

06.02 Penetrograph

The standard set is equipped with various penetration cones, recorder pens, probing rods and recording charts.

The entire set, including spare parts, operating instructions and the tool are packed in an aluminium carrying/ transport case.

The measuring range is up to 5000 kN/m² (= 5000 kPa).

The penetrograph is suitable for measurements up to 0.80 m depth.

The cones have the following dimensions:

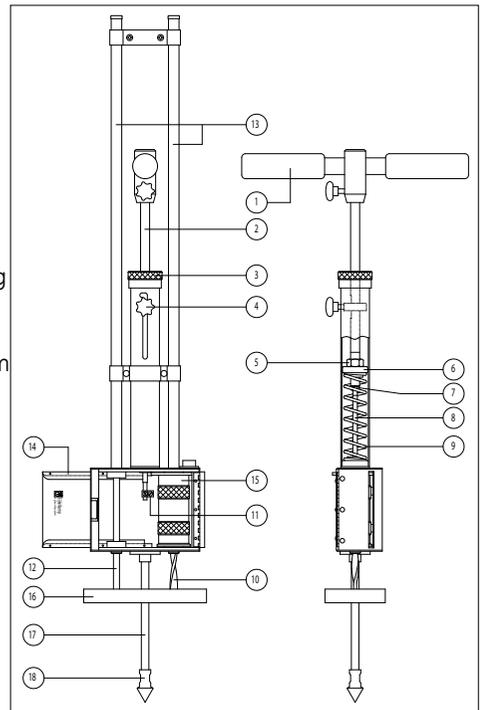
Cone	Base area	Diameter	Rejection diameter
no. 1	1 cm ²	11.28 mm	11.00 mm
no. 2	2 cm ²	15.96 mm	15.55 mm
no. 3	3 ¹ / ₃ cm ²	20.60 mm	20.08 mm
no. 4	5 cm ²	25.23 mm	24.59 mm

Sounding cones

1. Keep the cones dry and clean. Apply a drop of oil to the screw threads to prevent them from rusting.
2. Check the wear of the cones by using the cone check (06.01.26). If you are measuring the diameter with a caliper gauge: If their base area is 5% less than the prescribed base area they should be replaced. If the conical surface is damaged, the cone must be replaced.

To use the penetrograph

1. Select a cone (18) appropriate for the expected density of the soil that is to be sounded. Select the probing rod (17) that fits the base area of that cone. Screw the rod into the recorder.
2. Place the hand grips (1) on the pressure rod (2) at right angles to the two guide tubes (13).
3. With the help of the pressure rod guide knob (4), adjust the compression spring (9) so that it fits, with no tension and no play, between the recorder and the spring seat (6).
4. Using the card guide (14), push a recording chart in to the recorder. To position the chart under the recorder pin, lift the recorder pin by slightly turning the hand grips. Then using the notched edge of the driving roller (15), turn the chart until its zero point is precisely beneath the recorder pin.



5. Position the recorder pin precisely above the vertical zero line. To do this, unscrew the screw in the recorder pin holder (11), using the screwdriver provided with the set, and move the recorder pin holder over the recorder rod.
6. Adjust the recorder pin so that it exerts a slight pressure on the paper. To do this loosen the screw in the recorder pin holder and obtain the correct pressure by tilting the recorder pin either backwards or forwards.

 **Never lift the penetrometer by its guide tubes (13).**

Next, with the help of the ground plate (16), pull the twisted spindle (10) and guide rod (12) out of the measuring instrument and place the ground plate on the soil surface.

Then, applying a uniform pressure to the hand grips, push the sounding cone at right angles into the ground at a constant rate of about 2 cm/sec.

Check that the apparatus is held vertically by checking the spirit level on the recorder.

Put your hand between ground plate and recorder and pull the rod out of the ground.

 **Never pull the probing rod and cone out of the ground by the guide tubes (13).**

Now the chart can be taken out of the recorder and the graph can be read.

Depending on which cone was used, one of the four scales at the top of the chart will have been used. Each chart can be used for more than one measurement.

Check during use

While the apparatus is being used, compare the graphically recorded line on the card with the sounding depth. If they do not agree, this can be due to one of the following:

1. The twisted spindle is damaged.
2. The pressure rollers, under the driving roller, are not functioning.
3. The rubber of the driving rollers is loose.
4. The bearings of the driving roller are dirty.

Also check that the adjustable pressure rod guide knob is properly positioned so that the tension of the spring while at rest is zero and the maximum sweep of the recorder pin is possible.

Maintenance

The penetrometer is an instrument that must be treated with care!

Before each measurement, ensure that the square guide rod and the twisted spindle are thoroughly clean (to reduce friction to a minimum). Dirt on these rods when the sounding cone is pushed into the ground can also clog the bearings.

 **Never apply grease or oil to the guide rod and spindle because grease and oil attract dirt.**

 **We advise to return the apparatus every year for calibration.**