

Mini Bladder Pumps

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Version 1.0

# Operator's Manual

DURHAM GEO - SLOPE INDICATOR

# Operating Instructions

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## Introduction

*Thank you for purchasing a Durham Geo/Slope Indicator Mini Bladder Pump. By following the setup, operating and maintenance procedures, you can enjoy a lifetime of use.*

### **DESCRIPTION**

The new MBP Series of bladder pumps, U.S. Patent No 6,382,923, use the squeeze operating principle for gentle purging and sampling. The pumps feature two options in construction: stainless steel and Teflon<sup>®</sup>, or PVC, Delrin<sup>®</sup> and Teflon<sup>®</sup> construction for durability and lack of effect on the sample or the matrix.

The designs provide new concepts in ground water sampling: The stainless steel models feature a short, 18-in long and slim, 1-in (TR-035) or 3/4-in. (TR-037) diameter, body which makes them ideally suited for use in small diameter monitoring wells and piezometers. Additional features include rounded ends to assist in preventing hang up, and a detachable bottom with a point source intake that is only 1 1/4-in. long. Pump efficiency is enhanced with the new flow-through design. The pump incorporates standard 1/4-in. diameter barbed fittings suitable for bonded or regular 1/4-in. tubing. A fitting is also provided to allow attachment of a support cable.

The small physical size of these pumps permits a stroke volume of between 51 and 95 ml. When used with the TR-032 Dual Range Controller, pump rates of up to 1.75 l (0.46 g) per minute are possible. With the 1-in. model and 1.45 l (0.38g) per minute with the 3/4-in. model. For these tests the pump was positioned about 8 feet below the water surface.

The all-plastic model, (TR-070) is just 14-in long and 1.32-in diameter. It is made from PVC and Delrin<sup>®</sup> with a Teflon<sup>®</sup> bladder. The point source inlet is 0.5-in long and is protected by a plastic mesh screen. The removable bottom is weighted to ensure easy submergence. The take-apart design allows both the upper and lower check valves as well as the pump inlet screen to be accessed for maintenance. The pump is provided with push-to-connect fittings for standard 1/4-in diameter tubing and a fitting for the attachment of a support cable. This

## I N T R O

model has a working stroke volume of 36 ml and a maximum pump rate of 1.2 l (0.32 g) per minute using the Dual Range Controller.

The pumps are equally suited to applications where low flow purging and sampling is required from wells of any diameter. Flow rates as low as a few milliliters per minute are easily attained when used with the Dual Range Controller. The special flexible Teflon<sup>®</sup> bladder used in the MBP series pumps also make them suitable for use in shallow submergence situations, 1-3 feet below the water surface.

## Setup

### GENERAL

All MBP series Mini-Bladder Pumps are supplied cleaned and sealed in a poly bag ready for installation. The cleaning process involves circulating a laboratory detergent solution, usually Alconox<sup>®</sup>, through each pump. Clean water is then passed through the pump followed by air-drying. The pumps may be further processed if required by your sampling plan or SOP.

Durham-Geo/Slope Indicator offers a pre-assembly service where the pump is supplied with the bonded tubing, well cap, and suspension cable cut to length and attached to the pump. A suspension wafer/well cap assembly may also be supplied, attached to the upper end of the pump tubing and suspension cable. The complete assembly is then packed in a sealed poly bag.



The barb fitting on the top of the TR-035 and TR-037 stainless steel pumps are marked with an "A" for the air line. If Durham-Geo bonded tubing is used (Teflon<sup>®</sup> lined polyethylene and polyethylene), the rougher surfaced Teflon<sup>®</sup> lined tube should be connected to the unmarked fitting and the smooth surfaced polyethylene tube to the "A" fitting. Note: You can see the Teflon lining

inside the discharge tubing.



## SETUP

The suspension cable should be passed through the loop support and secured with a stainless steel crimp to form a loop.



To facilitate the placement of the pump at the desired sampling point in the screened area of the well Durham-Geo/Slope Indicator offers a locking cap assembly with attached wafer. When used with the Well Head Fixture it allows the pump to be placed at the same position in the well each time it is sampled. The wafer is provided with two bulkhead quick connect fittings marked “A” and “W” on both sides to allow attachment of the pump tubes below and tubing to the controller and flow cell or sample container on the top. A hole is provided to allow placement of a water level meter cable and probe. When sampling is complete the Well Head Fixture is removed and the pump lowered a few inches and the sealing type well cap placed back on the top of the well casing and secured. This arrangement is illustrated on the following page.

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## OPERATION



Suggested Installation of a MBP pump with Locking Cap Assembly and Well Head Fixture

The pump and tubing assembly should be removed from the poly bag and gently lowered into the well in a single operation to minimize the possibility of introducing contaminants into the well. Slip the tubing, just below the wafer assembly, through the slot in the Well Head Fixture and then place the Fixture over the top of the casing. Connect the tube from the Controller output to the “A”, air fitting on the top of the Wafer Assembly and the tube to the flow cell or sample container to the “W” fitting.

The following instructions are for the Dual Range Controller.

- Switch to the desired pressure range and adjust the regulator to the pressure required to operate the pump. Note that approximately 0.43 psi will be needed for each foot of depth from the ground surface to the water surface in the well.

## OPERATION

- Set the pressure gauge to the theoretical pressure plus about 10 psi to ensure good flow to start with.
- Set the timers to about 2 seconds.
- Start the pump by turning the power switch to on and allow the pump to cycle until water is discharged into the container.
- Adjust the pressure time to just allow the charge volume of water from the pump to be expelled into the container. Excess time is not necessary and will reduce the pump rate. Too little time will not fully discharge the pump.
- Adjust the exhaust time by evaluating the stroke volume. Too little time will not allow the pump to completely fill. Excess time will reduce the pump rate.

At a minimum it will be necessary to purge the pump and tubing of water before samples are collected. The following data is provided for the Durham-Geo/Slope Indicator, Models TR-035 and TR-037 with 1-in and 3/4- in diameters by 17-in long and the TR-070 with a 1.32-in diameter by 14-in long . All models are designed to use standard 1/4-in OD Teflon<sup>®</sup> lined polyethylene or solid Teflon<sup>®</sup> tubing for the water line.

- -TR-035 stroke volume 95 ml
- -TR-037 stroke volume 51 ml
- -TR-070 stroke volume 36 ml
- -1/4 in. OD Teflon lined polyethylene tubing- 4 ml per foot

After the system has been purged the controller exhaust time may be extended and the supply pressure reduced to cut the flow to the desired rate for low flow sampling. Note that the timers provide sequential times from 0.1 to 10 seconds. Very low flow rates may also require the pressure time to be reduced, thereby reducing the charge volume and subsequent flow rate.

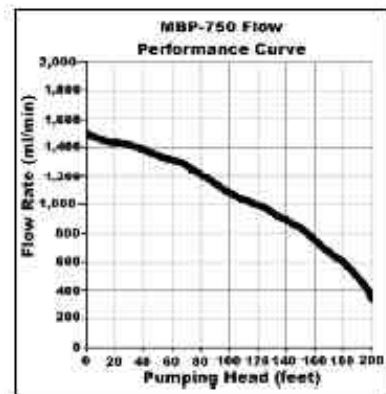
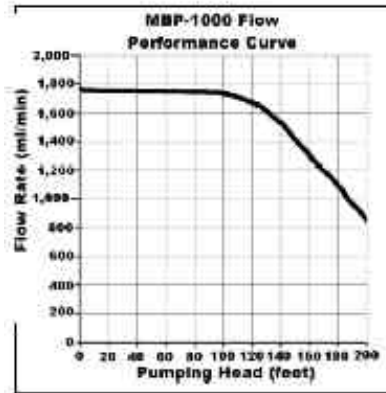
When purging and sampling is completed the pump assembly needs to be placed in the “storage” position:

- Turn off the controller.
- Remove the air line from the “A” fitting on the top of the wafer by pushing down on the fitting ring while gently pulling the tube out of the fitting.

## OPERATION

- Remove the water sample tube from the “W” fitting using the same technique.
- Remove the water level meter cable and probe through the port in the wafer.
- Raise the wafer a sufficient height to allow the Well Head Fixture to be removed.
- Lower the pump assembly into the well and place the sealing well cap into the top of the casing.
- Tighten the locking mechanism to expand the sealer. Lock the well cap with a padlock.

## SPECIFICATIONS

**TR-037**

Construction	- Stainless steel type 304*, Teflon® and Viton® seals
Dimensions	- Length 17.25-in. (44 cm) - Diameter 0.75-in. (1.91 cm)
Weight	- Weight 12 oz (340 g)
Stroke Volume	- 51 ml
Inlet Length	- 0.75-in. (1.91 cm)
Fittings	- Custom dual barb for ¼-in. tubing
Screen	- 30 mesh stainless steel

\*Type 316 and electropolishing available

**TR-035**

Construction	- Stainless steel type 304*, Teflon® and Viton® seals
Dimensions	- Length 17.25-in. (44 cm) - Diameter 1.00-in. (2.54 cm)
Weight	- Weight 18 oz (510 g)
Stroke Volume	- 95 ml
Inlet Length	- 1.35-in. (3.44 cm)
Fittings	- Custom dual barb for ¼-in. tubing
Screen	- 30 mesh stainless steel

\*Type 316 and electropolishing available

**TR-070**

Construction	- Polyvinylchloride, Delrin®, Teflon® and Viton® seals
Dimensions	- Length 14-in. (36 cm) - Diameter 1.32-in. (3.30 cm)
Weight	- Weight 13oz (368 g)
Stroke Volume	- 36 ml
Inlet Length	- 0.5 in. (1.27 cm)
Fittings	- Custom push-to-connect for ¼-in. tubing
Screen	- 30 mesh plastic

## TROUBLESHOOTING

The pumps may be used for either dedicated or portable sampling. They are cleaned by Durham Geo/Slope Indicator prior to dispatch and bagged. The cleaning process is in accordance with ASTM D 5088. It is recommended that this process be followed if the pump has been used in one well before it is installed in another. The pump bottom on both the stainless steel models and the plastic model may be removed to allow thorough cleaning of the mesh filter. The lower check valve may also be removed. The plastic model (TR-070) upper check valve can be accessed by first carefully removing the push-to-connect fitting for the water line on the top of the pump. In most situations it should not be necessary to physically remove any of the check valves as part of a normal decontamination process. Should the pump not appear to be producing the desired flow the following should be checked:

- Adequate pump submergence, the pump will operate with a minimum submergence of 12-in over the pump top. It is recommended however that a minimum submergence of 36-in be used. Maximum performance will be achieved when submergence is 48-in or greater.
- Check the tubing fittings on the pump top for leakage. If necessary, re-cut the tubing and carefully reconnect.
- Check the surface connections- filter and/or flow cell for leakage.
- Check the tubing for kinks and obstructions.

If the pump is used with minimal submergence and excessive air pressure has been applied for a significant number of cycles it is possible for the bladder to become compressed. The lack of natural hydrostatic pressure prevents the bladder from fully expanding during the exhaust part of the pumping cycle. The remedy is to lower the pump so that a submergence of 48-in is available to naturally reform the bladder. In situations where this is not possible it will be necessary to reform the bladder by applying a vacuum to the air supply tube to the pump, or the air supply fitting on the pump top. A hand-operated vacuum

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pump such as a MityVac is suggested, using a short piece of 3/16-in ID silicone tubing as a connector.

Check that your Dual Range Controller is operating correctly:

- The exhaust vent on the rear lower side of the case is not obstructed.
- The air supply pressure to the controller is at least 45 psi, this is needed to operate the pilot assisted solenoid.
- The Controller battery has sufficient charge to drive the timers and solenoid.
- Check the battery status test indicator if fitted or using a voltmeter check the voltage at the charger/accessory socket. At least 10-volts is required for full operation.

## REFERENCE

### Precision Dual Range Controller

Developed originally for the Mini-Bladder Pumps, the new Precision Dual Range Controller U.S. Patent No. 6,382,923) allows precise control of both the air pressure supplied to the pump and the timing. Two independent air pressure regulators with gauges are provided to allow precise control of the applied pressure in ranges of 2-50 psig and 5-100 psig. The encapsulated timer module provides accurate, independent timing of the pressure and exhaust cycles from 0.1 to 10 seconds. An internal lead acid gel cell powers the Controller. A 110 V ac charger and 12-volt auto lighter socket charger lead are provided. The Controller will operate for up to 36 hours in continuous use. The Controller with Compressor is designed for stand-alone use. The controller features are as described above. A compressor, cooling coil, two reservoirs and heavy duty battery are included. It will provide up to 1 ½ hours continuous use. A heavy-duty charger and power cord assembly for attachment to an external or vehicle battery are included. The controller section may also be used stand alone, a connection for an external compressed air source is provided. The Controller with Compressor is designed for low flow sampling, using the MBP pumps.



### MODEL DESCRIPTION SHIP WT

<b>TR-035</b>	TR-035 Bladder Pump, 1 x 18 in. stainless steel body, Teflon <sup>®</sup> bladder	2	lb
<b>TR-037</b>	TR-037 Bladder Pump, ¾ x 18 in. stainless steel body, Teflon <sup>®</sup> bladder	2	lb
<b>TR-070</b>	TR-070 Bladder Pump, 1.32 x 14 in. PVC body, Teflon <sup>®</sup> bladder	2	lb
<b>TR-032</b>	Precision Dual Range Controller	12	lb
<b>TR-03210</b>	Precision Dual Range Controller with Compressor	32	lb
<b>TR-027</b>	2 in. Locking Cap Assy.	2	lb
<b>TR-028</b>	4 in. Locking Cap Assy.	3	lb
<b>TR-033</b>	¼ in. Poly x ¼ in. Teflon <sup>®</sup> lined Poly Bonded Tubing, (per ft)		
<b>918702</b>	Suspension, safety cable, (per ft)		

### Locking Cap Assemblies

The new Durham-Geo/Slope Indicator Locking Cap Assemblies are designed to facilitate the placement of bladder pumps in monitoring wells. The assembly comprises a lockable cap with an expandable gland that holds it firmly in place and seals the well to prevent entry of surface water or contaminants. A stainless steel suspension loop fitting attached to the cap and a quick link support a wafer. The wafer contains two bulkhead type Pushlok<sup>®</sup> fittings, a hole for attachment of a pump safety cable and a 3/4 in. port to allow a water level probe to pass through the wafer when sampling. For sampling, a slotted wellhead fixture is placed on the top of the well casing and the wafer is seated in it.



#### MODEL DESCRIPTION SHIP WT

<b>TR-52</b>	2 in. Locking Cap Assy. ¼ x ½ fittings	2	lb
<b>TR-54</b>	4 in. Locking Cap Assy. ¼ x ½ fittings	3	lb
<b>TR-027</b>	2 in. Locking Cap Assy. ¼ x ¼ fittings	2	lb
<b>TR-028</b>	4 in. Locking Cap Assy. ¼ x ¼ fittings	3	lb
<b>TR-42</b>	2 in. Well Head Fixture For sampling	3	lb
<b>TR-44</b>	4 in. Well Head Fixture For sampling	4	lb

## Limited Warranty

The Durham Geo/Slope Indicator Mini Bladder Pump is guaranteed against defective materials and workmanship for a period of one year from the date of shipment. We will repair or replace such items as may prove defective at our option. Under no condition will we allow labor charges or other expenses to repair defective merchandise without our approval. Durham Geo makes no other warranties of any kind or nature and all implied warranties or merchantability or fitness for a particular purpose which exceeds the previously stated obligation are expressly excluded. We accept no responsibility for damage or abuse to apparatus due to improper installation or operation. We accept no responsibility for and will not pay for any lost profits incidental, consequential or special damages.

For a complete warranty disclosure, please call 1-800-837-0864 📞 (outside Georgia, USA) or (770) 465-7557 📞 (inside Georgia, USA) or refer to the printed statement on the back of any Durham Geo/Slope Indicator original invoice.

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# Information Record

We can be reached between 8:00 am and 5:00 pm Eastern Standard Time (EST)  
at:

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**Telephone:**

**1-800-837-0864 (outside Georgia, USA)**

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