



# **INSTRUCTION MANUAL**

## **SELF-BORING PRESSUREMETER**

### **Model BOREMAC**

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This product should be installed and operated by qualified personnel only. Its misuse is potentially dangerous. The Company makes no warranty as to the information furnished in this manual, and assumes no liability for damages resulting from the installation or use of this product. The information herein is subject to change without notification.

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# TABLE OF CONTENTS

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<b>1</b>	<b>INTRODUCTION.....</b>	<b>1</b>
<b>2</b>	<b>DESCRIPTION OF THE BOREMAC COMPONENTS .....</b>	<b>1</b>
2.1	The Disintegrator Module .....	1
2.2	The Probe .....	1
2.3	The Probe to Rod Adapter .....	2
2.4	The Rod String .....	2
2.5	The Rods-to-Drill-Rig Adapter .....	2
<b>3</b>	<b>SYSTEM ASSEMBLY .....</b>	<b>2</b>
<b>4</b>	<b>SETTING THE PROBE IN PLACE .....</b>	<b>5</b>
<b>5</b>	<b>TEST EXECUTION .....</b>	<b>6</b>
<b>6</b>	<b>ASSEMBLING A NEW SHEATH.....</b>	<b>7</b>

# 1 INTRODUCTION

The BOREMAC is a self-boring pressuremeter probe that is run with a TEXAM pressuremeter. The only difference between using one of this TEXAM's probe alone or in conjunction with the BOREMAC components resides in the method the probe is set in place. The execution of the test itself remains the same and is fully described in the TEXAM pressuremeter instruction manual.

Maximum working pressure in the self-boring mode is 4000 kPa.

## 2 DESCRIPTION OF THE BOREMAC COMPONENTS

The Boremac is comprised of:

- A disintegrator module
- A modified TEXAM, N size probe
- An EW to probe adapter
- A coaxial rod string
- The disintegrator drive unit
- Rods-to-drill-rig adapter

### 2.1 THE DISINTEGRATOR MODULE

The disintegrator module consists of the following components:

- A 68 mm O.D. by 126 mm-long threaded cutting shoe.
- A 275 mm-long cylindrical housing.
- A helicoidal 4-wing cutter, 2 wings of which are fitted with hardened steel pin teeth. Two holes through the cutter allow the passage of water. The cutter is threaded onto a hollow rod 16 mm in diameter and 152.4 cm in length.

### 2.2 THE PROBE

The probe is similar to the N size TEXAM probe with the exception of the external metallic tapered rings and nut assemblies which lock the tapered rings in place.

The tapered rings are made of cadmium plated steel and have the same outside diameter as the cutting shoe. The rings are advanced and held in place by an internal 61 mm O.D., 12.5 mm wide knurled nut which threads onto the core of the probe. An external nut with a 68 mm O.D. and 28 mm width fits over the knurled nut and threads onto the outer threaded male extremity of the tapered ring.

## 2.3 THE PROBE TO ROD ADAPTER

The adapter is comprised of 2 parts:

- A 27.5 mm long cylinder with a uniform O.D. which screws onto the probe. The cylinder houses the tubing connection to the probe. It has 6 countersunk holes to accept the screws which hold the upper and lower parts of the adapter together.
- A grooved adapter 25 cm in length which slides flush into the top end of the lower part of the connector. It is held in place with 6 countersunk machine screws.

The longitudinal grooves in this part allow the spent drilling fluid to the surface as well as the passage of the tubing linking the control unit to the probe.

## 2.4 THE ROD STRING

The coaxial rod string is comprised of:

- An outer EW casing string 46 mm O.D. assembled in 1.52 m lengths. The EW casing is used to transmit thrust to the probe as well as to extract the probe.
- An inner 22.2 mm O.D. by 9.5 mm I.D. rod string threaded and flush coupled in 1.52 m lengths.

## 2.5 THE RODS-TO-DRILL-RIG ADAPTER

A rods-to-drill rig adaptor can be provided by Roctest. This equipment will allow to connect the BOREMAC assembly to a drill rig for using the torque and hydraulic power of this latter. This adaptor will be used for adjusting the position of the helicoidal 4-wing cutter relatively to the cutting shoe.

# 3 SYSTEM ASSEMBLY

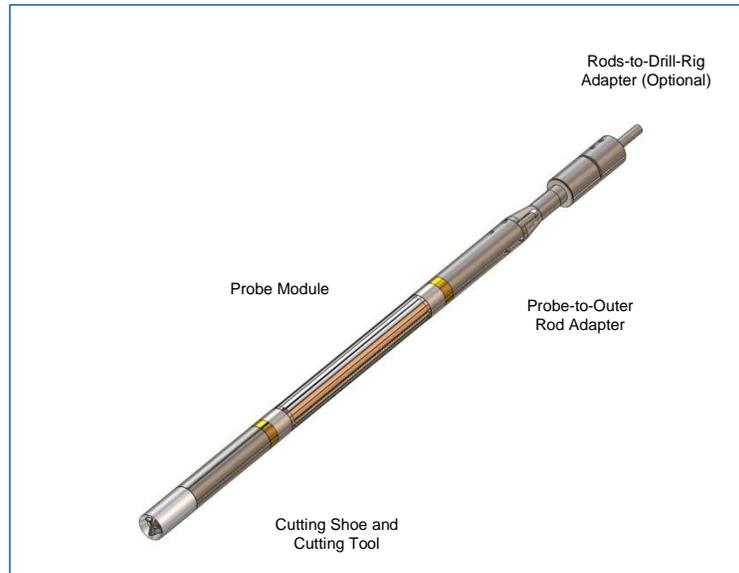
- If necessary, install a new sheath on the probe's body
- Thread from top to bottom the coaxial tubing, which links the pressuremeter to the probe, through the plain cylindrical part of the probe-to-rod adapter.
- Saturate the probe as follows: put it vertically, connect the tubing to it but do not tighten the nut, inject some water in the probe, disconnect the tubing from the probe to allow the air to get out, repeat until there is no more air in the probe. Reconnect the tubing and tighten the nut with wrenches. Do not tighten too hard.
- Screw the probe-to-rod adapter onto the upper extremity of the probe.
- Connect the upper slotted component of the 2 part rod adapter to its mating part using the 6 countersunk screws. The tubing will occupy one of the longitudinal slots.
- Thread the 1.5-m long lowermost inner rod through the probe assembly.

- Thread the locking nut and cutter onto the lower end of this rod.
- Screw the cutting shoe onto the cylindrical probe extension which houses the inner rod guide.
- Screw the above 2 part assembly onto the threaded lower end of the N probe.

Please refer to the sequence of images below:







## 4 SETTING THE PROBE IN PLACE

- The rig pump and water swivel must be in good order for getting appropriate flow of water.
- Open a 1.5-meter length, 76-mm diameter pilot hole.
- Connect the BOREMAC assembly to the drill rig. The connection with the drill rig spindle is a specific task that requires a good measure of care. A step ladder can be required to reach for the connection to the drill rig spindle, which can be 2 – 3 meters above work level.
- It is during this operation that the position of the disintegrator bit inside the cutting shoe of the probe will be adjusted. During the test, the cutting bit should be kept at least 25 mm inside the shoe. If the bit is pushed downward and protrudes from the shoe, water might start to go upward outside the probe, disturbing the soil to be tested. For softer soils, the cutter will be raised inside the cutting shoe. For stiffer soils, the cutter will be lowered inside the cutting shoe.
- The outside casing is pushed down by the adaptor through the thrust bearing seating on top of a short section of casing. Slowly lower the probe into this hole being careful not to plug the lower extremity (especially in soft materials).

- The different parameters for self-boring vary according to the soil type encountered. The soil should be homogeneous and should not contain too much gravel. Gravel size should not exceed 19 mm.
- The speed of rotation should be between 50 and 300 RPM (e.g. 100 RPM in clay). The penetration rate will be between 10 cm/min and 50 cm/min (e.g. 30 cm/min in clay) and should be very regular.
- The drilling fluid pump should be capable of supplying 15 l/min (4 US gpm).
- During the self-boring, the flow of drilling fluid should be maintained constant so as to provide a regular return of fluid. An excessively high flow will result in an oversize hole.
  
- Turn the flow of drilling fluid on and wait until there is a return of drilling fluid to the surface.
- Begin the rod rotation.
- Prevent any rotation of the outer EW casing when drilling.
- Proceed with the downward penetration of the probe. Checking the probe penetration rate and the rate of drilling fluid return.
- Proper attention must be paid to prevent the Boremac probe to rotate and to unscrew from the above outer EW casing lengths. The casing lengths must be tightened with pipe wrenches to prevent rotation by driving friction between the disintegrator bit and cutting shoe full of soil cuttings.
- In silty and sandy soil, consecutive tests can be done without retrieving the probe. In clayey soils, the probe will get clogged more rapidly and will have to be retrieved more frequently for cleaning.
  
- When the end of the stroke is reached or the testing depth is attained:
  - Stop probe penetration
  - Stop the rod rotation
  - Maintain drilling flow for approximately 1 minute and then cut the flow off.

## 5 TEST EXECUTION

Proceed as described in the TEXAM instruction manual.

## 6 ASSEMBLING A NEW SHEATH

Please refer to the sequence of images in section 3 of this manual.

Screw the probe to vice adaptor and clamp the adaptor in a bench vice. Place the pair of o-rings in their grooves. Slide the outer protective sheath over the probe's body. Center the sheath with respect to the o-rings. Use three hose clamps for preventing the sheath from moving. Non-petroleum molykote lubricant may be used sparingly to assist in mounting the sheath. Slide the tapered sleeves in place over the ends of the sheath. Orient tapered sleeve such that the threaded extremity points outward. Screw on the brass knurled nuts to the body of the probe. This will advance the outer tapered sleeves inward providing a seal between the sheath and the o-rings. Continue to advance the brass nuts until approximately 19 mm of thread is exposed beyond the nuts. When advancing the nuts, verify that no relative movement between the sheath and the probe's body occurs. This can be achieved by holding the sheath in position with three crew clamps. Then, screw the cover nut unto the tapered sleeve.

The disassembly is done following the same steps in a reverse order. The metallic rings can be slightly warmed to facilitate their removal.

Please refer to the TEXAM instruction manual for further information,



Figure shows a new membrane being assembled on the body of the probe.