Hukseflux
Thermal Sensors

GT SERIES

GUIDING TUBES FOR THERMAL NEEDLES TP02, TP08 AND TP07

The GT series guiding tubes are accessories for Non-Steady-State Needle probes. They are intended to facititate measurements in hard soils, concrete, cement and bentonite. Also in case of measurements on large quantities of samples one can use several guiding tubes and one single needle.

None-Steady-State Probes are used to determine the thermal conductivity of the surrounding medium. The method can applied in various substances such as sludges, fluids, foodstuff. The most frequest application however is in soils.

A recurring problem is that insertion into hard soils, bentonites and cements is quite difficult. The main problem is that it is quite difficult to insert needles into these hard materials.
The use of guiding tubes in many cases can solve this problem;
The guiding tube should be inserted into the medium, and the needle can be inserted at a later stage.

Hukseflux is a leading supplier of Non-Steady-State Probes, and is the inventor of this guiding tube technology.

APPLICATIONS

In case of bentonites and cement the guiding tubes are cast into the material and experiments can be carried out later
In case of hard soils, a typical approach is to pre-drill a hole, insert the guiding tube, compact the soil again, and perform a measurement.
In case of dryout experiments guiding tubes are inserted into the samples, dryout can then take place at high temperature (the needle is not inserted).

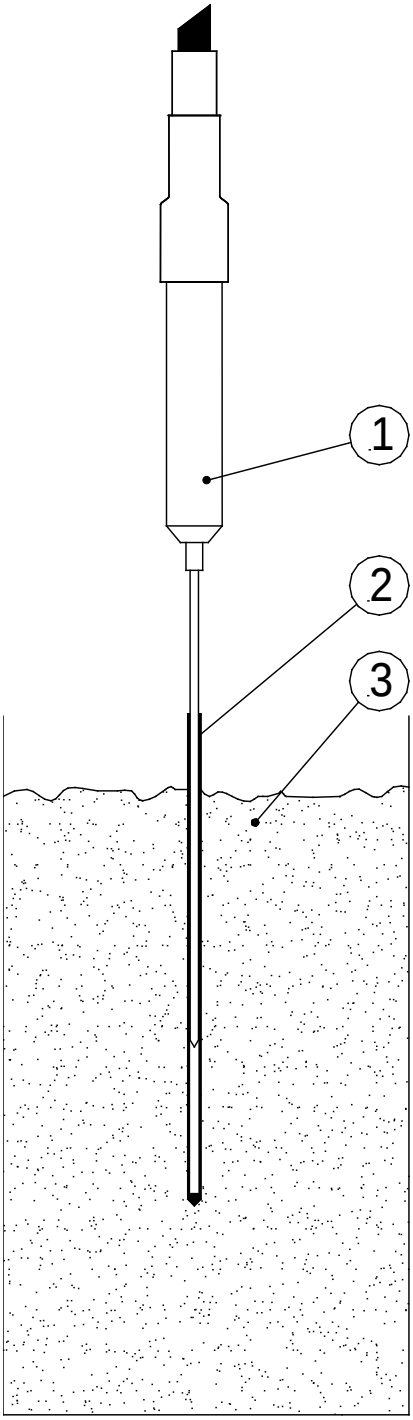

Figure 1 *Non-Steady-State Probe. The needle (1) is inserted into a guiding tube (2), typically in a solid sample (3).*

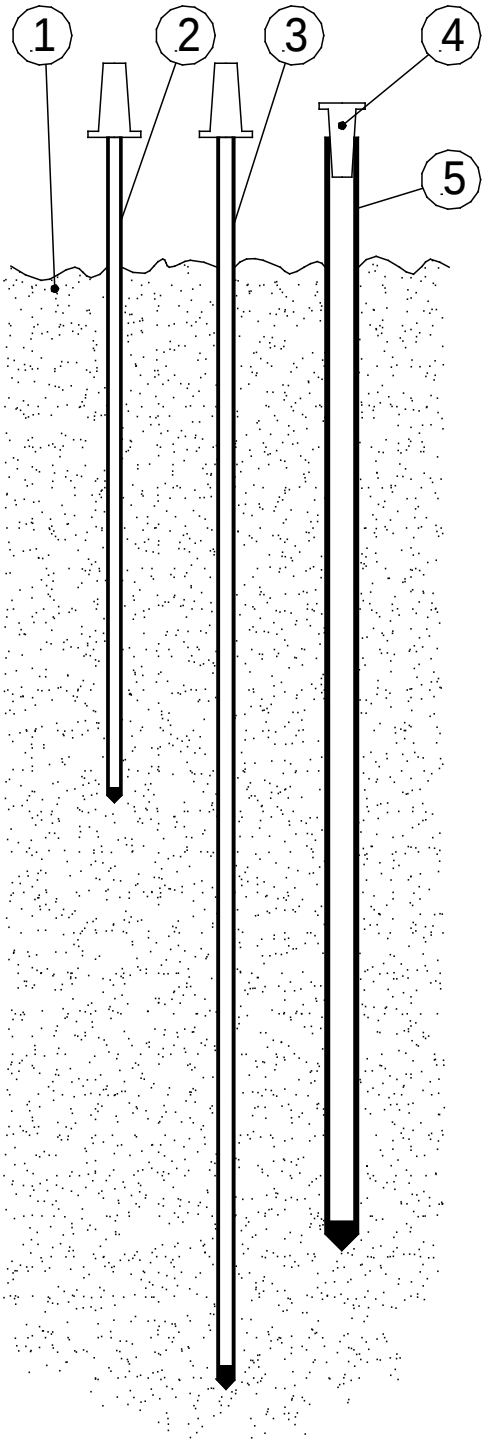

Figure 2: *guiding tubes in a soil (1) sample. Caps (4) are used to avoid soil coming into the tubes. GT01 (2), GT02 (3) and GT03 (5) have different dimensions to suit different needle types.*

ACCURACY CONSIDERATIONS

It has been verified that the addition of a guiding tube does not have a significant impact on the measurement accuracy; when inserting a needle into a guiding tube, essentially a larger diameter needle is created. This results in a larger transient time; one has to wait longer before the desired linear behaviour (of temperature versus the logarithm of time) is occurring.
This is normal behaviour for thicker needles.
In case it is possible, it is recommended to add a small quantity of glycerol into the guiding tube (before inserting the needle) to minimise the contact resistance. This improves the repretability of the measurement. One should however be careful not to pollute the soil with the glycerol.

Type	Dimensions	Suitability for needle types
GT01	L = 90 OD = 2	TP08
GT02	L = 170 OD = 2.38	TP02
GT03	L = 150 OD = 4.50	TP07

Table 1: *GT guiding tube types and their application.*

DIRECTIONS FOR USE

1 put the GT into the medium
2 cast or compact as much as possible
3 remove the cap
4 (optional) put a small quantity of glycerol into the GT. Make sure not to spill glycerol on the soil.
5 put the needle into the GT
6 perform an experiment however increase the heating time by 50% relative to the normal situation
7 remove the needle
8 put the cap onto the GT
9 if applicable: remove the GT from the sample (in many cases the GT can be re-used).

GT SPECIFICATIONS

Test method:	ASTM D 5334-00 and D 5930-97 IEEE Std 442-1981
Delivery:	sets of 5 tubes, including caps
Material:	stainless steel
Needle ends:	welded
Protection tube with cap:	IP 67