# TECHNICAL NOTES FOR USERS - NOTE #022
## HOW TO MEASURE HOT WEBS

Keywords: paper moisture meter, biofuel moisture meter, infrared moisture meter, industrial installations

**Hot Webs, General**

Hot papers are not straightforward targets when measured with infrared moisture meters. Difficulties arise due to strong local variations of moisture and temperature. General applications are in the last dryer section of paper machines, pilot paper machines, some printing machines, laser printers and other hot nips for research or hot calendars. AK50 meters have been used for a great number of similar applications since 1997. Its high speed and various data capturing features are optimized for research. The same meter can be used in regular on-line quality control.

Due to the fast speed of the paper sheet or web, the hot nip contact is usually very short. The web temperature may rise to 90 C in many cases and in a laser printer's hot nip, at the usual 180 C, it may rise momentarily up to 140 C or higher. The paper temperature does not rise as much as is expected since moisture in paper will evaporate causing strong cooling, even for the nip rollers. If paper contains 5% of water, then it is a simple task to calculate the amount of heat energy to be fed into the nip heaters for removing the water alone per square meter of web.

**Web Temperature**

The AK50 moisture meters have been compensated against surface temperature variations and pose no big problems as long as temperature does not vary too fast in time. The typical response time of the internal web thermometer is about 160 ms to full accuracy. For best accuracy in very high temperatures, align the IR thermometer's estimated sensing point (2) and the sensitive area of the moisture meter's spot along the same line across the web (3), not along it (1), refer to Figure 1 in the following. Small errors in temperature do not cause too big errors into moisture. However, if calibrations are made at 25C and the web is run at 125 C, a significant error (+/-0.7% in moisture) may arise if the web temperature would be measured incorrectly at 25C. Needless to say, that the IRMA-7 model DE economy model is not able to take this into account since it does not have a web thermometer and thus should not be used for measuring very hot webs at all.

**Variations in Moisture**

Moisture will vary strongly when the web arrives from the hot nip. This is caused partly by the still continuing drying of the paper (especially true with boards) caused by high vapor pressure. On the other hand, paper is cooling down quickly and is able to accept water back to its structure immediately from the surrounding air. Remoistening will happen very rapidly, especially, if the paper has become very dry. This is a matter of fractions of a second. Thus, if you want to measure loss of moisture in the nip, you need to install the meter rather close to it. That is sometimes very difficult for many practical reasons. If the surrounding air is hot, you need to arrange purge air flow for the meter. Also, it is important to avoid a situation where the web thermometer is looking at the hot surface of the rollers. Even a reflection of the infrared radiation from the paper surface may cause incorrect readings to the thermometer. The same applies to the moisture meter itself. Its optical head must not see the hot nip as it may cause saturation of infrared detectors due to the massive amount of radiation. Test and retry is the advice here.

Please note that a paper never becomes bone dry by just going once through a hot nip. The remaining moisture content may be near 1.5% in many cases. Paper will restore its moisture to 2% from bone dry in a few seconds. Careful working methods are required if sample sheets are handled and weighed in a laboratory balance.



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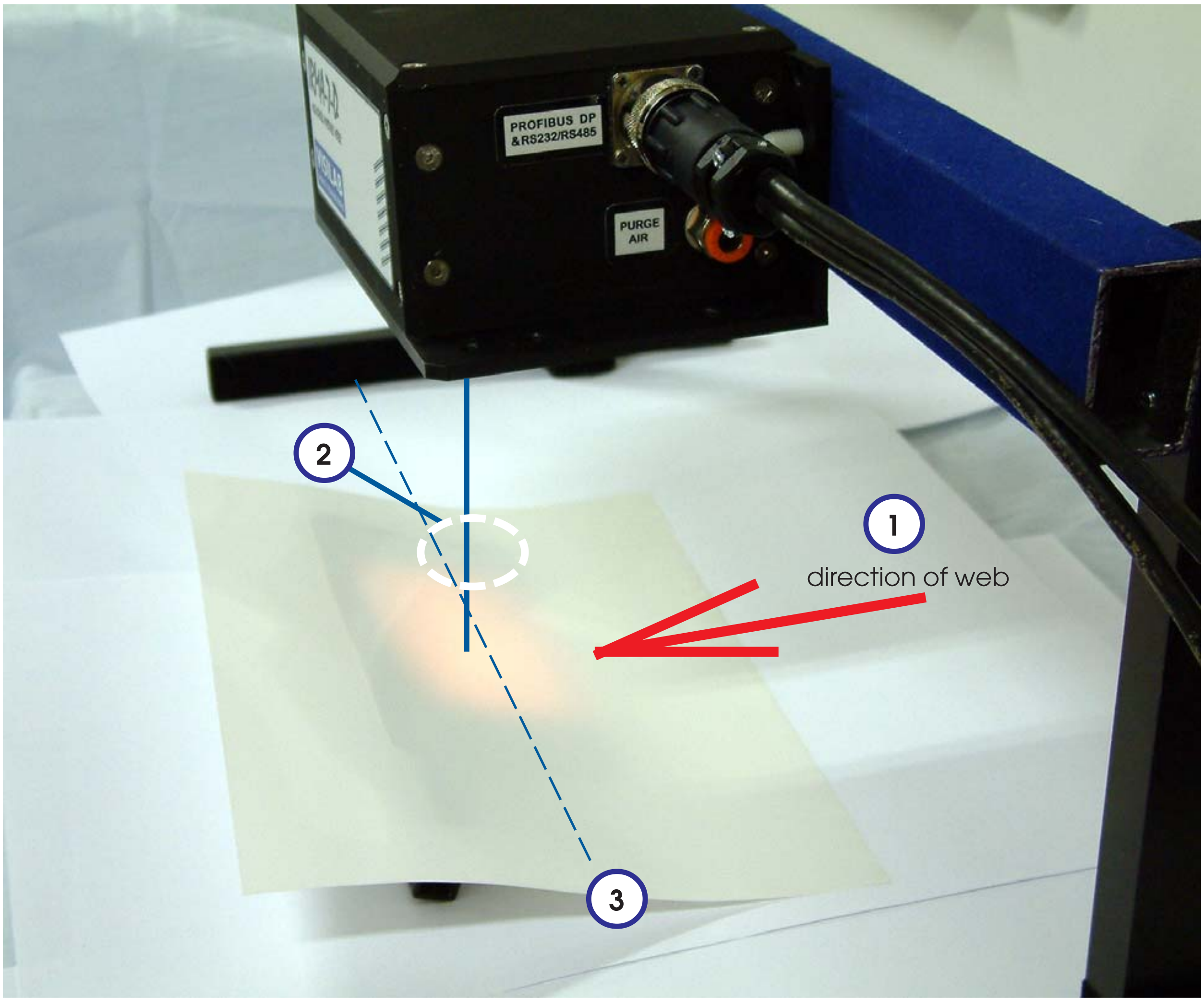


Figure 1. Measuring hot webs, definition of terms. Refer to text for the numbers.



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