01.09 PISTON SAMPLER SET

OPERATING INSTRUCTIONS

Contents

All it takes for environmental research

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On these operating instructions

If the text follows a mark (as shown on the left), this means that an important instruction follows.

If the text follows a mark (as shown on the left), this means that an important warning follows relating to danger to the user or damage to the apparatus. The user is always responsible for its own personal protection.

1. Description

1.1 Piston sampler set

The piston sampler set is suitable for sampling in moderately cohesive soil layers below the groundwater level to a depth of 5 m.

The piston sampler set consists of a 200-cm piston sampler, a handle with a synthetic grip, the Edelman auger, extension rods and accessories. The set is contained in a sturdy carrying bag.

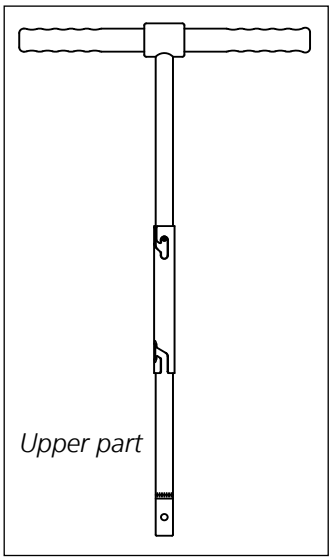
The set has bayonet connections, allowing easy (dis)assembly.

1.2 Piston sampler

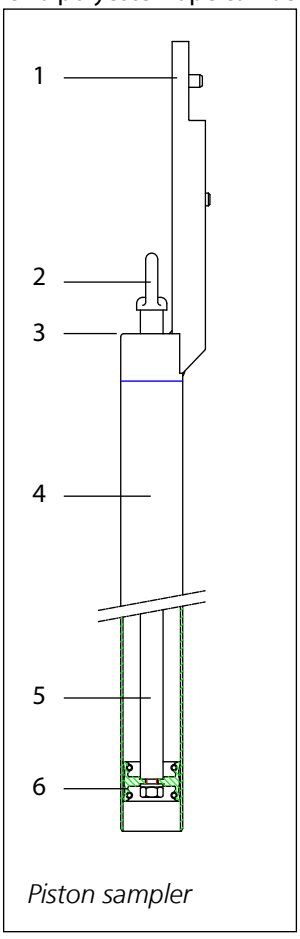
The piston sampler is constructed from a thin-walled, 40-mm diameter, stainless steel tube (4). The bottom end is open, whereas the top has outflow openings and an opening (3) through which a stainless steel extension rod (5) can be moved. The bottom end of the extension rod holds a piston (6). The top-end has a wire eye (2) to which a polyester rope can be attached. The single piston sampler has a 196.5-cm operational depth.

The piston sampler is fitted with a bayonet connection (1) to which extension rods can be attached. It is welded on the outside to permit free passage of the extension rod.
Due to the eccentricity of the sampler, one has to reckon with a maximum of 60 mm when working with auger holes.

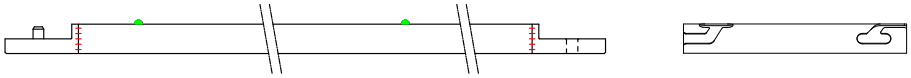
The upper part measures 60 cm, and has a detachable synthetic grip. The extension rods measure 1 m. The upper part, the extension rods and all bottom parts have bayonet connections, allowing augering at differing depths. Cylindrical coupling sleeves lock the connections.



Upper part



Piston sampler



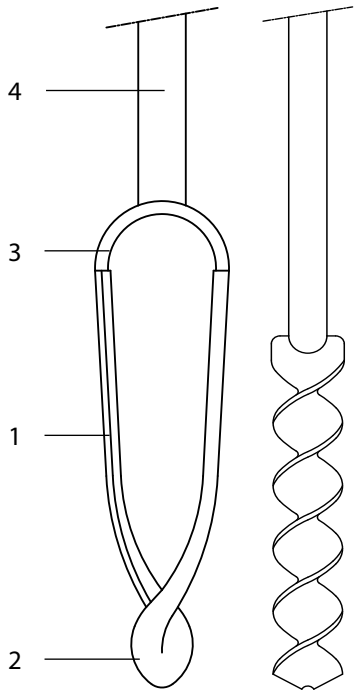
Extension rod (left) and coupling sleeve (right)

1.3 Edelman auger and spiral auger

The set contains an Edelman combination-type auger with a 7-cm diameter (see figure). The Edelman auger body is conical in shape and consists of two blades (1) joined in a bit (2). The top of the blades is welded to a bracket (3), which is connected to the auger rod (4).

The blades are vaulted and when entering the soil the sample is dug up and evenly guided into the inside of the auger body. The vaulting of the blades not only promotes digging up but also ensures a firm grip of the sample while permitting easy emptying of the auger body. The Edelman combination-type holds moderately cohesive soils well, whereas cohesive soil samples can easily be removed.

The spiral auger (see figure) has a 3-cm diameter. Its shape makes it particularly suitable for augering in hard and stiff soils. The spiral auger is used to drill out gravelly sample material clogging the piston sampler.



Edelman auger combination type (left) and spiral auger (right)

2. Technical specifications

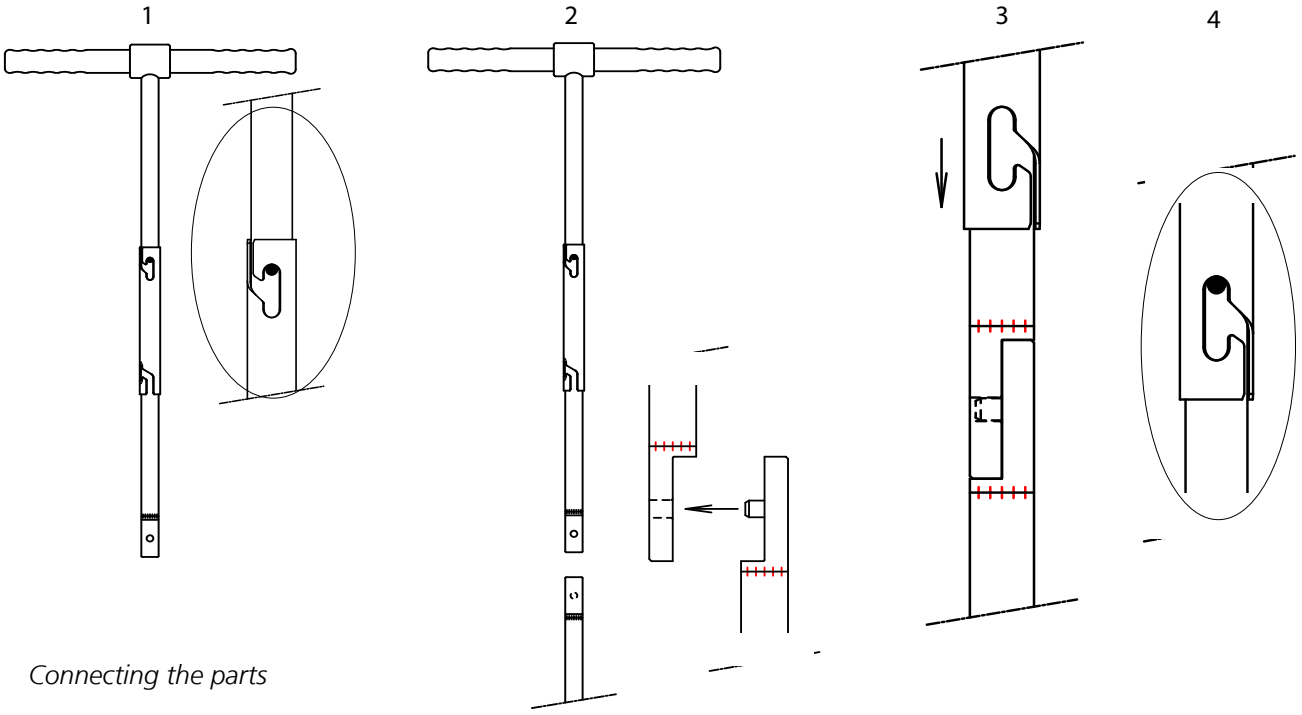
Auger type	Diameter (mm)	Dimensions (mm)	Material
Single piston sampler	Tube: 38 x 40 Overall: ca. 60	Oper. length: 1965 Tube length: 2000	Stainless steel
Edelman auger combination type	70	Blade width: 35	Iron-manganese steel, un-varnished
Spiral auger	30		Iron-manganese steel, un-varnished

3. Instructions for use

3.1 Piston sampler

1. Attach the synthetic grip to the handle.

2. Connect the handle, and optionally one or more extension rods with bayonets to the piston sampler (see figure):



Connecting the parts

2.1 Hold the coupling sleeve in the middle and slide it onto the upper part until it clicks on the nipple (step 1). The sleeve is locked if it cannot be rotated.

2.2 Join the upper and bottom part (step 2).

2.3 To lock the connection, unscrew the sleeve from the upper part, and slide it across the connection (step 3) and click it onto the nipple (step 4). Check the lock. Notice it will have a slight play.

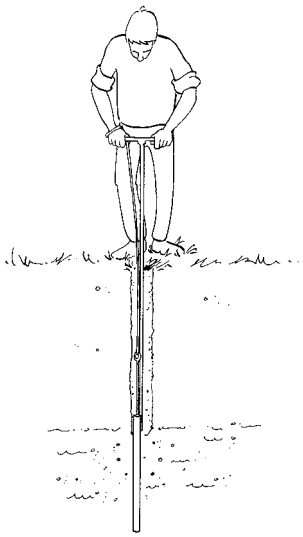
Hold the coupling sleeve in the middle, this will prevent you from catching the skin of your hands between the parts while (dis)connecting them.

Always check the coupling sleeves. Well-attached sleeves will prevent jamming, or loss of parts when augering.

3. Attach a polyester cord to the piston sampler's wire eye and let the (extended) auger down to the bottom of the augered hole. The extension rod should remain in the lowest position! By shaking the extension rod it will fall to its lowest position.

4. Pull the cord attached to the wire eye of the extensoin rod intermittently to hoist the piston and an underpressure will be created below the piston. Push the tube steadily down at the same time.

☞ **Keep the cord (and the piston) stationary, i.e. at a constant distance to the sample material.**



Pressing down the tube may cause resistance. Small pulling movements of the cord will cause an increase of the underpressure, thus reducing resistance and disturbance of the sample.

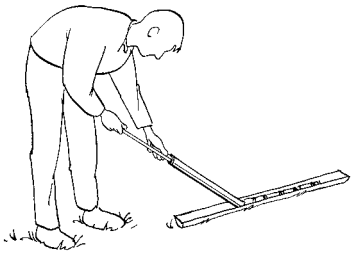
5. When the tube has been filled, push once more and pull it out of the auger hole.

☞ **To keep the sample in the tube, the piston should remain in the highest position by keeping the cord taut (suggestion: tie the cord to the handle).**

☞ **Keep the extension rod parallel with the auger rod to prevent the piston to leak, and consequently cause loss of sample.**

6. If the difference in height between the water level in the auger hole and the ground surface is too large, the sample may flow out of the tube. Filling the auger hole with water can prevent this.

7. Place the sampler horizontally on the surface and push the sample out of the tube with the piston while drawing the sampler towards you. Use the gutter to collect the sample material. Shaking the tube will facilitate this process.

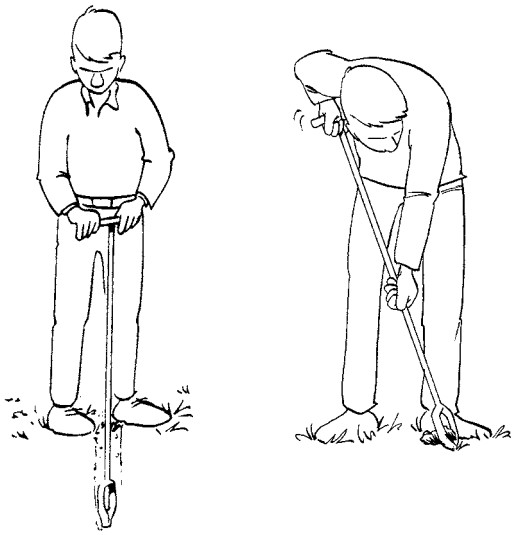


The sample will have a practically undisturbed profile. Its maximum length equals the operational length of the sampler.

Some remarks:

- ❒ Prior to piston sampling, The Edelman auger is used to pre-auger to the moderately cohesive layer below the ground-water level.
- ❒ Thin and cohesive strata (such as clay or loam up to a maximum of several centimetres) within a moderately cohesive layer may cause clogging of the tube. This impedes pressing the tube into the soil. It is recommended to note the depth of the cohesive layer, because pushing out the sample may cause it to flow as a result of increased water pressure behind the cohesive layer, thus disturbing the sample.
- ❒ The piston sampler should be used to sample one auger hole at a time. After sampling, the auger hole may cave in and cannot be augered further.
- ❒ If gravelly sample material clogs the piston sampler because it no longer contains water, a spiral auger can be used to drill out the sample material from the sampler. The dividable piston sampler set includes a spiral auger.
- ❒ It is recommended to keep the equipment in good condition by rinsing it with water during use. This will prevent sleeves to jam and the piston sampler to leak (see 6. Maintenance).

3.2 Edelman auger



1. Hold the auger by its handle and place it vertically on the ground (see figure, left).

2. Rotate it clockwise while gently pushing it into the soil. Upon 2¼ rotations (360°) the auger should have dug 10 cm. The auger body will be filled up to its bracket with slightly disturbed soil material. Depending on the type of soil additional rotations may be necessary.

Do not overfill the auger body. Superfluous material will coat the auger hole, which impedes the process of augering. In addition, it hinders removal of the sample material.

Do not force, or pound on, the auger. This may cause serious damage.

3. To obtain the sample, rotate the auger 360° clockwise without pushing down. To withdraw the auger after sampling, hoist it while gently rotating the auger. This will prevent loss of sample material. Keep your back straight and your knees bent to prevent injuries.

4. To release the cohesive material hold the auger askew on the surface (see figure), rotate the auger 180° while pressing it into the ground. The sample should detach itself and can be taken out by hand or by lightly tapping the auger.

4. Application

The piston sampler is suitable for sampling in moderately cohesive soils below the groundwater level (sand, soft soil layers), both in auger holes and in open water. The piston sampler set is standard suitable for sampling to a depth of 5 m (or deeper if necessary). The samples are hardly disturbed; their length equals the operational depth of the piston sampler used.
The Edelman auger is suitable for augering down to a moderately cohesive soil layer below the groundwater level. The spiral auger can be used to remove jammed sample material from a piston sampler.

The piston sampler is particularly suitable for:
- ❒ General soil research
- ❒ Environmental and hydrological research
- ❒ Quaternary-geology
- ❒ Sampling in conjunction with bailer boring
- ❒ Wet decontamination

5. Troubleshooting

- ❒ Soil particles between the augering rod and the coupling sleeve have caused the sleeve to jam. Pour clean water in the sleeve, this will flush out the particles. Use the synthetic backside of the spatula to tap the sleeve, coarse particles will become come loose, thereby allowing the sleeve to slide.

- ❒ The piston sampler leaks, leading to loss of sample. Slide the extension rod up and down parallel with the auger rod to prevent the piston to dislocate. If so, the piston doesn't prevent to leak and there will be loss of sample. Non-parallel movements can damage the piston permanently. Grains of sands may cause damage and leakage to the piston. Damaged pistons should be replaced (see 6. Maintenance).

- ❒ Loss of sample material. The difference in height between the water level in the auger hole and the surface is too large. Fill the auger hole with water.

- ❒ Make sure not to lose the coupling sleeves. Count them after augering. Carry them attached to an extension rod or to an upper part. Always check whether the sleeves are locked.

- ❒ Make sure to withdraw every single part of the auger. Always check whether the sleeves are locked.

6. Maintenance

- ❒ It is recommended to keep the augering equipment in good condition by rinsing it during use. Flush out any dirt from the piston sampler by moving the extension rod up and down under water.

- ❒ Clean the augers after use with running water. Take off the coupling sleeves from the rods and the upper part, clean and dry them well to keep the insides smooth and prevent oxidation (rough inner surfaces of the sleeve may cause it to jam). To avoid excessive oxidation when storing the auger body, apply vaseline (not for the piston sampler).

- ❒ The piston of the piston sampler can be removed for cleaning or changing.
  Hold the wire eye and turn the nut on the piston using a 13-mm (ring)spanner. Pull the extension rod out of the piston. Push the extension rod to remove the piston (slant it slightly) from the tube. If necessary, remove the spring washer. Clean the piston, reposition it, or place a new one in the tube, including a spring washer.

- ❒ The auger bodies need no whetting, use keeps them sharp-edged. Under normal conditions oxidation is not detrimental to the auger and will vanish upon use.

Appendix: Rust on augers and gouges

These augers and gouges are made of high tensile-strength forgeable iron-manganese steel. Both iron and manganese are non-toxic metals, abundant in the earth's crust on which we live. Natural concentrations are very high. During storage and transport some rust may develop on the bare metal surface. During first use this rust will scour off quickly. You may also scour with some wet sand prior to first use. The auger or gouge is then ready for sampling of soil on all metals like zinc, cadmium, chromium, copper and even iron and manganese!

Question 1: How do I clean and maintain my augers / gouges?
In practice augers keep themselves clean (and sharp) by the high friction of soil particles rubbing the augers surface. Augers or gouges used in acid, saline or alkaline soil are prone to oxidation and should be rinsed with pH neutral water after use. After a drilling in an oil-polluted borehole you may clean the auger with a brush in a bucket with water with neutral baby-shampoo added. Spraying our detergent 20.05.29 is very effective too and will also mobilize trace-metals, even the zinc plating from the extension rods! Use this detergent with care or limit the use to stainless steel or plastic tools only. Isopropylalcohol on a tissue is fine for rapid on-site cleaning. Acetone is more effective and will even remove tars from metals. Dismantle coupling sleeves and other loose parts prior to cleaning to allow rapid and complete drying after the final water rinse. Store in a well ventilated area free from dust and, for plastic materials, smells.

Question 2: Why did we not prevent the development of natural rust?
A paint will blister off quickly and will pollute samples with a variety of organic pollutants during a prolonged period, necessitating a difficult and cumbersome cleaning procedure prior to first use.
A zinc plating is very soft. The zinc will be scratched off in a few dozens of drillings resulting in measurable quantities of zinc in your soil samples and influencing your measurements during a prolonged period. After a few days or weeks the zinc has completely disappeared and is not effective anymore.
A wax or grease is easy to put on, but fairly hard to remove and, again, risky. Greases, oils and waxes will influence a gas chromatogram (GC) made from soil samples taken with such an auger or gouge. In addition the layer is sticky and it is unavoidable that it will spread all over in carrying bag or case, extension rods, gloves and consequently soil samples. This should be avoided at all times.

Question 3: The extension rods and upper part are zinc plated. Does this zinc plating contaminate the soil sample?
No, since there is no intense scouring contact between soil sample and the rods there is no influence.

Question 4: Do stainless steel soil samplers (coring tubes and rings) contaminate soil samples?
Stainless steel is an alloy of high percentages of mainly chrome, iron and nickel. Alloys have characteristics that are different from the characteristics of a simple "mix" of these metals! Stainless steel is so chemically stable that no loose oxides are formed. It is also hard; scouring with soil will not lead to detectable levels of iron, chromium or nickel concentrations in soil.

Question 5: Does the chromium plated gouge Model P (04.03) contaminate a soil sample?
This gouge is plated with a pure thick layer of nice shining chromium. Chromium is an extremely hard metal and will only and partly be rubbed off in years of use! Although there is very little chance that these quantities will contaminate a sample with Chromium we would not recommend this gouge as first choice for soil analysis on chromium.