TK04 Quick Start Guide

TK04 Thermal Conductivity: Quick Start Guide

V368X (T. Cobb, B. Novak) ;V371T – 7/11/17 (T. Cobb); V1.1; M. Hastedt 8/15/2011 reviewed |S. Frazier March 2018

Introduction

The Teka Berlin TK04 system determines thermal conductivity based on a transient heat flow method. A line source is heated with constant power, and source temperature is recorded simultaneously. Thermal conductivity is calculated from the resulting heating curve.

Preparing Samples for Analysis

Measuring the Standard

1. Prior to initial testing of received cores at a site, the TK04 system should be tested and calibrated to ensure that there are no potential mechanical or software issues. Additional tests using the Standards should be run as part of the troubleshooting process if you experience issues during actual testing (*See **Troubleshooting** in the TK04 Thermal Conductivity: User Guide)*.
2. The Macor Standard for the Standard VLQ consists of its black holding shell, while the Macor Standard for both the Standard HLQ and Mini HLQ is a white disc. Calibration tests for any of the available probe types should provide results of TC=1.626-1.637±2%.
3. To conduct a probe test, scan the STND MACOR disc TCON (H) label kept above the testing apparatus and ensure that the appropriate heating time and drift control (DCL) settings are input under the Configuration settings (*See Configuring the Measurement Program).*
4. Once the proper settings are confirmed, you can test the probes on the standards as if it were a normal sample.

Soft-Sediment Samples

1.	Equilibrate core sections to room temperature for at least 4 hr in the core rack before bringing a target section to the thermal conductivity workstation.
2.	Select measuring points in the core and record offset in cm. –Intact core: middle of section –Cracked core: just above/below the middle
3.	Use the cordless drill to drill a ~2 mm hole into the core liner at the border between the working and archive halves. If the sediment is semi-consolidated, drill a small hole in the sediment for the needle probe as well.
4.	Optional - Apply thermal joint compound to the probe unless the sample is very soft and/or moist.
5.	Carefully insert a clean full-space needle into the sediment. Avoid twisting the needle into the core.

Hard Rock samples

1.	Place hard rock samples in an ambient temperature seawater bath to equilibrate and saturate (4–12 hr). Keep sample saturated until measurement. A bell jar/vacuum pump can aid in saturation. **Seawater bath is not necessary when using the mini-puck
2.	If the surface of the split core is excessively rough, use a lap plate and grit from the Thin Section Lab to prepare a smooth surface on a split-core piece. Pieces must be at least 10 cm long.
3.	Equilibrate the sample and sensor needle together in an insulated seawater bath for at least 15 min prior to measurement. Do not submerge the puck – let the water level rise to half the depth of the puck or less. Secure the puck to the sample with a rubber band.

4.	Optional - Apply thermal joint compound to the side of the probe where the line source is located.

Measuring Samples

Configuring the Measurement Program

1.	Load **ThermCon** software in offline mode. Ensure that the *Text_ID* field is blank.
2.	Scan the core label using a scanner, then click **Verify Sample**.
3.	If login is requested, enter *UserName* and *Password* and then click **OK**. **Note**: The folder path is shown on the screen. Do not close this window during measurement.
4.	Run **TK04** program and choose **Measuring > Configuration**.
5.	Set configuration parameters as follows: –*Probe Number:* serial number of probe to be used in the measurement (Note: results may be wrong by several percent if the wrong serial number is entered or by a factor of ~2 if the wrong type of probe is entered). –*Root Name:* 6 characters or less; suggest Core-Type-Section (no special characters). –*Serial Number*: number of repeat measurements at each point (1–99 single measurements). –*Folder:* path for saving data results. –*Heating Power:* for the VLQ (needle probe), set to twice the estimated thermal conductivity value of measured sediment. For example, 2–3 is good for sediment. For the HLQ (large and mini puck), set equal to the estimated thermal conductivity value of the measured sediment. The mini puck often gets better results without the thermal compound when measuring the standard. –*Measuring Time:* set to at least 80 s (needle probe); set to 60 s for Puck. Click **Expert Options** to configure *Drift Control* and *Pause in Minutes* (see Step 6). Enter comments.
6.	To configure *Drift Control* and *Pause in Minutes* in **Expert Options:** –*Drift Control (DCL)*: limit for the range of temperature drift allowed prior to heating and measuring. A larger number allows quicker but less accurate measurement. Default (unchecked) DCL = 10; Recommended DCL =. 10-20 –*Pause in Minutes*: insert a pause between single measurements; recommended = 10 min. This parameter does not apply when conducting a single measurement on each core or each core section.

Measuring Samples

1.	Confirm configuration settings shown in the lower part of the **TK04** screen, insert the probe into the hole drilled into the sample, and click **Start Measuring.**
2.	Drift control (DCL) repeats until the criterion for drift (set in the **Expert Options** window) is met. Each drift control measurement takes 0.5 min. For DCL = 40, drift control is <10 series (~5 min). For DCL = 10, drift control is <30 (~15 min).
3.	After satisfying drift control, sample heating and measuring begins, and temperature values are corrected automatically for the drift effect predicted from the last drift series. Elapsed measurement time is controlled by the value entered in **Configuring Measurement Program > Step 5**.
4.	Best solutions calculated by the TeKa SAM algorithm are shown on the screen. Note the sample result on the hand-written log.

Uploading and Verifying Data in LIMS

1.	To upload results to LIMS, click **Upload to LIMS**.
2.	If upload is successful, a message like "Logged results for sample …" is shown.
3.	Close the **ThermCon** program.

Verifying Data in LIVE (LIMS Viewer)

Run LIVE from the ship application page to check thermal conductivity data:

1. Select the PHYS_PROPS_Summary template.
2. Select the Site/Hole/Interval to be queried.
3. Click View Data.

Retrieving Data from LIMS Reports

1.	Go to *LIMS Reports* at http://webserv.ship.iodp.tamu.edu:8080/UWQ/.
2.	Under **Select Report**, choose **Physical Properties** > **Thermal Conductivity (TCON)**. a. Note: The "expanded" report shows all of the database parameters and may be confusing to a general user; use the "standard" report.
3.	Under **Select Sample Range**, specify *Expedition*, *Site*, *Hole*, and *Section* image(s) to retrieve.
4.	Click **View data** or **Download data file** to view results or download a CSV file.

After Verifying Data Upload

1.	Once uploaded data are confirmed, clean the needle probe and place it in its storage container.
2.	Repeat sample measurement process with a new sample.

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- TK04 Quick Start Guide 2020 (*.pdf)