any kind of disturbance in their immediate surroundings. In geotechnical

applications lower air pressure (in the range of 12-18 bar) is therefore recommended. Focus is on reliable and safe operations along with minimal environmental impact.

With focus on your operations

With your operations in mind, we are now proud to present Terranox – a range of DTH hammers dedicated to cost efficient and reliable geotechnical drilling. The Terranox DTH hammers are designed for optimum performance in low pressure operations.



Reliable, well proven technology

The Terranox hammer is based on well proven technology and over 30 years of successful operations in the industry. When working in urban areas, drilling must usually be accomplished during restricted drilling hours. Reducing down time is critical. Terranox hammers are rugged, reliable and when damaged, easily repaired or replaced. Together with TerraRoc's worldwide service network, assuring availability of parts, services and support, you can trust this cost efficient product to do the job for you.

A dedicated package

The Terranox DTH hammers are very well suited for use together with our well proven casing advancement systems Symmetrix, Odex and Elemex, the Mustang drilling rigs

and Unigrout grouting equipment, all committed to reliable and safe geotechnical drilling. With TerraRoc you get a unique in-house turnkey solution for your geotechnical drilling operation.



The Terranox product range

The Terranox DTH hammer comes in five sizes. Choosing the right hammer is largely determined by hole size and type of ground conditions. Ideally, the size of the hammer should match the required hole dimension as closely as possible, leaving just enough space for cuttings to evacuate the hole.



Terranox DTH hammers											
Description	Thread connection	Outside diameter		Rec. hole size		Shank style	Length without bit*		Weight without bit		Part number
		mm	inch	mm	inch		mm	inch	kgs	lbs	
Terranox 3	API 2 3/8 Reg PIN	79	3 1/8	88 - 105	3 7/16 - 4 1/8	DHD	902	35 1/2	30	66	8393 0826 35
Terranox 4	API 2 3/8 Reg BOX	92	3 5/8	105 - 127	4 1/8 - 5	DHD	1049	41 5/16	39	86	8393 0826 40
Terranox 5	API 3 1/2 Reg PIN	115	4 1/2	130 - 152	5 1/8 - 6	DHD	1166	45 7/8	69	152	8393 0826 50
Terranox 6	API 3 1/2 Reg PIN	137	5 3/8	152 - 216	6 - 8 1/2	DHD	1255	49 7/16	103	227	8393 0826 60
Terranox 8	API 4 1/2 Reg PIN	181	7 1/8	200 - 270	7 7/8 - 10 5/8	DHD	1443	56 13/16	177	390	8393 0826 80

* Shoulder to shoulder

Service and tuning kits

In abrasive drilling conditions, partly external components of the DTH hammers are subject for excessive flush blasting and is wearing out before the internal parts reaches their fatigue limits. Wear often appears on the chuck itself or on the cylinder at the chuck-end. For this reason many of the Terranox hammers are designed with reversible cylinders.

With help of defined **service kits** the hammers can be rebuilt and most internal parts re-used for another run. Use of service kits, extends the total hammer life and substantially reduces the total drilling cost, as the cost for service kits is only approximately 10 % of a new hammer.

Terranox service and tuning kits			
Description	Part number		
	Hammer	Service kit	Tuning kit
Terranox 3	8393 0826 35	8393 0827 23	8393 0827 28
Terranox 4	8393 0826 40	8393 0827 24	8393 0827 29
Terranox 5	8393 0826 50	8393 0827 25	8393 0827 30
Terranox 6	8393 0826 60	8393 0827 26	8393 0827 31
Terranox 8	8393 0826 80	8393 0827 27	8393 0827 32

Terranox hammers are, for optimized drilling performance and hole cleaning, fitted with choke plugs to enable a ultimate tuning of the hammer for each occasion and use. Replacement choke plugs are included in the Terranox **tuning kits**.

For easy logistics defined kits containing the vital parts are available for each hammer as to below table.

A rule of thumb for use of service kits		
Rock formation	Hammer life	Action
Highly abrasive	< 5 000 m	Use service kit to rebuild the hammer 1-2 times
Medium abrasive	5 000 - 10 000 m	Consider service kit to rebuild the hammer 1 time
None abrasive	> 10 000 m	Rebuilding not recommended, risk that internal parts might fail before the service kit is worn out



Matching hammer and casing diameter

For proper selection of Terranox hammer to match casing diameter, please use cross reference table below. Casing size and drilling conditions will be decisive factors when selecting casing advancement system.

Hammer description	Casing diameter range	
	mm	inch
Terranox 3	114.3	4 1/2
Terranox 4	139.7 - 152.4	5 1/2 - 6
Terranox 5	168.3 - 177.8	6 5/8 - 7
Terranox 6	193.7 - 244.5	7 5/8 - 9 5/8
Terranox 8	244.5 - 323.9	9 5/8 - 12 3/4

Selecting compressor capacity

The Terranox hammer range is designed for a maximum working pressure of 25 bar. In overburden drilling applications the air pressure is normally recommended to be kept in the range of 12-14 bars. However, for proper hammer performance throughout the entire drilling operation, the compressor model should be selected to match the corresponding maximum hammer air consumption, shown below.

Drill rig requirements

For proper hammer performance, the geotechnical drilling rig should be equipped with a rotation unit providing minimum torque as per the table shown below.

Hammer description	Minimum torque	
	Nm	lb ft
Terranox 3	600	440
Terranox 4	1 500	1 020
Terranox 5	2 000	1 480
Terranox 6	3 000	2 210
Terranox 8	8 000	5 900

Hammer description	Air consumption (at 24.1 bar)	
	L/s	scfm
Terranox 3	239	506
Terranox 4	292	618
Terranox 5	358	760
Terranox 6	459	973
Terranox 8	725	1 538

Above specifications/ratings are based on initial factory setting

A complete package from TerraRoc

Casing advancement systems

TerraRoc offers three casing advancement systems: Symmetrix, Elemex and Odex. With these systems a casing pipe is installed simultaneously as the hole is drilled. The casing prevents the hole from collapsing. Using the TerraRoc casing advancement systems is particularly advantageous for foundation works or well drilling in urban areas. The systems offer high productivity even if the ground contains boulders, concrete blocks or old foundations which are hard to penetrate and they can

easily drill a rock socket into the bedrock if required. When used for micropiling, cased piles can accommodate large load concentrations also from lateral forces.

The drilling principle is based on a pilot bit and a reamer bit, which together drill a hole larger than the external diameter of the steel casing. This enables the casing pipe to follow the drill bits down the hole. Odex has an eccentric reamer bit while Symmetrix and Elemex feature a concentric reamer called ring bit.



Symmetrix

The concentric drill bit design gives Symmetrix plenty of benefits: incomparable hole straightness, deep drilling capability and incredible quick pile setting. Symmetrix is ideal tool for all kind of ground conditions and superior when there are big obstacles in the ground or sloping bedrock exists. For well drilling, the Symmetrix range offers drill-through systems. When the surface portion is cased and sealed in the overburden layer, the pilot bit can drill further into the bedrock without having to change drilling equipment. Symmetrix is also capable for all types of micropiling work whether there is an end-bearing or friction pile to be drilled.



Elemex

The Elemex system design is based on the Symmetrix concentric system but is especially designed for DTH drilling in urban areas or sensitive ground. The unique concept behind the Elemex design is built on redirection of the air flow. Once the air reaches the bit face, it is blown against the extended ring bit walls which redirects the flow across the face. This way, the air pressure is decreased just enough to allow an efficient flushing of the bit face without escaping to the surrounding ground. Elemex is gentle on the surrounding but tough on the boulders that might come in its way.



Odex

The eccentric, retrievable Odex system is ideal for short holes up to 273 mm (10 ¾") in diameter. Well drillers often have an Odex drill bit at hand for simultaneous casing of water and geothermal wells. Odex offers quick and cost efficient drilling. When a casing has been installed, the complete drill bit is retrieved – ready to drill the next hole. Odex system was originally developed, in the late 1960's, as a reliable method for micropiling with steel core piles, as is today still very popular when drilling in basic ground conditions.

Customized Geotechnical Solutions.

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

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