KAYE
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Minimizing Risk when Using a Traceable Temperature Standard

Precision and reliability are of the utmost importance in the validation of thermal processes. These requirements demand time-consuming and complex procedures for the validation, calibration, and verification of the instruments used. In this context, the Kaye IRTD, a high-precision traceable temperature standard, plays a noteworthy role. Its application is crucial for the accuracy of Kaye's validation systems, like the Kaye AVS and the Kaye ValProbe, and thus forms an integral part of these verification and calibration processes. However, the use of temperature standards also brings specific challenges and potential risks. This Technical Note shows how such risks can be minimized, and the validation and calibration processes can be optimized and have their risks reduced.

The Kaye IRTD, a high-precision, traceable temperature standard, plays a crucial role within the Kaye validation systems. It is deployed in both Kaye AVS and Kaye ValProbe, where it is used for the calibration of thermocouples and data loggers. During the sensor calibration or verification, the sensors are compared with the IRTD, with all deviations, also known as offsets, automatically detected, adjusted and recorded. In the context of the calibration procedure, the IRTD is therefore indispensable, and, in simplistic terms, forms the core of the calibration. Measurement errors, which, for example, could be caused by improper handling of the temperature standard, directly influence the calibration result. Thus, as part of a risk assessment, it is necessary to take suitable precautions and incorporate necessary optimization measures in the respective calibration instructions.

It is apparent that a traceable temperature standard that does not work correctly leads to significant, but often hidden, measurement errors. These directly influence the calibration result of each sensor and affect the accuracy of the temperature measured in the application, which ultimately leads to incorrect temperature measurements.

This raises the question for users: **How can I minimize this risk?** This is especially relevant if the traceable temperature standard is only sent back to the manufacturer for verification once a year. Indeed, a worst-case scenario would be having to retrospectively perform an OOS investigation of all calibrations carried out over the course of a year with the Kaye IRTD.

In this regard, Kaye offers several practical and feasible solutions to choose from. At the heart of these is a second Kaye IRTD, which is used as a comparison reference. This second reference IRTD can, for instance, be rented occasionally, or the user may already have a second IRTD. In practice, the second variant has emerged as the favorite, as it provides the most significant flexibility in everyday work. This is because the user can conduct a review independently and promptly whenever doubts arise. This second Kaye IRTD is used exclusively as an internal reference IRTD and is not used in daily applications.

What possibilities for independent verification by the user are there, and what is needed for this?

1 Kaye AVS + Kaye Calibration Oven (e.g., Kaye LTR-150) + Working IRTD + Reference IRTD

Both IRTDs are connected to the Kaye AVS Validator at the respective IRTD port and simultaneously inserted into the designated reference holes on the Kaye LTR-150 at a stable temperature, e.g., 121.1°C. The temperature values measured at both Kaye IRTDs can then be quickly visually compared via the online display of the Kaye AVS software.

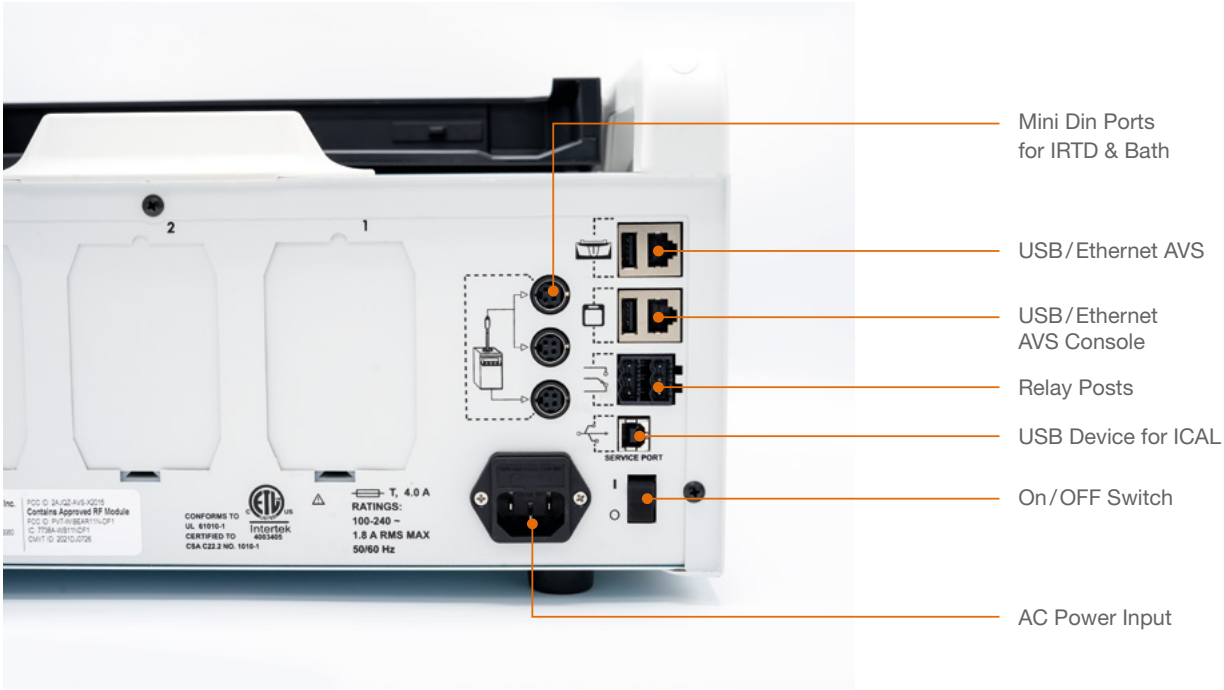

Figure 1: Connections for 2 IRTDs on the Kaye Validator AVS

2 Kaye Calibration Oven (e.g., Kaye LTR-150) + IRTD interface + Kaye Console Software + Working IRTD + Reference IRTD

The working IRTD and the reference IRTD are connected to the IRTD interface and again simultaneously inserted into the designated reference holes of the calibration oven. At the same time, the Kaye Console with installed IRTD Console software is connected. Upon reaching the verification temperature set on the calibration oven, simply start the software to visually display the measurements of both IRTDs. These are logged in the background in a database for later verification.

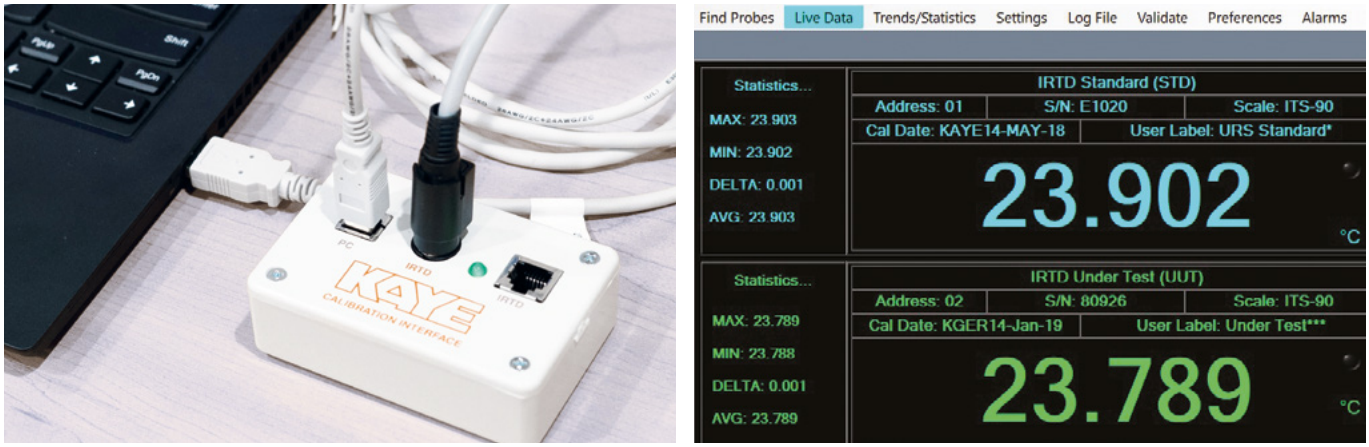

Figure 2: Connection via IRTD interface and display of measurement values using Kaye Console Software

3 Kaye Calibration Oven (e.g., Kaye LTR-150) + Kaye IRTD Display + Working IRTD + Reference IRTD

The Kaye IRTD Display is a temperature display unit with touchscreen. This advanced display can connect directly with up to two Kaye IRTD temperature reference probes, offering real-time temperature values in a very user-friendly format. Equipped with a 4.3-inch touchscreen, it provides clear and highly visible measurements for the connected IRTDs, enabling the user to easily read and document the temperature. The display also shows the temperature difference (Delta) between the two connected IRTDs, thereby enabling swift and accurate analysis. The Kaye LTR-150 calibration oven is used once again as a stable temperature source.

Figure 3: Direct comparison of two IRTDs via the IRTD display

4 Kaye LTR-150 Calibration Oven + Working-IRTD + Reference-IRTD + IRTD Interface Box

Both the Working and Reference IRTDs are connected directly to the Kaye LTR-150. The measured temperature of both IRTDs is displayed directly on the touchscreen of the calibration oven, and a visual comparison, even across different programmed temperature stages, is possible.
Once again, Kaye demonstrates its comprehensive technical expertise and decades of practical experience in the field of thermal process validation. The solution approaches presented in this Technical Note are user-friendly, easy to implement, and possible with existing Kaye systems, helping to reduce potential risks when using traceable temperature standards as calibration references. In addition, all Kaye ISO 17025 accredited calibration laboratories are available to our users to check, recalibrate, and adjust the Kaye IRTD temperature standards, if necessary.

Figure 4: Direct comparison of two traceable temperature standards on the Kaye LTR-150 dry block calibrator display

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