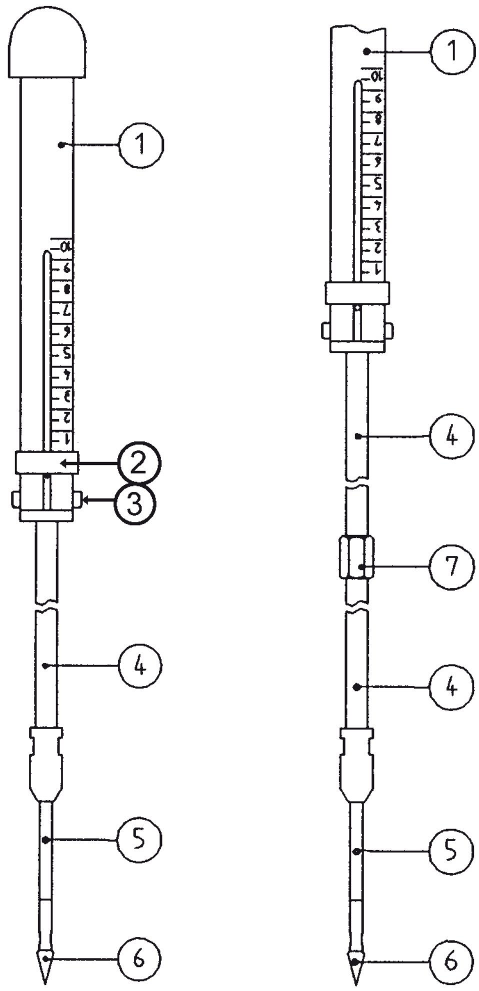
ROYAL Eijkelkamp
Meet the difference

Hand-penetrometer for top layers, type IB

Operating instructions



Meet the difference

Royal Eijkelkamp
Nijverheidsstraat 9, 6987 EN
Giesbeek, the Netherlands

T +31 313 880 200
E info@eijkelkamp.com
I royaleijkelkamp.com

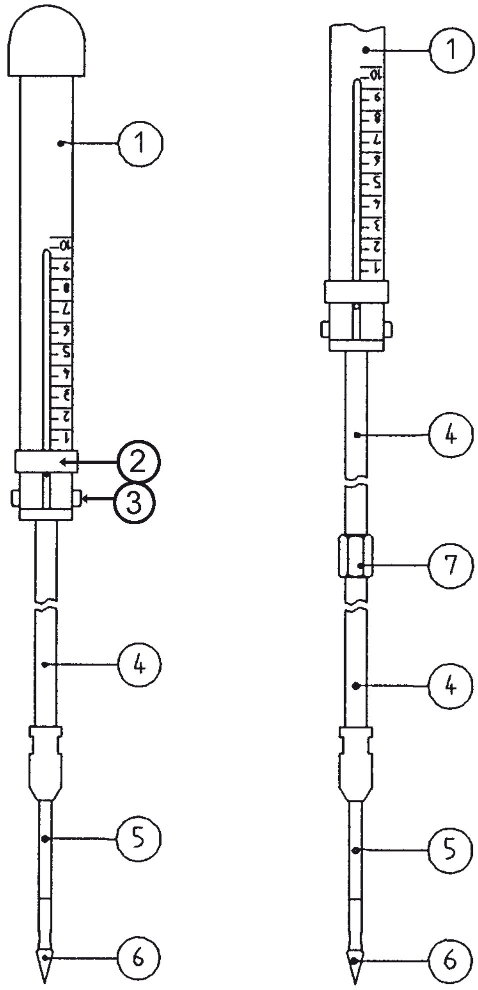
M-0606E

Contents

On this manual

This manual covers the following subjects:
1. Description
2. Calculation of the cone resistance
3. Maintenance

☞ **If the text follows a mark (as shown on the left), this means that an important instruction or an action to be executed follows.**



1. Description

The hand penetrometer for top layers is an instrument for indicative measurment of the resistance to penetration of the top layers. For more accurate measurements we advise the use of the penetrologger. The principle of the hand penetrometer is dependant upon measuring the highest penetration resistance against a cone in a top layer over a traject of approx. 10 cm. An appropriate cone (6), according to the penetration resistance expected, is screwed to the corresponding probing rod (5). The probing rod is attached to the necessary extension rod (4) which in turn is screwed into the penetrometer (1).

☞ **All components must be tightly screwed together, using the tools supplied, to prevent the screw threads becoming clogged with soil.**

The required compression spring is placed in the penetrometer (1) by unscrewing the screws (3) one turn with the supplied hexagonal wrench, the interior can be removed. The required compression spring can be placed inside. The indicator ring (2) must be set at the zero position when measuring commences. The cone is now pushed, with one hand only, at right angles into the soil layer to be investigated at a constant pressure of approx. 2 cm per sec.
The indicator ring now moves to a position that shows the maximum compression of the spring on the mm scale of the penetrometer. Horizontal measuring is possible, in a profile pit for example, by using one short extension rod (4). Two extension rods with connection nut (7) are mainly used for the normal top layer penetration. The choice of cone, compression spring and extension rod is dependant upon the type of soil and the expected penetration resistance. A compression spring 50 N and a large cone 0.5 cm^2 are necessary when investigating loose soils. For more accurate results in a harder and more compact soil the compression spring 150 N and cone 0.25 cm^2 must be used.

The compression springs are distinguished by color and the diameter:

Spring 50 N:	small (Ø 1.4 mm)	no marking
Spring 100 N:	middle (Ø 1.6 mm)	blue marking
Spring 150 N:	large (Ø 1.75 mm)	red marking

2. Calculation of the cone resistance

Calculation of the cone resistance is as follows:

$$\text{Cone res. (N/cm}^2\text{)} = \frac{\text{Total force (pressure(cm) x spring compression (N/cm)}}{\text{cone surface area (cm}^2\text{)}}$$

With a chosen combination and cone, the factor: $\frac{\text{spring compression (N/cm)}}{\text{cone surface area (cm}^2\text{)}}$

will remain constant (= constant factor).

Only the compression of the spring, indicated by the indicator ring, outside the penetrometer is variable. This compression, calculated together with the constant factor gives the cone resistance. The strength of the spring, as indicated, applies to the maximum compression of 10 cm. Therefore this reduces by a value of 10 cm. E.g. with a spring pressure of 150 N and a cone of 0.25 cm² the constant factor will be 15.0 / 0.25 = 60.0

The constant factors applicable to the various spring-pressures and cones are indicated in the following table:

Cone	0.25 cm²	0.5 cm²
Spring pressure		
50 N (5 kgf)	20	10
100 N (10 kgf)	40	20
150 N (15 kgf)	60	30

Example: Spring pressure 50 N; cone 0.5 cm²; reading 8.2 cm.
Cone resistance = 8.2 x constant factor = 8.2 x 10 = 82 N/cm².

To convert into kg/cm²: 10 N/cm² = 1 kg/cm², than 82 N/cm² = 8.2 kg/cm²

3. Maintenance

☞ **Keep the equipment clean and dry.**

☞ **Wear of the cones is unadvoidable with constant use. The diameters of the cones must be: 0.5 cm² = 8 mm and 0.25 cm² = 5.6 mm.**
A reduction of 5 %, i.e. with a diameter of 7.6 and 5.3 mm, means that the cones must be replaced

☞ **The compression springs must be replaced, if it is suspected that false values are indicated. An indicative check of the springs can be done by pushing the springs to the maximum on a appropriate balance and compare the value with the original values as stated above (resp. 5, 10 and 15 kgf).**